Introduction to the Special Issue Spotlighting Papers from the AERA Special Interest Group on Online Teaching and Learning

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The American Educational Research Association (AERA) is the premier association of educational research professionals. Founded in 1916, AERA has more than 25,000 members and is international in scope, with members representing over 85 countries world-wide. It is concerned with improving the educational process by encouraging scholarly inquiry related to education and evaluation, and by promoting the dissemination and practical application of research results. AERA's 2017 annual meeting, held in San Antonio, TX, included thousands of research presentations across a range of disciplines.

AERA supports 12 divisions and 150 Special Interest Groups (SIGs). One of the latter is the Special Interest Group on Online Teaching and Learning (SIG-OTL). SIG-OTL is a multi-disciplinary community of scholars focused on the creation, use, and evaluation of online learning environments. (For more information on AERA and SIG-OTL, visit the SIG-OTL website at: http://www.aera.net/SIG035/Online-Teaching-and-Learning-SIG-35 or the SIG-OTL Facebook page at https://www.facebook.com/AERAOTL/). In 2017, SIG-OTL accepted 65 papers from 101 submissions and sponsored 15 sessions in which researchers presented their findings on a variety of topics related to online learning.

For the past two years *Online Learning* (OLJ) has published a selection of high quality papers presented at AERA through a cooperative arrangement between the Online Learning Consortium and SIG-OTL. Special thanks to the SIG Chair, Steven Terrell, of Nova Southeastern University for his assistance. The eleven papers in this special issue were selected from accepted papers. They include research on online collaboration from the perspectives of minority students and instructors, on how perceptions of communities are influenced by course length and discussion facilitation, and on the relationship between self-reflection and achievement in online K-12 math courses. There are two papers on online teachers' professional development – one exploring best practices and the other opportunities for learning how to support students with disabilities online – and three interesting studies that explore fascinatingly different versions of "hybrid" learning ranging from the accommodation of students who became distant, the use of "robot-mediated communication," and virtual office hours. Finally, there are two papers on MOOCs, one offering a typology for categorizing MOOCs and the other exploring the relationship between student engagement and achievement in MOOCs. These are described below.

The first paper in this collection, "Online Collaborative Learning Activities: The Perspectives of Minority Graduate Students," reports on a qualitative study focusing on the perceptions of minority graduate students toward online collaborative activities. Authors Alex Kumi-Yeboah, James Dogbey, and Guangji Yuan found that the 20 African American, Hispanic and international students from Africa they studied felt collaborative activities helped meet their learning and communications style. The students also stated their preference for small group over whole group activities, their appreciation of opportunities to share and lead discussions, and their belief that collaborative activities support knowledge-building and construction. On the other hand, the students noted the challenges of dealing with cultural differences and reported a lack of cultural diversity and inclusion in the course materials and content. Read the article to find out about recommendations that instructors can use in their own courses.

The four instructors interviewed in Heather Robinson, Whitney Kilgore, and Scott Warren's study also provided perspectives on collaborative learning. In "Care, Communication, Support: Core for Designing Meaningful Online Collaborative Learning," the second paper in this section, the authors report that these instructors focused more than one might expect on technology issues in two of the three main themes that emerged from the study -- online communication approaches matter, challenges and supports for online collaborative learning, and care is at the core of online learner support. In this last category, all four discussed the importance of developing relationships with their students but also of providing scaffolding for collaboration.

The third paper in this collection is titled "Student Actions and Community in Online Courses: The Roles Played by Course Length and Facilitation Method." Its authors, Carrie Demmans Epp, Krystle Phirangee, and Jim Hewit take a primarily quantitative approach to studying the development of community in online discussion. Using a two (facilitation approach) by two (course length) design, they found that instructor-led (as opposed to student-led) facilitation and longer course lengths were associated with stronger student perceptions of community, but that facilitation approach had a stronger effect than course length. No interactions between main effects were found, but the authors noted that students' postings differed between groups.

The next paper in this collection deals with online learning in the K-12 arena. In "Self-Reflection and Math Performance in an Online Learning Environment," Jinnie Choi, Alyssa Walters, and Pat Hoge report on a series of retrospective studies of full time virtual students enrolled in elementary, middle and high school mathematics classes in eight online schools in the United states. In particular, the authors were interested in whether or not participation in self-reflection activities embedded in these courses improved student performance. They found that participation in self-reflection varied by grade, unit test performance level, and course/topic difficulty; that more frequent participation in self-reflection and higher self-confidence levels were associated with higher final course performance; and that self-reflection showed limited impact for more difficult topics, higher grade levels, and higher performing students.

In "Describing K-12 Online Teachers' Online Professional Development Opportunities for Students with Disabilities," Mary Rice reports on a phenomenological study that explored professional development focused on teaching students with disabilities online. Based on several semi-structured interviews with 18 administrators and 14 teachers involved in K-12 online education, results revealed that most professional development in this arena was on an as needed basis and professional development concerned with disabilities mostly centered on legal responsibilities, and that participating teachers and administrators had little opportunity to improve their accommodation and instructional knowledge and skills.

Turning to professional development in higher education, Sandra Mohr and Kaye Shelton recruited fifty-seven experts with at least five years' experience supporting online faculty for a four round Delphi study. In "Best Practices Framework for Online Faculty Professional Development: A Delphi Study," the outcome was the identification of four categories of professional development topics – faculty roles, classroom design, learning processes, and legal issues – and three categories of institutional strategies – campus climate, expectations for online learning, and staffing support.

Moving to hybrid environments we begin with a case study by Enilda Romero-Hall and Rocha Vicentini, "Examining Distance Learners in a Hybrid Synchronous Course: Successes and Challenges." The hybrid course studied was a tradition face-to-face course reconfigured using synchronous video and an LMS to accommodate three learners who due to various circumstances needed to complete their masters program as distance students. The study found that hybrid synchronous instruction improved the study habits of the distance learners. On the other hand, to succeed, the distance learners had to overcome pedagogical challenges involving the interactions, relationships, and communication exchanges between distance learners, their face-to-face counterparts, and the instructor.

In "Hybrid Education: The Potential of Teaching and Learning with Robot-Mediated Communication," Benjamin Gleason and Christine Greenhow explore hybrid learning in which 12 online and one campus-based doctoral students communicated using robots who occupied a physical space. Results from this fascinating study suggest that robot-mediated communication offers advantages over traditionally used video- conferencing, including affordances for fostering students' embodiment in the classroom, their feelings of belonging and trust, and their ability to contribute ideas in authentic ways.

Patrick Lowenthal, Joanna Dunlap, and Chareen Snelson also examined a hybrid environment, which integrated live synchronous web meetings into asynchronous online courses, collected student feedback, and made iterative changes over time based on that feedback. Their paper, "Live Synchronous Web Meetings in Asynchronous Online Courses: Reconceptualizing Virtual Office Hours," documents three successive redesigns of optional virtual office hours to increase student attendance. The authors conclude the paper with implications for practice, including providing orientation to live sessions from the beginning of the course, scheduling for a range of times, making the sessions relevant to students' learning needs, adding incentives (such as extra credit points), and making sure the sessions are highly interactive.

In the final shift of our special issue we look to MOOCs, beginning with Stephanie Blackmon and Claire Major's "Wherefore Art Thou MOOC: Defining Massive Open Online Courses. This study used a typology they developed to examine the public information about 30 MOOCs." The typology classifies MOOCs along ten dimensions – affiliation, size, accessibility, duration, timing, relation to knowledge, content, structure, authority and control, and pedagogy. The authors report that the typology was useful in general but that some categories such as affiliation, duration, and size needed revision. Some patterns that emerged were that MOOCs from particular providers generally shared pedagogical approaches, and that the size of MOOCs is related to who enrolls and is therefore independent of the other categories. The authors also found that the distinctions between cMOOCs and xMOOCs seem to be blurring.

Finally, Fernanda Cesar Bonafini, Chungil Chae, Eunsung Park, and Kathryn Weed Jablokow ask "How Much Does Student Engagement with Videos and Forums in a MOOC Affect

Their Achievement?" Their answer is that both engagement with videos and participation in discussion forums are positively associated with achievement in MOOCs but both of these both of these behaviors are strongly influenced by students' intention to get MOOC certificates. The paper also reports on an interesting qualitative analysis of discussion posts, which reveals that most students' posts display more information acquisition than critical thinking. The authors suggest that MOOC instructors foster engagement in forums by implementing discussion prompts that foster interactions about the deep meaning of concepts or application of concepts covered.

The editors of this special issue hope our readers enjoy the articles selected and welcome any comments

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Online Collaborative Learning Activities: The Perceptions of Culturally Diverse Graduate Students

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Abstract

This exploratory study examined the perceptions of minority graduate students toward online collaborative learning activities. The participants were 20 minority graduate students from diverse cultural backgrounds (10 African Americans, 5 Hispanics, and 5 international students from Africa) enrolled in online graduate instructional technology and special education program at a university located in the Northeastern United States. A qualitative research design using semi-structured interviews, focus group interviews, and a non-participant observation were employed to collect the data for the study. The analysis of the data identified six themes on the perceptions of the minority graduate students toward online collaborative learning activities: (a) knowledge building and construction, (b) preference to work in small-group over whole-group activities, (c) opportunities to share and lead discussion in cross-cultural online environment, (d) collaborative activities help meet their learning and communication styles, (e) challenges of dealing with cultural differences, and (f) lack of multicultural inclusion in the curriculum/course content. The findings of the study suggest that instructors who are tasked to teach online courses should take into account the benefits, preferences, and challenges of students from diverse cultural backgrounds as they participate in online collaborative learning activities.

Keywords: Culturally diverse students, multicultural inclusion, cultures in online learning, knowledge building, knowledge construction, online collaborative activities

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Online Collaborative Learning Activities: The Perceptions of Culturally Diverse Graduate Students

Collaborative learning is an educational approach to teaching and learning that involves groups of students working together to solve a problem, complete a task, or create a product (Johnson, Johnson, & Holubec, 2008). This approach to teaching and learning, which represents a significant shift away from the typical teacher-centered instructional practice, is increasingly becoming an instructional approach of choice in both the traditional face-to-face and online education settings due to the numerous positive effect it has on students' educational outcomes (Gunawardena, Layne, & Frechette, 2012; Havard, Du, & Xu, 2008; Shi, Frederiksen, & Muis, 2013; Pattanpichet, 2011; Yazici, 2004). Several research reports have observed that learning tends to be the most effective when students are given the opportunity to work collaboratively, express their thoughts, discuss and challenge the ideas of others, and work together towards a group solution to a given problem (e.g., Gabriel, 2004; Johnson & Johnson, 1989; Means, Toyama, Murphy, Bakia, & Jones, 2010).

Ashong and Commander (2012) reported that the practice of collaborative learning is growing rapidly in online education because many program developers, and instructors of online courses are beginning to realize its positive effect on students' learning, and as a result, are incorporating collaborating learning as one of their instructional strategies of choice in the online environment. Some of the frequently cited advantages of collaborative learning in the online environment include the development of critical thinking and problem-solving skills, the development of skills of self-reflection, and the construction of knowledge and meaning (Brindley, Walti, & Blaschke, 2009; Gachago, Morris, & Simon, 2010). It has also been shown that skills gained from collaborative learning in the online setting are highly transferable to team-based work environments (Shaw, 2006), which are essential for the 21st-century workforce. Collaboration among students and teachers also works to cement a student's interest and expand their knowledge in specific topics (Means et al., 2010; Smith, Clark, & Blomeyer, 2005).

The increasing popularity of collaborative learning in the online environment has been generating significant research interest within the online education community in recent years, resulting in an increasing number of researchers examining factors that promote or impede effective collaborative learning in the online environment (e.g., Brindley, Walti, & Blaschke, 2009; DeRosa & Lepsinger, 2010; Dirkx & Smith, 2004; Gabriel, 2004). Several researchers, for example, have explored students' perceptions about the benefits of collaborative learning, students' participation and sense of community in collaborative learning, and the effects of group settings on collaborative learning outcomes (e.g., Du, Zhou, Xu, & Lei, 2016; Ellis, 2001; Gabriel, 2004; Shea et al., 2001). Others have also examined the kind of interactional strategies that are necessary for collaborative learning to be effective and rewarding, as well as the problems students encounter while studying as members of online learning group (e.g., An & Kim, 2007; Dirkx & Smith, 2004). There is also a growing body of research looking into online instructors' characteristics (e.g., subject matter and pedagogical knowledge) that enhance the implementation of collaborative groups in the online environment, and ways in which instructors can design effective online collaborative learning activities for students (DeRosa & Lepsinger, 2010; Driver, 2002; Garrison, 2006; Murphy, 2004).

For example, in working with students enrolled in a master of education program on collaborative activities, Gabriel (2004) found that the M.Ed. students in her online class developed deeper understanding of the recursive nature of knowledge construction (review, rethink, and revise one's work), and an increasing belief in their own ability to learn efficiently in the online group environment (i.e., their perception of self-efficacy increased as the course progressed). Similarly, Ellis (2001) identified: 1) access to peer knowledge, 2) availability of other students to provide feedback, and 3) opportunities to reflect on exchanged messages as positive elements of online collaborative work. Shea et al. (2001) found that students taking online courses achieve higher satisfaction with their learning experiences when they are engaged in collaborative assignments.

In identifying factors that impede collaborative learning in the online environment, Dirkx and Smith (2004) reported that online learners are often reluctant, frustrated, and dissatisfied with collaborative learning methods, especially when working within small online groups, because they "struggle with the development of a sense of interdependence and inter-subjectivity within their online groups, but end up holding fast to subjective, individualistic conceptions of learning" (p. 134). An and Kim (2007) examined inservice teachers' (enrolled in an online master's program) perceptions about their online group project experiences, and found that the participants expressed difficulties from participating in online group projects, yet their positive experiences outweighed the negative ones. Hiltz and Turoff (2002) argued that, ideally, collaborative learning activities in online environments should include debates, group projects, case study discussions, simulations, role-playing exercises, the sharing of solutions to homework problems, and the collaborative composition of essays, stories, and research plans. However, in reality, most online collaborative work is usually relegated to discussion board conversations, in which students merely generate a dialogue with their peers about the weekly readings. Additionally, several studies have noted that while the instructions in online education (e.g., the use of small groups and real-time, web-based tools) can be leveraged to engage students in collaborative learning, the effective use of these strategies require deliberately planned lessons on the part of online instructors (Garrison, 2006; Murphy, 2004; Watson & Gemin, 2008).

In spite of above studies and many other vested efforts in researching the effectiveness of collaborative learning in the online environment, there is a dearth of empirical studies examining issues related to culturally diverse students and collaborative learning in the online environment, particularly, the perceptions of culturally diverse students toward collaborative learning activities within the online environment (Boyette, 2008; Du, Ge, Xu, 2015). Thus, as an increasing number of minority students continue to enroll in online education (Ashong & Commander, 2012; Petersen, 2015), it is imperative that researchers examine the extent to which instructional strategies such as collaborative learning—well documented in the research literature as effective for the general online student population—works effectively for culturally diverse students.

This is particularly important because several studies have reported that instructors of online courses often fail to recognize and address the cultural diversity of their learners in the online learning environments (e.g., Adeoye & Wentling, 2007; Gunawardena, Layne, & Frechette, 2012; Mushtaha & Troyer, 2007; Rogers, Graham & Mayes, 2007), and results from some studies seem to suggest that students from diverse cultural backgrounds exhibit poor leadership skills in leading online discussion (Okwumabua, Walker, Hu, & Watson, 2011), as well as experience challenges in participating online collaborative learning activities (Du & Anderson, 2003). The purpose of this study, therefore, was to investigate the perceptions of culturally diverse graduate students about online collaborative learning activities. A related goal was to examine the learning preferences of these learners in online collaborative learning environments, the benefits they derive from participating in online collaborative activities, and challenges they encountered in such environment.

Review of Related Literature

Individuals from different cultures engage in, as well as expect different communication practices and behaviors during interactions in learning or work environments. Understanding intercultural communication involves studying links between culture and communication. Vygotsky's (1978) constructivist theory identifies personal and cultural backgrounds of learners as essential factors that influence ways in which students learn and acquire knowledge. Watson, Ho, and Raman (1994) defined culture as "the beliefs, value systems, norms, mores, myths, and structural elements of a given organization, tribe, or society" (p. 46). In this study, we considered culture as one of the major factors that influence diverse students' experiences in collaborative processes, communications, and attitudes or behaviors in collaborative group online learning (Shi, Frederiksen, & Muis, 2013), and we investigated the culturally diverse students' perceptions of online collaborative learning activities (Werstsch, 1998; Zhu, 2009).

Several studies have explored the relationships between cultural backgrounds of students and their learning experiences in online collaborative learning environments in the following categories: (1) cultural differences as related to online group processes (e.g., Anakwe & Christensen, 1999; Thompson & Ku, 2005); (2) how linguistic and cultural backgrounds of the collaborative partners affect their actions, behaviors, and engagement in the online collaborative environment (e.g., Kim & Bonk, 2002; Lim & Liu, 2006; Oetzel, 2001); and (3) the differences in the motivation of the students to work within an online collaborative learning environment (Wang, 2007).

Halverson & Tirmizi, (2008) stated that cultural differences can benefit or disrupt "intra-group dynamics" (p. 12). They identified the main benefits as the sharing of culturally diverse knowledge and the preparation of students for working in culturally heterogeneous settings. Among the major challenges of cultural differences were the need to coordinate clearly different, culture-specific perceptions of group processes and approaches to communication. Another study by Tapanes, Smith, and White (2009) that investigated students' perceptions of online course found that students with a collectivist cultural background were less motivated to participate in an asynchronous learning network than students with an individualist cultural background.

A similar study by Fogg, Carlson-Sabelli, Carlson, and Giddens (2013) showed that African American students tended to be more like assimilators in online learning environments in contrast to students of other races. Correa and Jeong (2011) examined the differentiated uses of online participatory technologies among diverse racial and ethnic groups of college students (African Americans, Caucasians, and other racial/ethnic students). The results from their study showed that African Americans students valued the technological tools as instruments to help them connect with online communities and share their identities to augment their voices, while Caucasian students did not value the tools in this way. The findings also indicated that African Americans emphasized the idea of self-expression (the ability to express their inner thought and culture to other students) in contrast to Caucasian students who aimed more at instrumental reasons like promoting their work.

Several studies (Gunawardena, 2014; Kim & Bonk, 2002; Lim & Liu, 2006; Uzuner, 2009) reported that the following forms of communication create problems for racially and culturally diverse students collaborating online: (1) inability to understand specific cultural references in online discussions; (2) lack of non-linguistic cues; (3) difficulties expressing disagreement; (4) communicative constraints resulting in less substantive postings; and (5) mismatched communication patterns (i.e., use of short, content-driven contributions as opposed to long, relationship-driven contributions or vice versa).

A study by Popov, Biemans, Brinkman, Kuznetsov, and Mulder (2013) examined facilitation of computer-supported collaborative learning in mixed-versus-same culture dyads. A total of 130 university students worked in dyads on a topic concerned with intercultural communication. The researchers used a 2 x 2 factorial design to examine the effects of using collaboration scripts on students' online collaborative behavior and the quality of their discussions. Results indicated that students who worked in culturally mixed dyads showed a higher frequency of seeking input and social interaction than the students in the other types of dyads. Students from the same culture showed a lower frequency of planning activity than same-culture dyads working without the script. Overall, the same-culture dyads displayed a higher frequency of contributing activity and higher quality of online discussion than the mixed-culture dyads. The study recommended that further collaboration in culturally mixed groups needs more facilitation.

A study by Du, Zhou, Xu, and Lei (2016) explored the perspectives of African American female students' experiences of online collaborative learning. The study was conducted at a university in the southeastern part of the United States using qualitative semi-structured interviews with nine African American female students in an online instructional design course. The findings from the study indicated that the perceptions of African American females towards online collaborative learning revolved around peer support, group member and identity formation, and challenges of frustration as they respond to different levels of peer participation and interaction. Similarly, Ke and Kwak (2013) investigated online learning across ethnicity and age groups using mixed-method analysis with 28 students in an online course via content analysis to include online interaction, structural equation modeling, and interviews. Results from qualitative analysis of students' transcripts by Ke and Kwak (2013) did not show significant benefit or disadvantage related to the quality and quantity of online interaction of minority students. However, quantitative results found that minority students had preference for student-to-instructor interactions. Yücel and Usluel (2016) investigated the processes of knowledge building, interaction, and participation of students in an online collaborative learning environment, and the relations among them. The participants were 145 prospective teachers using multiple data sources (log records and content analysis of knowledge postings). Results from Yücel and Usluel's study indicated that there was a significant relationship between the use of opinion building, expressing forms, and knowledge creation by the students. The results also showed that courses offered in online collaborative knowledge building environments contributed to students' expression, opinion building, quality of interaction, and participation.

Thus, results from several studies (e.g., Kim & Bonk, 2002; Zhao & McDougall, 2008; Zhu, 2009) have indicated that cultural factors play an important role in how students gain and share knowledge in online collaborative learning activities. However, they failed to recognize the perceptions of students from culturally diverse backgrounds related to online collaborative learning activities and the influence it had on their academic performance (Vatrapu & Suthers, 2010; Weinberger et al., 2007). Additionally, only very few empirical studies have been conducted about culturally diverse students' perceptions on online collaborative learning activities (Shi et al., 2013). Therefore, this study will fill the gaps of knowledge regarding culturally diverse students' perceptions of cross-cultural online collaborative learning activities.

Theoretical Framework

This study draws on Vygotsky's (1978) social constructivism theory, and Watson, Ho, and Raman's (1994) theory of culture as the theoretical frameworks to advance our understanding about the perceptions of minority graduate students on online collaborative learning activities. Vygotsky's (1978) social constructivism, which is based on his theories about language, thought, and their mediation by society, recognizes the importance of personal and cultural backgrounds of learners as major factors that influence ways in which students acquire knowledge (Vygotsky, 1978; Zhu, 2009). Vygotsky's (1978) work suggests that knowledge is first constructed in a social context and is then appropriated by individuals (Eggan & Kauchak, 2004). According to social constructivists, the process of sharing individual perspectives called collaborative elaboration results in learners constructing understanding together that would not be possible alone (Meter & Stevens, 2000). We also adopted Watson, Ho, and Raman's (1994) definition of culture as "the beliefs, value systems, norms, mores, myths, and structural elements of a given organization, tribe, or society" (p. 46).

Building on the work of Vygotsky (1978) and Watson, Ho, and Raman's (1994) theory of culture, several contemporary researchers have established a relationship between the cultural backgrounds of students and their participation, behaviors, and engagement in the online collaborative environments (e.g., Kim & Bonk, 2002; Lim & Liu, 2006; Oetzel, 2001). Thus, in assessing the quality of the online interactions, cultural factors that are known to play a role in what students share, expand upon, and gain from a collaborative learning process should also be considered (e.g., Kim & Bonk, 2002; Zhao & McDougall, 2008; Zhu, 2009). However, many social and cultural factors have yet to be taken into account in the study of online collaborative learning (Vatrapu & Suthers, 2010; Weinberger et al., 2007). Very little research has empirically examined the quality of online discussions involving students with different cultural backgrounds. In this study, therefore, we considered culture as one of the major factors that influence diverse students' experiences in collaborative processes, communications, attitudes, or behaviors in collaborative group online learning (Shi, Frederiksen, & Muis, 2013), and we investigated the perceptions of culturally diverse students regarding online collaborative learning activities (Werstsch, 1998; Zhu, 2009).

Methods

This study employed qualitative research design using semi-structured interviews, focus group interviews, and a non-participant observation to understand the perceptions of culturally diverse graduate students about online collaborative learning activities. It also examined the challenges the participants encounter in such environment. The following three research questions guided the study:

(1) How do culturally diverse students describe their perceptions and experiences in online collaborative learning activities?

(2) How do culturally diverse students describe their learning preferences toward online collaborative learning activities?

(3) How do culturally diverse students describe the benefits and challenges they encounter while engaging in online collaborative learning activities?

Participants

A purposeful sample of 20 full-time graduate students from culturally diverse backgrounds enrolled in Instructional Technology and Special Education Master's degree programs at a university in the Northeastern United States during the study year of 2015-2016. In this study, all of the participants will be referred as culturally diverse students. The race/ethnicity, gender, and age composition of the participants were: 10 African Americans (*n* = 10, aged 25 to 28), five Hispanics (n = 5, aged 25 to 30), and five African international students from Ghana, Nigeria, and Kenya (*n* = 5, aged 24 to 35). The 20 participants were 12 males and 8 females. All of the participants were affiliated with two departments in the School of Education (Instructional Technology and Special Education). They had varying experiences of online courses in higher education in general (range: 2-4 years) as well as serving as teaching assistants in online courses. Our rationale for the purposeful sampling was to specifically gather perceptions of culturally diverse graduate students who: (a) had enrolled in at least three online courses in the past, (2) agreed and volunteered to contribute their own perspectives, (3) were familiar with the online programs at the School of Education, and (4) have knowledge of and participated in online collaborative learning activities. Six of the 20 participants had experience teaching asynchronous online course. All of the participants had experience participating in online collaborative learning activities and collaboratively developed a complete instructional design project, which involved selecting instructional problems. Participants have participated in multiple online activities including discussion, group projects, small-group discussions, whole-group discussions, debate discussion, and presentations.

Recruitment and Data Collection

The research team contacted and recruited participants via the School of Education of the university where the study took place. First, we contacted the Office of the Dean to have access to students' biographic data. After Institutional Review Board approval, the Dean's office provided students' information, upon which we contacted the Instructional Technology and Special Education departments, which had a large population of culturally diverse students. Researchers then contacted the heads of departments via email about the rationale and objectives of the study. They agreed to email participants for the study. Second, we emailed participants with the objectives of the study and after the second email, we received 25 responses from which 20 agreed to be interviewed and observed in their online courses. Third, we contacted participants' course instructors with permission to observe them in online activities. The research team then contacted students who agreed to participate in the study and scheduled interviews time and date based on their convenience.

The data for the study came from three main sources: semi-structured interviews, focus group interviews, and observations. The individual interviews took place at the conference room in the School of Education building. Interviews used a protocol of questions that were reviewed by four experts in the field of multicultural education and online learning to ascertain their validity in generating appropriate data that address the research questions under investigation (see Appendix A for Interview Protocol). All the interviews were audiotaped, and conducted in English. We also reviewed materials from the participants' email, transcripts of bulletin boards, online assignments, discussion boards, and presentations with their permission in order to have detailed information on their perspectives and experiences of the course and online collaboration to complement data from our interviews. We used pseudonyms to protect the identity and confidentiality of all participants.

Focus Group Interviews

We obtained a total of two hours of focus group interview recordings with 20 participants. The purpose of the focus group interview was to help the research team gain insights into participants' shared perceptions and understandings in identifying collaborative learning activities that facilitate their cross-cultural learning experiences. The focus group interviews also afforded the research team the chance to ask the participants to share their perceptions about collaborative learning activities, the benefits gained, and challenges faced as culturally diverse students. The focus group interview questions were also reviewed by four experts mentioned above (see Appendix B for focus group interview questions). During the interviews, the participants were asked to provide insights about their perceptions of online collaborative learning activities including what strategies helped them to succeed, their role in online discussion in collaborative environment, and challenges faced. The participants were also encouraged to share their perceptions during an extended discussion, as well as to reflect on those perceptions and responses.

Observations

The researchers conducted a two-semester observation of 20 participants (minority graduate students) with regards to their perspectives on online collaborative online learning activities. They observed participants' interactions with peers, the support they received from instructors, reading materials, posts in chat rooms, instructor feedback, students reflection posts, and how they led discussions in online classrooms. We also paid special attention to cultural differences of participants' access to resources, their participation in online discussions, and group activities. We observed strategies that the participants used to manage their online learning activities to achieve academic success, and to adapt to the instructional practices and maintain interactions with peers and instructors to facilitate building a community of inquiry. We then took detailed field notes of instructional practices, and students' posts in the discussion forums, and how they address cross-cultural perspectives in collaborative online learning. We did not take any form of photos of participants to protect confidentiality and anonymity.

Data Analysis

During the analysis of the data, the research team thoroughly read through all transcripts (interviews, focused-group interviews, and observation notes) and carefully transcribed and checked for accuracy against the original sources. Our data analysis followed widely accepted forms of qualitative inquiry, comprising both inductive and deductive components (Xu, coats, & Davidson, 2012; Erickson, 1986; Graue, Hatch, Rao, & Oen, 2007), using the constant comparative method (Xu & Corno, 1998; Charmaz, 2005) with the aid of the qualitative software Nvivo (2015). The Nvivo software helped us to develop an audit trail (e.g., the process of data collection and coding procedures), in addition to comments and discussions in our data analysis. This audit trail included coded interview transcripts and course posts in addition to other comments made by participants during the data analysis process (e.g., memos, annotations, and queries). Based on our theoretical framework and related literature in the field, we developed a list of codes during the initial analysis (e.g., participants perceptions on collaborative learning activities, benefits, and challenges faced in collaborative learning activities). We examined participants' responses and statements in the various group activities to help format the data into systematic categories (Strauss & Corbin, 1990).

Independently, each of the three researchers (two faculty members, and one student assistant) in this study selected, coded, and analyzed that data, after which the team met to discuss, deliberate, and negotiate the various category of codes identified. Through engagement and discussions, the three researchers reached an agreement through the constant comparison thematic analysis process. Further, the units that emerged with commonalities from our data were grouped as the initial themes (Creswell, 2007). For instance, the research team carefully examined many transcripts from the interviews that had similar meanings before labeling a theme (e.g., cultural differences, preference of small group over whole/large group, contributions to discussions, benefits of collaborative activities and cognitive learning, perspectives towards online discussions, and cross-cultural online classrooms). At this stage, we checked to find out if the addition of other excerpts from interviews or participants' posts could change the meaning.

The first themes were then refined by removing any redundancies, as well as by capturing the main thrust of each theme's meaning, and then re-examining them via member checking (Guba & Lincoln, 1994). At the initial stage of our data analysis, six themes, including "(a) facilitates knowledge building and construction, (b) preference to work in small-group over whole-group activities, (c) opportunities to share and lead discussion in cross-cultural online environment (d) collaborative activities meet learning and communication styles, and (e) challenges of dealing with cultural differences, (f) lack of multicultural inclusion in the curriculum/course content" emerged. However, after further reviews of the coding records, we recognized that participant statements in Blackboard and interactions with peers and instructors preferred using the word "active," hence we added (g) "Active attitude towards online discussions." Finally, the research team employed the services of three peer reviewers who helped to review all interview transcripts and observation notes by debriefing to reduce potential biases (Erickson, 1986). We also shared with other researchers from diverse backgrounds and other peers at conferences (e.g., the Annual Meetings of Instructional Technology Conference, American Educational Research Associations, Online Learning Consortium Innovate conferences). The feedback and critique we received helped us to clarify and expand our interpretation and analyses of initial findings to promote credibility and ensure validity of the current study.

Results

Our analysis of the response data produced six major themes, namely (a) facilitate knowledge building and construction, (b) preference to work in small-group over whole-group activities, (c) opportunities to share and lead discussion in cross-cultural online environment, (d) collaborative activities meet learning and communication styles, (e) challenges of dealing with cultural differences, and (f), lack of multicultural inclusion in the curriculum/course content.

Facilitate Knowledge Building and Construction

Knowledge building and construction begins with small group learning that promotes higher-level thinking, positive interactions, and discussion among students and instructors in an online learning environment. One participant indicated that online collaborative learning activities helped him to engage with peers during discussions. He noted that: "Collaborative learning facilitates critical thinking and communication - which is crucial for knowledge building. It allows me to think and contributes to knowledge construction." Participants expressed that online collaborative learning activities allowed them to exchange ideas, critique the work of others, and become part of the knowledge construction process. They expressed their preference to work in a diverse group, by stating that interacting with other students from diverse backgrounds provides them with different views, insights, opinions, and ideas about the topics discussed. A similar sentiment was noted in another participant's response:

> Collaboration involves lots of networking in the classroom to build via web format—that is from inductive to deductive or vice versa. It is the best way to facilitate me to or help me build on knowledge via collaborative learning activities. I like the fact that it helps you to become part of the knowledge-building process.

The participant stated that collaborative online activities helped them to work with other students via learning activities such as group projects, project presentation, and inquiry-based projects, as it offered them opportunities to take an active role in the knowledge construction.

For example, one participant commented in his interview: "I really appreciated collaborative activities that allow you to engage, be proactive, and to contribute to knowledge creation." Another participant stated: "Learning a topic is valuable, but creating knowledge is beautiful, as collaborative activities help to facilitate knowledge-building communities in my online classrooms, especially in technology classes." Overall, the majority of the participants in our study suggested that collaborative online learning activities helped them to gain different perceptions and insight from what is being discussed. In particular, they mentioned that working with students from diverse cultural backgrounds helped to provide them with varied perspectives and contribute to their knowledge building in the classroom.

Preference to Work in Small-group over Whole-group Activities

Many of the participants expressed their preference to work in small-groups over whole-groups. Reflecting upon his experiences in online collaborative group activities, a participant stated:

> I prefer small-group over whole-group activities, because I am able to make my presence felt in small-group than in whole-group. You get recognized and demonstrate the ability to work effectively and respectfully with diverse teams. Small-group activities give the best chance to assume shared responsibility for collaborative teamwork.

Likewise, another participant commented that:

> Small groups in online collaborative activities provide the opportunity to value the individual contributions made by each team member because of the size. With the small size, you can interact with team members and share responsibility better than in the whole-group activities, the issue of confusion is less.

It is interesting to note that, participants preferred small-group activities in collaborative online environments because they felt that as minority students, small-group activities allow them to engage and participate more proactively than in the whole-group activities. This was illustrated in one participant's statement: "With small group discussions and activities, you get to know each member easily and share the responsibility with them much better than whole-group interactions and participation." A participant in the instructional technology program agreed with these ideas:

> I guess my interactions and responses are more recognized and appreciated in the small-group activities than in the whole-group activities. I feel like my peers understand me better in small-group interactions and presentations than in whole-group interactions. I am able to build more relationships with peers in small group activities than in whole-group activities.

Opportunities to Share and Lead Discussion in Cross-cultural Online Environment

Another important finding showed that 16 of 20 participants expressed that online collaborative learning activities provide them opportunities to share and lead discussions. They indicated that collaborative activities help them to gain leadership skills because with group work activities, they are delegated to lead discussions and write weekly reflections. A participant elaborated on this:

> I feel comfortable to lead discussions in online collaborative activities as it helps me to express my opinions and make sure all of my concerns are heard. In the courses I'm currently taking, we are assigned to be group leader every other week. I am dedicated to all the work and distribute responsibility for each team member. It makes me feel accepted as a minority student leading a mixed group in an online environment.

These minority graduate students were willing to become leaders in the group activities. It is interesting to note that, having become group leaders, minority graduate students tended to be aware of the benefits of becoming a leader, participate, and contribute to group activities. Most participants also explained their willingness to be group leaders in online learning environments. They reported that group leadership provided them opportunities to share ideas, life experiences, and cultural backgrounds with classmates. This leadership preference could be due to the fact that they want to express their perceptions and experiences in online collaborative learning, and to function as leaders and diverse leaners in online discussions. Group leadership among participants helped them to be part of knowledge construction and collaborative learning.

Online Collaborative Activities Meet Their Learning and Communication Styles

Many participants further expressed that online collaborative learning activities meet their learning and communication styles, as one participant said: "With online collaborative learning activities such as group presentations, project-based learning, and team-work on projects in online learning, these projects meet my learning styles as they have varied reading materials and formats." Another participant commented:

> I enter into online classroom with different perspectives and cultural background and expected instructors and other students to understand me or provide examples that meet my learning styles and communication patterns, and I guess online collaborative activities help to meet my learning preferences and communication patterns as it provides many activities to choose from. Again, I have the opportunity to work with other students where I can express my thoughts and ideas using my cultural backgrounds to serve as an example.

The participants' responses revealed that online collaborative activities help to meet their learning and communication styles. The various activities allowed them to choose which activities meet their learning styles as well as the way they communicate with peers and instructors. For example, a participant noted: "Collaborative online activities provide you the opportunity to collaborate more with your peers and the opportunities to choose from many online activities in terms of which one best fit or meet your learning and communication styles." Since the need to obtain and sustain knowledge is to understand the concept, the participants felt that group activities give them varied examples to understand the concepts. They also reported that collaborative activities promote social presence and the exchange of ideas; participants have the chance to engage with peers and instructors via blogging, online chats, and other online mediums through social presence.

Challenges of Dealing with Cultural Differences

The participants agree with the above statement but had some reservations with the implementation of cross-cultural online collaboration in all subjects. The participants reported experiencing challenges of dealing with cultural differences with their peers and instructors during discussions. For example, the majority of the participants stated that, sometimes, instructors and other peers do not understand the examples they use in their responses and comments, or posts in online because of the cultural differences. A participant noted: "I face the challenge of lack of cultural understanding and differences on both sides, and wish I could provide examples that my peers and instructors can understand, and same from their side." Yang et al. (2014) indicated that, "students found it difficult to collaborate when they did not have sufficient background knowledge" (p. 216). The participants emphasized that instructors do not incorporate culturally relevant examples and fail to address the cultural differences among students in the online environment. Thus, during collaboration and discussion, they do not know one another's cultural background or experiences where they can learn from each other. They advised that instructors incorporate more activities such as icebreakers in the first week of class so that students introduce themselves in the first discussion and establish ground rules in order to create an open learning environment. Another participant elaborated:

> I believe instructors have a responsibility to integrate cultural education into the curriculum and address cultural differences where appropriate to help minority students. This process will foster understanding of the various cultural differences as I, sometimes, find it difficult to relate and make appropriate contributions to discussions.

The participants in this study faced challenges in dealing with cultural diversity or differences in the online environment. For example, they felt that instructors do not address the issue of multiculturalism in their online classes. One of the participants shared the following to support this assertion: "As a foreign learner, I strongly experienced that language barriers for non-native speakers tend to detract from equal participation, and this caused depression sometimes."

Lack of Multicultural Inclusion in the Curriculum/Course Content

Another salient finding was the reported lack of engagement with cultural diversity and inclusion in the curriculum and reading content. One of the participants recounted the following: "All the articles I read are based on European culture and have no relation to my culture. I would like to read or see examples from my culture to help me understand the content or activities we do online." The participants reported that they experienced minimal cultural diversity in the content of their reading materials or examples in the curriculum. They pointed out that the curriculum materials lacked cultural inclusion, as most of the readings did not relate to their cultural backgrounds or experiences. The participants felt that they were being marginalized in online courses because, in many instances, their comments and responses were being ignored by peers and instructors, making it difficult for them to contribute to knowledge creation. For example, one of the participants noted: “As a minority student, I would like to read materials and resources that do not lack the inclusion of my culture in the content.” Two participants further elaborated:

> I understand that incorporating cultural diversity in online collaborative activities becomes challenging when examples and curriculum are devoid of cultural inclusion, and in most instances, instructors don’t address or incorporate cultural diversity into the curriculum. This makes it hard for me to understand and contribute to activities.
>
> It can be challenging to understand, relate to, and participate in collaborative online activities if the content of what you read is different. I get frustrated when I can’t give example based on my cultural background. I think it’s not fair for us minority students, as we can’t share our cultural experiences mainly because we are minority students. There is lack of response from other group members if you try to share your cultural experience or provide different examples.

This pattern of sentiment has been echoed by other participants, particularly as it relates to cultural inclusion in the course content they read and intercultural relations with peers and instructors. One participant noted:

> I don’t see my culture represented in any of the readings in the online courses I have enrolled. Sometimes, I question why all the examples are based on European cultures and not diverse. My friends get confused anytime I used examples based on my culture. It affects my communication with them.

Discussion

This study examined the perceptions of minority graduate students toward online collaborative learning activities. The participants were 20 minority graduate students from diverse cultural backgrounds enrolled in online graduate instructional technology and special education program at a university located in the Northeastern United States. A qualitative research design using semi-structured interviews, focus group interviews, and non-participant observation were employed to collect the data for the study. The analysis of the data generated six themes on the perceptions of the minority graduate students toward online collaborative learning activities. First, the majority of the culturally diverse graduate students agreed that online collaborative learning activities promote knowledge building and construction, as it provides them the opportunity to contribute to learning activities and become part of the knowledge construction process during discussions. Second, the participants indicated a strong preference for working in small groups to working in whole-class activities in a cross-cultural collaborative learning environment. Third, the participants concurred that online collaborative learning activities provided them the opportunities to share and lead discussions in cross-cultural online environments. Fourth, they reported that online collaborative learning activities seemed to meet their learning and communication preferences and enabled them to achieve better academically. Fifth, the participants contended that online collaborative learning activities posed challenges in terms of their ability to deal with cultural differences. Sixth, participants indicated that they experienced a lack of multicultural inclusion in the curriculum and online reading content.

The first theme suggests that this group of participants is willing to work in a racially mixed group that helps them to tap into the diverse knowledge construction of students who participate in online collaborative learning activities. On the one hand, online collaborative learning activities allowed them to contribute to knowledge creation via reviewing peers' activities, suggestions, and criticisms; on the other hand, the participants also benefitted from learning in a diverse group and the sense of belonging to a community in the online environment where there was constant social interaction between student groups and instructors. These findings are in line with Vygotsky's (1978) social constructivism theory that highlights the importance of social interactions in learner cognition and the construction of knowledge. It also recognizes the benefits of personal and cultural backgrounds of students as major factors that influence ways in which students acquire knowledge (Vygotsky, 1978; Zhu, 2009). The second theme pointed to culturally diverse students' preference of small-group interaction in collaborative learning environment over whole-group collaborative learning activities. The participants reported that small-group learning activities provided a sense of confidence and motivation to contribute to discussions because of the small number of students in the groups. They claimed that small-group activities allowed them to function better as their comments and responses are recognized. It also allowed them to share their cultural and educational experiences with other members to facilitate cross-cultural understanding. The participants also disclosed that cross-cultural online collaborative learning activities allowed them to share and lead discussions. This finding suggests that online collaborative learning activities provided opportunities for minority students to gain leadership skills that helped them to gain access to the control of group decision-making process, which helped them to meet their learning preferences and cultural experiences.

The fourth theme that emerged from the study regarding the participants' learning and communication styles does not seem to be supported by results from prior findings in the research literature, which identified the following problems for culturally diverse students collaborating online: (1) inability to understand specific cultural references in online discussions; (2) lack of non-linguistic cues, (3) difficulties expressing disagreement; (4) communicative constraints resulting in less substantive postings; and (5) mismatched communication patterns (i.e., use of short, content-driven contributions as opposed to long, relationship-driven contributions or vice versa) (Gunawardena, 2014; Kim & Bonk, 2002; Lim & Liu, 2006; Uzuner, 2009). One possible explanation is that this group of culturally diverse graduate students was determined to succeed in online collaborative learning activities, and had prior experience in online discussion settings, which might have helped them to consider academic grades above their individual cultural preferences in online environments. Another possible explanation that is closely related to facilitating learning, communication, and learning preference patterns, is that this group of culturally diverse graduate students claimed that small group collaborative activities served as a source of motivation for them to engage and participate in discussions, which allowed them to share, collaborate with their peers and instructors, and develop identity (Du, Zhou, Xu, & Lei, 2016). It also provided them opportunities to take more time to get to know peers and interact with them. They found this environment ideal for engaging in online collaborative learning activities for knowledge building and creation (Gunawardena, Layne, & Frechette, 2012; Ke, & Kwak, 2013; Li, 2012).

Further, the participants pointed out that they faced challenges in dealing with cultural differences, and the lack of cultural diversity in the curriculum or content of the materials they read online. They disclosed that these challenges limit their academic success, as they have to spend time to deal with the cultural differences among their peers and instructors. Several of the participants felt that their instructors do not incorporate diverse resources to help them understand the content of what they discuss online. This finding seems to be consistent with the results from several prior studies that identified the cultural diversity knowledge base of the majority of online instructors as poor, and hence they tend to ignore the rich multicultural experiences these students bring to the online learning environments (Anakwe & Christensen, 1999; Thompson & Ku, 2005). They also reported that cultural norms in online classrooms are at odds with their regular online learning practices (Ke & Kwak, 2013). Most culturally diverse students expressed that the reading materials instructors provide them lack cultural inclusion, which often makes it difficult for them to comprehend and contribute to knowledge construction via discussions. Further, some of the participants reported feeling marginalized in online discussions, especially, in whole group learning activities as their comments were unrecognized and received no feedback from other members. Prior research studies found that minority online learners felt a "sense of marginalization, or alienation" from the culturally dominant group (the Americans –i.e., native –born classmates) even in a highly interactive learning environment (Shattuck, 2005, p. 186).

Taken together, the present study extends previous research on online collaborative learning activities in several ways. First, this qualitative study is an attempt to better understand the perceptions of minority graduate students toward cross-cultural online collaborative learning activities, which has addressed a significant knowledge gap in the research literature on online collaborative learning, where cultural diversity of students has rarely been taken into consideration (Ashong & Commander, 2012; Boyette, 2008). Second, the findings indicated that there is a growing need to understand the perceptions of minority graduate students towards online collaborative learning. At a broader level, the study provides an opportunity for instructors who teach online courses to design and implement collaborative learning activities to help students from diverse backgrounds to achieve higher academic success. It also seeks to broaden instructors' understanding and the impact of diversity in promoting cross-cultural collaboration in online teaching. Finally, our findings regarding six themes identified above provide important strategies about how to facilitate and engage culturally diverse graduate students in online collaborative learning activities.

Recommendations

Several recommendations resulted from the present study in efforts to understand the perceptions of culturally diverse graduate students in online collaborative learning activities. For example, to promote cultural inclusion in online courses, instructors may incorporate cultural diversity learning activities at the early stage of the course, sharing ideas about culture, heritage, and how to address cultural differences in an online setting. It is also important for instructors to recognize the multiple cultures students bring to online classrooms, and the need to provide them with diverse reading materials to help them better understand the content, and contribute to knowledge building.

Collaborating with students from a different culture and having designed time to get to know each other can be very rewarding for students looking to understand a new culture. Another important recommendation of this work is to inform instructors and instructional designers to be sensitive and cognizant of the learning preferences of different minority students or groups when designing online courses, specifically with cross-cultural collaborative activities.

Implications

The present study provides insight into the ways in which culturally diverse graduate students collaborate with their peers and instructors in the online learning environments. The findings can guide instructors, educators, and instructional designers on how best to design and implement an online course to suit the academic needs of culturally diverse learners to better facilitate an intercultural collaborative learning context. Findings will help instructors to better understand how to attend to cultural differences of students to help improve the learning experiences of students in multicultural environments. For example, to promote cross-collaboration, instructors need to place culturally diverse learners in small group discussions and allowed them to take leadership roles to help them interact with other students and instructors. The present study provides the foundation for the design of collaborative activities that take into account the cultural backgrounds of students in the cross-cultural collaborative online learning environments (Popov, Noroozi, Biemans, & Mulder, 2012). For example, findings indicated that culturally diverse students prefer to have opportunities to share and lead discussion in a cross-cultural online environment.

Limitations

The findings from the present study extend previous research in the field regarding online collaborative learning activities. However, our findings were based on the perceptions and experiences of 20 minority graduate students enrolled in graduate online programs in education. Thus, these findings are based on a small sample size, and hence do not reflect the perceptions of all culturally diverse students in online settings. Future studies could look into minority students' perspectives in online collaborative activities via quantitative studies. Additional studies could be conducted to compare the perspectives of different minority graduate students from different programs and other related factors such as gender, age, and socioeconomic status.

Conclusion

Collaborations in online learning environments involve both students and instructors working together to achieve a common goal. According to Haythornthwaite (2006), collaboration in the online learning environment addresses learning and knowledge creation, group learning, development and maintenance processes, computer-mediated communication, and the presentation of these issues in online learning environments. As instructors, we need to understand the perceptions of students from diverse backgrounds toward online collaborative learning activities to help design effective instructional strategies to help diverse learners succeed. The findings indicate that culturally diverse graduate students perceptions about collaborative learning activities is demonstrated via the following: (1) facilitate knowledge building and construction, (2) preference to work in small-group over whole-group activities, (3) opportunities to share and lead discussion in cross-cultural online environment (4) collaborative activities meets learning and communication styles, and (5) challenges of dealing with cultural differences, and (6) lack of multicultural inclusion in the curriculum/course content. This paper sets out to expand our understanding of the perceptions of diverse student populations toward online collaborative learning activities in terms of their interactions, preferences, benefits, and challenges, and the ways that can be adopted to promote their participation in online collaborative learning activities. Since online collaborative learning activities can mean different instructional strategies, instructors are encouraged to understand the specific type of collaborative activity and to plan resources appropriately, taking into consideration the cultural backgrounds of students, and the challenges students may encounter in the online learning environment.

References

Allen, I. E., & Seaman, J. (2016). *Changing course: Ten years of tracking online education in the United States.* Newburyport, MA: Sloan Consortium.

Allen, I. E., & Seaman, J. (2014). Class differences: Online education in the United States. Needham, MA: Babson Survey Research Group. Retrieved from https://www.sloanc.org/publications/survey/pdf/sizing_opportunity.pdf

Adeoye, B., & Wentling, R. M. (2007). The relationship between national culture and the usability of an e-learning system. *International Journal of E-Learning, 6*(1), 119-146.

Anakwe, U. (1999). Distance learning and cultural diversity: potential users' perspective. *International Journal of Organizational Analysis (1993–2002), 7*(3), 224.

Avci Yucel, U., & Usluel, Y. K. (2013). The quality of interaction and participation in knowledge building processes within the online collaborative learning environments. In *International academic conference on education, teaching and e-learning (IAC-TTeL 2013), Prague, Czech Republic.*

Boyette, M. A. (2008). *An investigation of the online learning environment in higher education through the observations and perceptions of students of color* (unpublished doctoral dissertation). University of South Florida.

Chan, C. K. K., & Chan, Y. Y. (2011). Students' view of collaboration and online participation in knowledge forum. *Computers and Education, 57, 1445-1457.*

Charmaz, K. (2006). *Constructing grounded theory: A practical guide through qualitative analysis.* London: Sage.

Correa, T., & Jeong, S. H. (2011). Race and online content creation. *Information, Communication & Society, 14*(5), 638-659.

Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches* (3rd ed.). Thousand Oaks, CA: Sage.

Dikkers, G. A., Whiteside, A. L., & Lewis, S. (2013, Winter). Virtual high school teacher and student reactions to the Social Presence Model. *Journal of Interactive Online Learning, 12*(3), 156-170.

Du, J., & Anderson, J. D. (2003). Technology and quality of education: does technology help low-income and minority students in their academic achievements? *Journal of Law, Technology & Policy*, *2003*(1), 1-34.

Eggen, P., & Kauchak, D. (2004). *Educational Psychology: Windows, Classrooms.* Upper Saddle River, NJ: Pearson Prentice Hall.

Erickson, F. (1986). Qualitative methods in research on teaching. In M. Wittrock (Ed.), *Handbook of research on teaching* (3rd ed.). (pp. 119-161). New York, NY: Macmillan.

Fogg, L., Carlson-Sabelli, L., Carlson, K., & Giddens, J. (2013). The perceived benefits of a virtual community: effects of learning style, race, ethnicity, and frequency of use on nursing students. *Nursing Education Perspectives, 34,* 390-394.

Gachago, D., Morris, A., & Simon, E. (2010). Engagement levels in a graphic design clicker class: students' perceptions around attention. *Journal of Information Technology Education, 10*, 253-269.

Garrison, D. R. (2007). Online community of inquiry review: Social, cognitive, and teaching presence issues. *Journal of Asynchronous Learning Networks, 11*(1), 61-72.

Garrison, D. R., Anderson, T., & Archer, W. (2001). Critical thinking, cognitive presence and computer conferencing in higher education. *The American Journal of Distance Education, 15*(1), 7-23. Doi:10.1080/08923640109527071

Garrison, D. R., Anderson, T., & Archer, W. (2000). Critical thinking in a text-based environment: Computer conferencing in higher education. *Internet and Higher Education, 11*(2), 1-14.

Goodfellow, R., & Lamy, M. N. (2009). Conclusions: New directions for research in online learning cultures. In R. Goodfellow & M-N. Lamy (Eds.), *Learning Cultures in Online Education* (pp. 170-183). Harrisburg, PA: Continuum Studies in Education.

Goodfellow, R., & Hewling, A. (2005). Reconceptualising culture in virtual learning environments: from an 'essentialist' to a 'negotiated' perspective. *E-Learning, 2*(4), 355–367.

Gredler, M. E. (2009). Hiding in plain sight: the stages of mastery/self-regulation in Vygotsky's cultural-historical theory. *Educational Psychologist, 44*(1), 1-19. doi: 10.1080/00461520802616259

Guba, E. G., & Lincoln, Y. S. (1994). Competing paradigms in qualitative research. In N. K. Denzin, & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (pp. 105e117). Thousand Oaks, CA: Sage.

Gunawardena, C., Wilson, P., & Nolla, A. (2003). Culture and online education. In M. Morre, & W. Anderson (Eds.), *Handbook of distance education* (pp. 753-775). Mahwah, NJ: Lawrence Erlbaum.

Gunawardena, C. N., Nolla, A. C., Wilson, P. L., Lopez-lslas, J. R., Ramirez-Angel, N., & Megchun-Alpizar, R. M. (2001). A cross-cultural study of group process and development in online conferences. *Distance Education, 22(1),* 85–121.

Haythornthwaite, C. (2006). Facilitating collaboration in online learning. *Journal of Asynchronous Learning Networks, 10*(1), 7-24.

Havard, B., Du, J., & Xu, J. (2008). Online collaborative learning and communication media. *Journal of Interactive Learning Research, 19*(1), 37-50.

Henderson, L. (1996). Instructional design of interactive multimedia. *Educational Technology Research and Development, 44*(4), 85-104.

Henderson, L. (2007). Theorizing multiple cultures instructional design model for e- learning and e-teaching. In A. Edmundson & (Ed.), *Globalized e-learning cultural challenges* (pp. 130-153). Hershey: Information Science Publishing.

Hofstede, G. (1986). Cultural differences in teaching and learning. *International journal of Intercultural Relations, 10,* 301-320.

Hoepfl, M. C. (1997). Choosing qualitative research: a primer for technology education researchers. *Journal of Technology Education, 9*(1). Retrieved from http://scholar.lib.vt.edu/ejournals/JTE/v9n1/hoepfl.html

Du, J., Zhou, M., Xu, J., Lei, S. S. (2016). African American female students in online collaborative learning activities: The role of identity, emotion, and peer support. *Computers in Human Behavior, 63*(2), 948-958

Kim, K.J., & Bonk, C. J. (2002). Cross cultural comparisons of online collaboration. *Journal of Computer-Mediated Communication, 8*(1). Retrieved from http://www.ascusc.org/jcmc/vol8/issue1/kimandbonk/html

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2010). *Evaluation of evidence based practices in online learning: A meta-analysis and review of online learning studies.* U. S. Department of Education.

McLouglin, C. (2001). Inclusivity and alignment: principles of pedagogy, task and assessment design for effective cross-cultural online learning. *Distance Education, 22*(1), 7-29.

Meter, P. & Stevens, R.J. (2000). The role of theory in the study of peer collaboration. *Journal of Experimental Education*, (69), 113 – 129.

Mushtaha, A., & De Troyer, O. (2007). Cross-cultural understanding of content and interface in the context of e-learning systems. In N. Aykin M. (Ed.), *Usability and Internationalization. HCI and Culture,* Lecture Notes in Computer Science (Vol. 4559/2007, pp. 164-173) Berlin/Heidelberg: Springer Berlin.

Okwumabua, T. M., Walker, K. M., Hu, X., & Watson, A. (2011). An exploration of African American students' attitudes toward online learning. *Urban Education, 46*, 241-250.

Oetzel, J.G., Ting-Toomey, S., Masumoto, T., Yukochi, Y., Pan, X., Takai, J., & Wilcox, R. (2001). Face and face work in conflict: A cross-cultural comparison of China, Germany, Japan, and the United States. *Communication Monographs, 68*, 235–258.

Panitz, T. (1999). *Collaborative versus cooperative learning - a comparison of the two concepts which will help us understand the underlying nature of interactive learning.* Retrieved September 10, 2017 from ERIC database. (ED448443).

Pattanpichet, F. (2011). The effects of online of using collaborative learning to enhance students' English-speaking achievement. *Journal of College Teaching & Learning, 8*(11), 1-10.

Popov V., Noroozi O., Biemans H. J. A., Mulder M. (2012) Computer supported intercultural collaborative learning: A study on challenges as perceived by students. In A. Ravenscroft, S. Lindstaedt, C. D. Kloos, & D. Hernández-Leo (Eds.) *21st century learning for 21st century skills. EC-TEL 2012.* Lecture Notes in *Computer Science, 7563*. Springer, Berlin, Heidelberg.

Resta, P., & Laferriere, T. (2007). Technology in support of collaborative learning. *Educational Psychology Review, 19*, 65-83.

Rettig, M. (2013). Online postings of teacher education candidates completing student teaching: What do they talk about? *Linking Research & Practice to Improve Learning, 57*(4), 40-45.

Rogers, P. C., Graham, C. R., & Mayes, C. T. (2007). Cultural competence and instructional design: Exploration research into the delivery of online instruction cross-culturally. *Educational Technology Research and Development, 55*(2), 197-217.

Russell, M., Kleiman, G., Carey, R., & Douglas, J. (2009). Comparing self-paced and cohort-based online courses for teachers. *Journal of research on Technology in Education, 41*(4), 443-466.

Shea, P., & Bidjerano, T. (2012). Learning presence as a moderator in the community of inquiry model. *Computers & Education, 59*(1), 316–326.

Shi, Y., Frederiksen, C. H., & Muis, K. R. (2013). A cross-cultural study of self-regulated learning in a computer-supported collaborative learning environment. *Learning and Instruction, 23*, 52–59.

Shattuck, K. (2005). *Glimpse of the global coral gardens: Insights of international adult learners on the interactions of cultures in online distance education.* Unpublished doctoral dissertation, The Pennsylvania State University. Place.

Slavin, R. E., & Cooper, R. (1999). Improving intergroup relations: lessons learned from cooperative learning programs. *Journal of Social Issues, 55*(4), 647-663.

Smith, D., & Ayers, D. (2006). Culturally responsive pedagogy and online learning: implications for the globalized community college. *Community College Journal of Research & Practice, 30*(5/6), 401-415.

Smith, R., Clark, T., & Blomeyer, R. L. (2005). *A synthesis of new research on K-12 online learning*. Naperville, IL: Learning Point Associates. Retrieved from http://www.ncrel.org/tech/synthesis/synthesis.pdf.

So, H. J., Seah, L. H., & Toh-Heng, H. L. (2010). Designing collaborative knowledge building environments accessible to all learners: Impact and design challenges. *Computers and Education, 54(2), 479-490.*

Strauss, A. & Corbin, J. (1990). *Basics of qualitative research: Grounded theory procedures and techniques.* Newbury Park, CA: Sage Publications.

Timmis, S., & Cook, J. (2004). Motivating students towards online learning: Institutional strategies and imperatives. *The new educational benefits of ICT in higher education,* 73-79. Retrieved from http://repub.eur.nl/res/pub/1233

Ümmühan Avcı Yücel, Yasemin Koçak Usluel. (2016). Knowledge building and the quantity, content and quality of the interaction and participation of students in an online collaborative learning environment. *Computers and Education, 97*, 31-48.

Uzner, S. (2009). Questions of culture in distance learning: a research review. *International Review of Research in Open and Distance Learning, 10*(3), 1-19.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes. Cambridge*, MA: Harvard University Press.

Wang, M. (2007). Designing online courses that effectively engage learners from diverse cultural backgrounds. *British Journal of Educational Technology, 38*(2), 294-311.

Whiteside, A. L. (2015). Introducing the social presence model to explore online and blended learning experiences. *Journal of Asynchronous Learning Networks*, *19*(2)

Wertsch, J. V. (1998). *Mind as action.* New York, NY: Oxford University Press.

Wolfe, A. (2012). Implementing collaborative learning methods in the political science classroom. *Journal of Political Science Education, 8,* 420-432.

Wong, F., & Trinidad, S. (2004). Using ICT in web-based distance learning to reduce the cultural distance. *Journal of Interactive Online Learning, 3*, 1–13.

Watson, R. T., Ho, T. H., & Raman, K. S. (1994). Culture: a fourth dimension of group support systems. *Communication of the ACM, 37*(10), 45-55.

Weinberger, A., Stegmann, K., & Fischer, F. (2007). Knowledge convergence in collaborative learning: Concepts and assessment. *Learning and Instruction, 17*, 416-426.

Xu, J., & Corno, L. (1998). Case studies of families doing third-grade homework. *Teachers College Record, 100*, 402-436.

Xu, J., Coats, L. T., & Davidson, M. L. (2012). Promoting student interest in science: The perspectives of exemplary African American teachers. *American Educational Research Journal, 49*, 124-154

Yang, J., Kinshuk, Yu, H., Chen, S., & Huang, R. (2014). Strategies for smooth and effective cross-cultural online collaborative learning. *Educational Technology & Society, 17* (3), 208–221.

Yazici, H. J. (2004). Student perceptions of collaborative learning in operations management classes. *Journal of Education for Business, 80,* 110-118.

Zhao, N., & McDougall, D. (2008). Cultural influences on Chinese students' asynchronous online learning in a Canadian university. *Journal of Distance Education, 22*(2), 59-80.

Zhu, C., Valcke, M., & Schellens, T. (2009). "A cross-cultural study of online collaborative learning," *Multicultural Education &Technology Journal, 3*(1) 33-46. Retrieved from https://doi.org/10.1108/17504970910951138

Appendix A: Interview Protocol

1. Tell me about your online learning experience. How has it been? Please explain in detail how you are enjoying it or otherwise.
2. Can you tell us about your experience in cross-cultural online collaboration? How do you define that?
3. Tell me more about the role you play in the collaborative learning.
4. Tell us about your perceptions about online collaborative learning activities. How has it been? Did you enjoy it? Why or why not?
5. Tell me about your experience in online collaborative learning activities? How has it been? Did you enjoy it? Why or why not?
6. How do you interact with peers and instructors in the online collaborative learning environment?
7. Do you think the communication tools, such as emails, online chats, videos, and discussion board, have been useful for online learning collaboration? Why or why not?
8. What other communication tools (such as Skype, videos) did your online course?

   Why did you choose to use those tools or what was your preference?
9. What type of online group discussion do you prefer (e.g., small group, whole group or both)? Why do you prefer this type? Do you feel you contribute more to the group in this type of discussion?
10. What types of concerns/topics do you prefer to discuss online, theoretical or cultural issues? Why do you prefer to discuss this opposed to the other? What makes you uncomfortable in discussing certain issues?
11. How would you describe your experience leading and facilitating online collaborative learning activities? Please explain with examples.
12. Is there a connection among your peers in your small group online collaborative learning activities? If yes, why? If no, explain, Does this connection extend beyond online collaborative learning activities? Provide specific examples?
13. How do you contribute to online learning activities? Do you think about your answers first or just join in and try to become involved in online collaborative learning activities? Can you elaborate more on this?
14. Do you worry about how you answer questions in online collaborative learning activities? What make you feel this way?
15. How do you feel about your responses and comments and how your peers and instructors respond to your comments? Any specific examples you may have?
16. What are the benefits you gain from online collaborative learning activities? Please explain with specific examples you may have.

17. What are the major challenges you encounter in online collaborative learning activities? Please provide specific examples.
18. What strategies do you use to overcome or reduce the challenges you face in online collaborative learning activities?
19. Tell me how you respond to group leadership in collaborative learning activities. How do you address cultural differences in online collaborative activities? Provide specific examples.
20. How would you address cultural differences in online collaborative learning activities? Do you want anyone to ask you questions about your cultural background or related to your background in online environments?
21. Do you feel more comfortable working in mixed student groups? If so, why or why not? What is your preference? Any specific examples you may have?

Appendix B (Focus Group Interview Questions)

1. Tell us about your experiences in online collaborative learning activities? How has it been? Please in detail your experiences in online group activities?
2. Are there things that help you to be more involved or active in online collaborative learning activities?
3. Describe your perceptions of online collaborative learning activities? What are the roles you play in online collaborative learning activities?
4. Please explain to us how you contribute to group discussion or collaborate with peers in online collaborate learning activities?
5. Is there anything that you think would improve your communications with all of your peers and instructors in online collaborative activities or discussions?
6. Describe the type of online group discussion you prefer (e.g., small group, whole group or both)? Why do you prefer this type? Explain with examples? Do you feel you contribute more to the group in this type of discussion?
7. Tell us how your relationships with peers and instructors have been in online collaborative learning activities (Probing: Would you describe the relationship as positive or negative? If so, in what ways? Do you receive any support from your instructors in online learning environment? If so, what kind of support? Does the support in any way influence your academic performance in online courses?)
8. Describe the benefits you have gained or gain in online collaborative learning activities? Please explain with specific examples?
9. Describe the challenges you experience in online collaborative learning activities? Would you explain the major challenges you face?
10. Tell me about the strategy or strategies you have adopted to manage the challenges and succeed in online collaborative learning activities? How did you manage to navigate through the difficulties to succeed?

Care, Communication, Learner Support: Designing Meaningful Online Collaborative Learning

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Abstract

The purpose of this study was to identify emergent themes regarding higher education instructors' perceptions concerning the provision of collaborative learning activities and opportunities in their online classroom. Through semi-structured interviews, instructors described their teaching experiences and reported specifically about the online collaborative opportunities offered in their online classrooms. A multi-phase coding process was used to analyze the information, including the constant comparative coding method for theme and category development. The three main themes that emerged from this study are: the importance of online communication approaches, challenges and supports for online collaborative learning, and online learner support as the core of online learning. In the online classroom, additional factors must be considered in order to develop successful online collaborative learning. Beyond group work, these considerations include additional time and nurturing, scaffolding, instructional design, and understanding students' comfort level with collaborative online work. The findings of this study are discussed, and recommendations are provided for the development and design of meaningful online collaborative learning.

Keywords: care theory, collaborative learning, instructional design, online learning, student support

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Designing Meaningful Online Collaborative Learning

Concurrent with increased technology adoption are pedagogical changes in online learning. Further, interest in the use of collaborative learning in online courses has increased. For example, Kang and Im (2005) recognized that early online learning lacked meaningful interactions. This can be improved, as Vygotsky (1978) proposed, if students are placed in groups based on their level of experience and proficiency. In this case, individuals with less proficiency benefit from the strengths of their more capable peers, and individuals with a higher level of proficiency benefit from teaching their less capable peers. Learners with varying levels of proficiency can benefit from such a collaborative experience. Working with peers also allows students to use and improve their metacognitive skills (Ally, 2008). Recent research on online collaborative learning examined how the features of traditional collaborative learning evolve in the online environment. The same features of collaborative learning, such as intentional design, co-laboring of individuals, and meaningful learning are approached differently in an online course than in a face-to-face course (Barkley, Major & Cross, 2014; Major, 2015). Intentional design is potentially more important in the online classroom. For an instructor, ensuring co-laboring or equal distribution of work and meaningful learning presents a challenge in an online course because of the physical limitations (Barkley et al., 2014; Major, 2015).

Rovai (2004) emphasized quality online education by the integration of best practices and by encouraging instructors to reflect upon and improve their online teaching and course design skills. Successful, instructors "must have a solid understanding of the major principles of online course design before they attempt to put a course together" (Rovai, 2004, p. 82). Online teachers are inclined to educate as they were taught (Cyrs, 1997) and to apply the same approach in the online classroom. However, fundamental differences between the online classroom and the face-to-face classroom (i.e. the physical limitations; communication; course design and delivery) make it a mistake to teach an online course the same way an instructor would teach a face-to-face course (Rovai, 2004).

It is therefore critical to find approaches to "support teachers in developing and applying creative and collaborative teaching methods" (Hämäläinen, & Vähäsantanen, 2011, p. 179), as learner engagement and collaboration in online education continues to be a priority for further research (Kim & Bonk, 2006; Moore and Kearsley, 2012; Oncu & Cakir, 2011). The future potential of learning with technology is dependent on "designing new ways to support teachers in orchestrating collaborative learning and creativity, and second, in developing technological environments, which require and support definite collaboration in problem solving" (Hämäläinen, & Vähäsantanen, 2011, p. 178).

The purpose of this study was to identify emergent themes regarding higher education instructors' perceptions about the provision of collaborative learning activities and opportunities in their online classroom. With synchronous, Web- and cloud-based applications (i.e. conferencing applications and collaborative document development opportunities), options for developing collaborative learning activities continually expand. Central to this case study was to identify how instructors in higher education who teach fully online courses offered collaborative student opportunities. This endeavor used instructors' own words to gain insight into their lived instructional experiences. The topics of inquiry under investigation were:

- What are the perceptions of instructors in higher education toward collaborative learning in the online classroom?
- What experiences do faculty members identify concerning online collaborative learning?
    - o What tools do higher education instructors integrate into their pedagogy for collaborative learning in the online classroom?
    - o How do online instructors presently provide collaborative learning opportunities in the online classroom?

Review of Related Literature

Teaching and learning in an online environment permits participants the opportunity to apply new technologies, collaborate with others, and take advantage of flexible schedules (Johnson, 2013). However, teaching and learning in an online environment require a redefinition of roles for both instructors and learners (Anderson, 2008; Keengwe & Georgina, 2012; Johnson, 2013). The online instructor has an important role as a facilitator that establishes a constructivist-based learning environment which can encourage collaboration that supports the achievement of learning objectives (Rovai, 2004). Activities and group work in the online classroom require additional considerations and modifications beyond the typical face-to-face classroom. This reality requires instructors to consider alternative solutions to communicate, collaborate, and clarify written instructions. For example, Vonderwell and Turner (2005) reported that students want clear and effective communication of online messages and instruction. The delay factor and lack of interaction in asynchronous communication can negatively influence student learning (Kang & Im, 2005; Vonderwell & Turner, 2005).

The belief that advances in technology, connection speed, and the availability of collaborative tools will lead to new and improved online collaboration and address some shortcomings of traditional or early online learning and its static nature, has resulted in new research. Web-based tools provide many opportunities for small group collaboration that some online instructors have adopted and integrated into their online classroom to facilitate collaboration.

Constructivism and Social Constructivism

A learner brings a unique set of experiences and beliefs about the world into the constructivist epistemology (Smith & Ragan, 2005; Tam; 2009) and cannot be directed or led to expand their understanding (Von Glasersfeld, 1989). Rather, the learner gains understanding through interactions with the environment and peers, similar to, and emerging from, Vygotsky's conceptions; this is a core concept of constructivism according to Savery and Duffy (1995). *What* is learned and *how* it is learned are not separated in this view. All learning involves cognitive construction of concepts, regardless of what is taught, according to constructivists (Swan, 2005). Learners expand their understandings or new knowledge by building upon prior knowledge and by testing their beliefs to determine whether the information and knowledge constructs have utility through a process of regular critique that rejects knowledge that no longer holds and relegates it back to information without current value.

Social constructivists extend the constructivist worldview and believe that language, collaboration, and interaction play an important role in thinking and learning (Swan, 2005). Further, they believe "groups construct knowledge, collaboratively creating a culture of shared meanings" (Barkley et al., 2014, p. 17). Students working in groups can pool their knowledge, as the knowledge of a group combined is greater than that of an individual.

Online Learning

Online education "lies in the junction of distance education, human-computer interaction, instructional technology, and cognitive science" (Larreamendy-Joerns & Leinhardt, 2006, p. 568). Instructional design is another aspect to be included in this list. Classroom instruction sets the standard for the delivery of online courses that possess academic excellence and incorporate "sound cognitive and instructional principles" (Larreamendy-Joerns & Leinhardt, 2006, p. 571).

During the infancy of online learning in the early 1990s, social interactions experienced during a traditional face-to-face course with peers and instructors were generally converted into email communications and discussion or forum postings, with far less overall interaction (Van Bruggen, 2005). These content-heavy, independent study courses left little time or opportunity for meaningful interaction and collaboration.

In a learner-centered context, the online classroom instructor should understand the prerequisite knowledge held by each student (Anderson, 2008). These prerequisite skills are not overlooked in a constructivist learning environment; rather, higher order goals incorporate entry-level goals, and scaffolding is provided as necessary (Driscoll, 1994). Several practice implications for the improvement of online learning, as provided by Stodel, Thompson, and MacDonald (2006), are an important part of the learner-centered context. These implications include: coaching learners on how to learn online, creating opportunities to enhance spontaneity and emergent design, articulating and managing the expectations of the online community, and attempting to understand all learners in online learning environments.

Collaborative Learning

Collaborative learning occurs in "a learning environment in which individual learners support and add to an emerging pool of knowledge of a group; emphasizes peer relationships as learners work together creating learning communities" (Moore & Kearsley, 2012, p. 305). The term "collaborative learning" corresponds with Vygotsky's (1978) theory of learning, specifically the zone of proximal development (ZPD) in which a shared understanding can be developed during this learning process. In the online environment, "…collaborative learning comprises the same indispensable features as onsite collaborative learning, but they typically unfold differently" (Barkley et al., 2014, p. 5).

Online learning is best accomplished through collaboration and participation, which drives online learning, according to Hrastinski (2009). Three separate studies of 26 online courses at the New Jersey Institute of Technology determined that participation in collaborative learning correlates to higher learning outcomes when compared with those in traditional settings (Hiltz, et al., 2000).

> When students are actively involved in collaborative (group) learning on-line, the outcomes can be as good as or better than those for traditional classes, but when individuals are simply receiving posted material and sending back individual work, the results are poorer than in traditional classrooms

Collaborative learning and cooperative learning are terms often used interchangeably. While the terms have similar meanings, distinct differences exist. Online group activities do not "automatically result in collaborative interactions" or online collaborative learning, as instructors may believe (Paulus, 2005, p. 113). This technology determinism, or a "belief that because learners now can interact more frequently, they automatically will" is a side effect of the availability of various and emerging technology tools (Paulus, 2005, p. 102).

Group learning occurs in a larger group as compared to collaborative learning. Early examples of online group learning were typically asynchronous in nature and included the use of discussion threads that allowed students to discuss and pose questions to group members (Henri & Rigault, 1996; Paulus, 2005). Collaborative and cooperative learning groups are smaller, usually with fewer than six members. Further, cooperative learning utilizes a division of labor approach and members of a group choose certain tasks to complete individually (Henri & Rigault, 1996). In collaborative learning, students work together to increase understanding and reach a common goal with support from the instructor; as group members share various perspectives, individual awareness of thought process develops (Arvaja, Salovaara, Häkkinen, & Järvelä, 2007; Bento & Schuster 2003). Mutual respect for group members and recognition of the individual abilities that each group member possesses are essential components of a collaborative learning process (Hathorn & Ingram, 2002).

The instructor role is "significant in the enhancement of productive collaboration processes" (Hämäläinen, & Vähäsantanen, 2011, p. 179). Much of the current research focus about online collaborative learning is on student learning, specifically, online collaborative learning from a student perspective, the tools used to support collaborative learning, and instructors' ability to respond to the needs of students in order to provide these learning opportunities (Capdeferro & Romero, 2012; Coll et al., 2014; Kai-Wai Chu & Kennedy, 2011; Thompson & Ku, 2006). Assessing learners' readiness for computer-supported collaborative learning (CSCL) through the development of a framework measuring motivation for collaborative learning, prospective behaviors for collaborative learning, and online learning aptitude was the focus of one recent study (Xiong, So, & Toh, 2015). The use of social media, Mendeley, and virtual environments have provided additional areas of current research, exploring how students interact, whether student academic performance is improved, and how or whether tools support students in online collaborative learning (Al-Rahmi, Othman & Yusuf, 2015; Khwaja & Eddy, 2015; Vuopala, Hyvönen, & Järvelä, 2016).

A gap in current research relates to faculty perspectives on the integration of online collaborative learning. Additional research with heightened attention to how to support instructors' "abilities to apply creative and collaborative working methods" is needed (Hämäläinen, & Vähäsantanen, 2011, p. 179). There is also a need to offer teachers concrete resources to orchestrate collaborative teaching methods, provide administrative and work culture support for these methods, and a "need to highlight the autonomy of teachers' abilities to apply creative and collaborative working methods" (Hämäläinen, & Vähäsantanen, 2011, p. 179).

Implementing social constructivism in an online classroom is a substantial task. To do it well, an online instructor must understand the theoretical principles and design models for constructivist pedagogy and be familiar with the approaches for providing a rich, learner-centered environment for active learning. Interaction and collaboration are different in an online classroom compared with a face-to-face classroom, although best practices have gradually begun to emerge. Many instructors have used asynchronous learning activities since the advent of online college courses, which support increased reflection and cognitive effort. However, synchronous learning opportunities are more available today because of technological advances; tools such as Blackboard Collaborate, BigBlueButton in Canvas, Adobe Connect, and GoToTraining, are now widely available. Improved understanding of how instructors use such methods forms the basis of this study.

Methods

Procedures

A descriptive design with four unique cases was used as the qualitative approach for this study. Each participant functioned as a separate case since multifaceted experiences, including setting and pedagogical approach, led to individual, subjective outcomes. This is not to say that the cases were structurally idiosyncratic; rather, the individual cases were bound by the commonality of online learning as a shared practice, while the interviews focused on care expressions in digital delivery settings made within each instructor case. Therefore, it was possible to explore similarities and the themes that emerged across these cases (Ravitch & Mittenfelner-Carl, 2016).

Such qualitative studies are naturalistic and use an interpretive practice to consider how social experiences are created (Denzin & Lincoln, 2005). A case study is empirical inquiry that "investigates a contemporary phenomenon in depth and within a real-world context, especially when the boundaries between phenomenon and context may not be clearly evident" (Yin, 2014, p. 16). The "particularity and complexity of a single case" is further studied to understand the importance of the case (Stake, 1995, p. xi). Since the topics and subtopics of inquiry were *how* and *why* questions regarding a contemporary phenomenon, case study research was the preferred method for such an inquiry (Yin, 2014). Further, more than one source of evidence was used; four instructors from two universities were studied, and cross-comparison of their care expressions enriched the overall thematic development.

In this type of research, the wealth of information derived from a case study and its closeness to real-life situations are important in two respects, according to Flyvbjerg (2005). First, case studies are "important for the development of a nuanced view of reality, including the view that human behavior cannot be meaningfully understood as simply the rule-governed acts found at the lowest levels of the learning process…" (Flyvbjerg, 2005, p.303). Second, case studies help the researcher's learning process and development of research progression. Further, case studies are appropriate for learning and can be a "route to knowledge" (Campbell, 1975, p. 191) and more in-depth learning surrounding a phenomenon or case.

The researcher sought to understand the phenomenon of collaborative learning in online education. To understand what this looks like, how it happens, and how it is defined for online learning today, a case study is appropriate. The "detail, richness, completeness…" of such exploration of a phenomenon during a case study are the strengths of this type of research (Flyvbjerg, 2005, p. 314).

Information sources

The participants for this study were four female higher education instructors who teach fully online graduate courses and use collaborative learning in their courses. Originally, eight male and female participants were contacted and recruited through e-mail from two research institutions. Purposive sampling was used to identify and recruit instructors for the semi-structured interviews who teach online and provide collaborative learning opportunities in their online classroom. Further, participants taught at the graduate level, significant because the class size of fully online graduate courses is potentially smaller than undergraduate courses. To locate potential participants, peers and colleagues were contacted and discussions were held regarding the purpose of the dissertation study. Colleagues from both universities provided names and email addresses of potential participants. Multiple attempts over several months were made to recruit and interview at least one male participant, but this was unsuccessful. Primary source information for the study was obtained by semi-structured interviews. Table 1 summarizes the demographics of the participants, and pseudonyms are used.

	Teaching Online	Online Learning	Present Work Goals
Abby, Ph.D.	8 years	Appreciates the flexibility of teaching online; extra effort is needed to keep students engaged	Primary goal is to help her students
Catherine, Ph.D.	8 years	Strives to provide a connected or human element to her online classes	Seeks tenure and promotion
Susan, Ph.D.	11 years	Likes the flexibility of teaching and collaborating online, but challenges are presented in the preparation time for online instructors	Mentors those in her department and in her field to continue the growth of the field
Elizabeth, Ph.D.	10+ years	Appreciates meaningful conversations and learning with and from her students	To maintain and increase student enrollment and retention in her department

Table 1. Participant Demographics.

Analysis

The researcher role was that of a human instrument, specifically, the primary research instrument (Erlandson, Harris, Skipper, & Allen, 1993). The researcher verbally and analytically investigated participants' views in order to build broad themes and generate interconnected themes. The researcher audited all information, notes, and documentation. She remained responsive to new insights that arose and expanded the scope of research as needed to confirm or enhance meaning from each phase of the study. The researcher followed Lincoln's (1985) recommendation with regard to establishing trustworthiness and credibility: truth value (credibility), applicability (transferability), consistency (dependability), and neutrality (objectivity).

To establish confidence in the "truth" (truth value) of the findings, member checking was used once the interviews were transcribed and again once categories and themes were analyzed and findings were recorded. Peer debriefing sessions were used to discuss emerging themes and develop explanations aloud (Erlandson et al., 1993). These working sessions and discussions were also used to reach inter-coder agreement on any code or category questioned during coding. Applicability or transferability was established through the use of thick, rich description of each phase of the study. Further, transferability "takes the place of generalizability as a criterion for making a judgment regarding rigor in constructivist studies" (Lincoln & Guba, 2013, p. 80). The written findings report accurate accounts of the semi-structured interviews, including the use of direct quotations of faculty members and instructors interviewed. Purposeful sampling was used in this study for transferability (Lincoln, 1985).

Consistency was implemented, as the researcher coded and analyzed when well rested and not distracted. An audit trail to organize information collection and phases of the analysis was an important component of this study (Merriam, 2009). An analytic memo was used during the interviews, during post-interview reflection, and during the analysis and coding processes and phases. Neutrality or objectivity was established during the analysis and recording of the findings. A subjectivity statement was developed so that the researcher could better understand and reflect upon personal biases before interviewing and analysis and interpretation.

Multiple coding phases and processes were used for information analysis in the study. This included In Vivo, Attribute, Initial, Descriptive, and Structural coding in the first phase, and the constant comparative analysis to combine codes in a second phase of analysis. The researcher used the guidance of Lincoln (1985), Glaser and Strauss (1999), and Saldaña (2009) to analyze the information gathered from the interviews. The first phase of the coding process began with hand coding individual interviews using the voice of the participant through In Vivo, Initial, and Descriptive coding methods (Saldaña, 2009). Highlighting important participant quotations and dividing sections that pertained to each topic of inquiry was accomplished using Structural coding.

All codes and pertinent highlighted sections were combined for further analysis, comparison, and reduction or saturation following a constant comparative method in the second phase of analysis. A second pass through the data corpus was conducted to accomplish this. The researcher combined evidence from the previous steps to address the developmental theory from the constant comparative process (Glaser & Strauss, 1999). Lincoln (1985) referred to this process in terms of "construction" versus theory, as in an initial construction phase of potential theory development. Creswell (2013) explained the constant-comparative process and phases as a *zigzag process* surrounding one core phenomenon, during which the researcher moves back and forth between phases of analysis. The entire data corpus was used when constructing the theory for this stage. As categories were narrowed and major themes developed from the coding phases, they were used as section titles to organize the findings of this case study. Further, predominant themes were analyzed to determine how, or whether, each related to a specific topic of inquiry, and support was provided for each placement in the write up of the findings.

During the multi-phase analysis, nine top categories were identified and further analyzed to determine how each related to the topics of inquiry. These nine categories were compressed into three themes based on further evaluation of online collaborative learning conducted with the aid of two other trained analysts who helped to eliminate underlying duplicate codes, to reduce or merge categories, and to confirm identified themes.

Findings

Nine categories were developed in the multi-phase analysis process of this study: (1) Working in Groups; (2) Nurturing, Helping, and Supporting Students; (3) Technology Tools; (4) Challenges in Online Learning; (5) Synchronous; (6) Scaffolding; (7) Relationships with Students; (8) Communication; and (9) Asynchronous. Figure 3 provides a display of these categories. The categorical placement flows clockwise in this figure from the most instances (Working in Groups) to the least (Asynchronous).

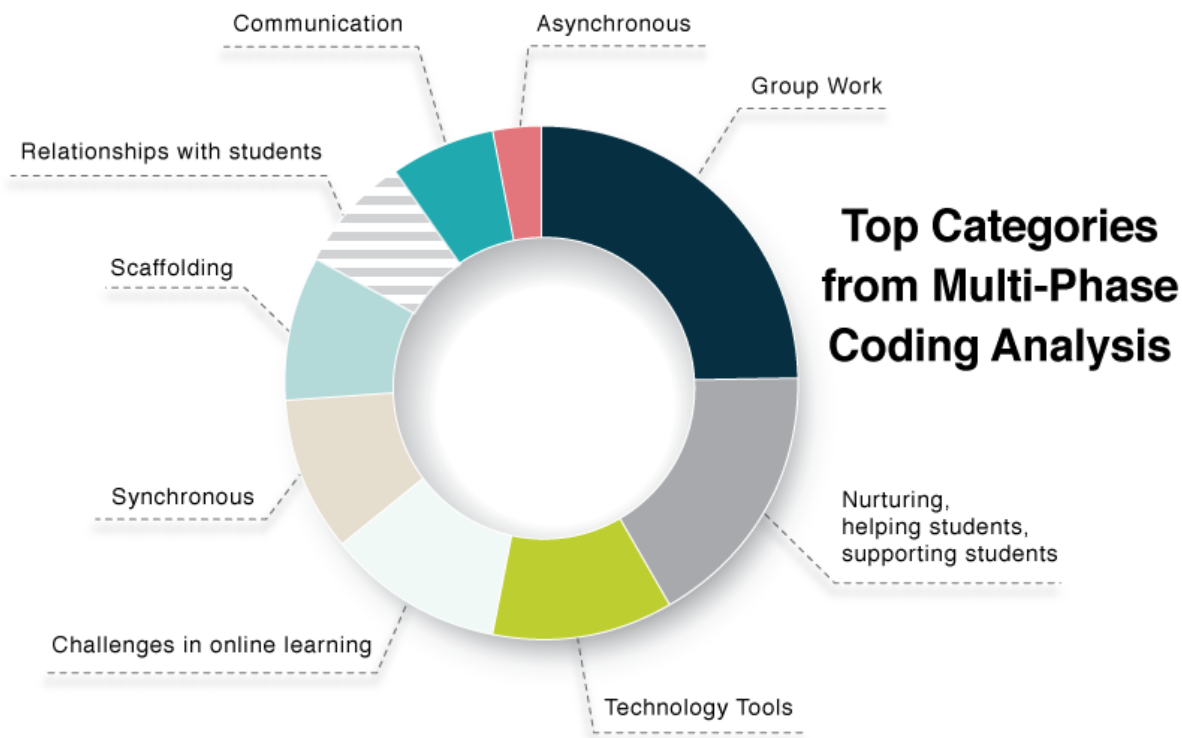

Figure 1. Top categories

The three main themes that emerged from this study were: the importance of online communication approaches, challenges and supports for online collaborative learning, and that care is at the core of online learner support. In terms of participants and their relation to online teaching, Abby, Catherine, Susan, and Elizabeth stated that they each enjoy teaching online and recognize the flexibility offered in this learning environment for themselves and their students. Both Elizabeth and Catherine noted that this is not the case for all online instructors and that online teaching may not be a good fit for every instructor. All four participants discussed various challenges and obstacles that confront online instructors. Collaborative learning is at the heart of this case study, and each participant defined and explained this type of learning. They described it as a process of working and learning together on an authentic endeavor, and building mutual understanding and knowledge.

Overall, participants expressed the perception that collaborative learning in the online classroom presents challenges but is nonetheless achievable. Online collaborative learning can be as effective, and can occur in the same manner, as face-to-face collaborative learning. However, accommodations should be made by instructors and designers in consideration of distance and various other online challenges. Each participant in this study continues to refine and improve her approach to collaborative learning. All participants shared specific concerns.

One major concern was explained by Elizabeth who stated that, "I think it takes more time [online]. It also takes a great deal of commitment on both parties to really develop a collaborative environment when you start online." She assessed that students may not be comfortable working together in an online setting but accommodated her students and alleviated anxiety through a variety of methods, including humor, versatility, and support. Susan reaffirmed Elizabeth's concern that students may not be comfortable working together online. She observed that students do not care for collaborative activities, although she continues to provide them in order to prepare students for future online courses where, she believes, they will be expected.

Abby discussed the logistical challenges of online students working in groups: "you cannot get together physically…to solve an issue or to just talk about something or to share materials." She believes that instructors who provide collaborative learning must consider schedules and time zones. Catherine handles the issue of different time zones by grouping students in pairs so as not to "damper progress."

In order to support student task engagement, participants explained that their students work in small groups with fewer than four members on authentic and real-world problems and projects that demonstrate their relevance. Although the level of structure provided for collaborative learning varied among the participants, all utilized scaffolding and/or modeling, as well as an assortment of tools for collaborative learning. These range from the tools within the learning management system (LMS) to three-dimensional virtual environments. Abby explained that when evaluating a potential tool for the online classroom she investigates its capabilities. "I see…its affordances and how it can be used. I also try to read what everyone else is saying about the tool…[and] how teachers are using it in the classroom."

Regarding synchronous and asynchronous collaborative learning opportunities and instructor communications, participants were equally divided. Catherine and Susan reported more asynchronous activities while Abby and Elizabeth offered more synchronous activities and communication. See Table 2 for a summary of findings overview organized by topic of inquiry.

Topic of Inquiry 1 *Perceptions toward collaborative learning*	Topic of Inquiry 2 *Experiences of providing collaborative learning*	Sub-topic 1 *Tools integrated for collaborative learning*	Sub-topic 2 *Collaborative learning opportunities provided*
Everything takes more time online	Critique sessions with objectives and modeling	3-D Environments	*Synchronous*
Students may not be comfortable working together	Moderators for group discussion topics	Adobe Connect	Online collaborative discussions
Students need the extra support	Projects are culmination of objectives met	GoToMeeting	Online collaborative student critiques
Lack of physical proximity makes it challenging	Use of scaffolding and modeling	Skype	Online meetings and projects in 3-D environment
Special considerations may be needed	Discussion threads	Canvas LMS	*Asynchronous*
Technological issues	Integrated instructor videos	Moodle LMS	Real-world design projects shared and student critiques in LMS
Increased instructor presence needed		Google Drive	Group discussion topics with moderators
		Google Docs	

Table 2. Summary of Findings.

The themes that emerged from these findings tended to focus on considerations for design and pedagogical approach. The nuts and bolts of developing or putting together an online course for each was different from teaching online, especially in terms of communication choices, as noted in the first theme.

Online Communication Approaches Matter

Effective communication with online students is critical, as explained by the participants of this study. Elizabeth clarified that one central challenge of online learning is alleviating anxiety for students, stating that "when you have students face-to-face, you can reassure them and they can read your body language, but when you are in an online setting, all you have is either the synchronous meetings that you hold or the written feedback you provide." The interviews revealed that instructors utilize activities and communications both synchronously and asynchronously. Participants explained the benefits for each method:

- asynchronous communications allow for flexibility;
- synchronous communications remove the factor of delay.

Communications with students occurred through e-mail, videos, and within the LMS (asynchronous communication), but also in online course meetings or through conferencing software (synchronous communication).

"For communication, I use Adobe Connect," said Abby, who holds synchronous online meetings or classes for her students. Features such as the web camera, screen sharing, presentation mode, notes, and drawings are used as well as when students present projects. Elizabeth also uses online synchronous meeting spaces including Adobe Connect, GoToMeeting, and Skype. She likes to hold synchronous meetings for fully online courses. "I think it is important to have as close to a real-time connection as you can." She also likes to use Google Hangouts, Google Docs, and Google Drive for synchronous and asynchronous work and sharing, saying "I like anything where we can share things in real time." While asynchronous approaches are more common in online learning, it is the co-presence of instructor and student that is essential, provided by synchronous communication, according to Abby and Elizabeth.

Challenges and Supports for Online Collaborative Learning

Participants discussed the challenges that influence online collaborative learning. Time, distance, technology, and connectivity inadequacies affect students. Each instructor interviewed has a unique approach to overcome such challenges. Elizabeth believes that technology failure and/or technology difficulties can present challenges to online learning and stated that

> It is just a wide-open thing. Of course, any time you are on the Internet, you always run into bandwidth issues…Every time you have a tool that requires a lot of bandwidth, I think you limit what you can do with it…because as much as we like to believe they (students) are placed on a level playing field, the bottom line is not everybody is.

Susan also explained that collaborative learning takes more time online. Collaborative learning can be successful in the online classroom and according to Susan,

> It takes lots of planning and preparation and lots of nurturing with those collaborative groups for it to be effective online, in an online setting. I think that's largely because students do not have much experience with it as graduate students in a face-to-face setting, so they do not have anything to transfer in terms of their skills [and experiences in] doing it. They do not know how to do it. They do not know what they're supposed to do in terms of communication, and they'll use technology as the barrier, when it's really not the barrier. They just do not know what to do.

Group work or group projects are often used to facilitate collaborative learning. Each participant in the study spoke of group projects or group work. Elizabeth believes that each student has something unique to offer during group work. Abby believes collaborative learning is possible in the online environment and noted that, "I usually ask my students to work in groups to generate a project or to solve something." However, she expressed concern about equal workload within the groups and as a result recently incorporated a peer review process that students are made aware of at the beginning of the semester. If students understand their level of contribution or effort will be evaluated they may be more conscientious about their role in group work.

When discussing particular collaborative learning tools, Elizabeth said, “I think every tool has inherent benefits and inherent challenges associated with it. I think the key is using the tool appropriately for the circumstance.” This is consistent with Gibson’s (1977) view of pairing the appropriate learning affordance with the defined needs of a learning task. Such pedagogical effort eases the transition into group work and new technology tools.

Care is at the Core of Online Learner Support

Participants portrayed relationships with online and face-to-face students similarly. Abby described a good relationship with her online students and believed that they know they can count on her. Susan explained that the relationships with her students in her online courses are not much different than those with her face-to-face students. “We communicate frequently, sometimes as a whole group or small groups, sometimes independently…students feel comfortable contacting me.” Elizabeth echoed these feelings, stating that she is an accessible and approachable instructor.

However, because online students are not in the same physical location and learn at different times, additional support is necessary to achieve collaborative learning. The participants therefore provide scaffolding for collaborative activities and online coursework. Elizabeth models expectations for critique sessions. She explained why she does this, saying

> You also have to be strategic about that because if you have not laid the foundation for that, if you have not built the rapport, if you have not established yourself as an instructor, if you have not modeled what your expectations are. If you have not demonstrated the process at least once or twice, students are so terrified of doing it that they just do not quite know what to do. At particularly undergrad and masters level, I do not like to just throw people into the deep end of the pool. I like to show them how to swim first.

Susan believes that her students do not have anything to transfer from their high school and many earlier college experiences when it comes to collaborating online and they need extra support. She stated that “I'm trying to help them get some experience in this for future courses, because I know it's not going to go away for them, but they're not real crazy about it.” Catherine also noted that

> I try to make an effort to connect with students and if they do have a certain situation happening, I want them to reach out to me and let me know. It might not affect our coursework but if it does, at least I have a way to help guide them through both my class and how they can handle this outside issue.

Catherine is ardent about establishing a human connection with her online students, which is a hallmark of social constructivist learning experiences. She explained, “You can have a class without that (human connection) but I feel like it’s different. It may not be better or worse, but it’s not the same.” Therefore, she strives to make this connection with her videos. She said, “Because of my videos, I think I also develop a different kind of relationship and this gets at some of the literature on instructor presence in an online class.”

Communication with students, accessibility, and instructor presence were priorities for all instructors. Participants are committed to assist and support their students. Each approaches instruction and design with a distinct level of care, believing that it supports students and improves learning. Their availability, affirmations, and authenticity provide students with a strong instructor presence.

Discussion

All four participants enjoy teaching online and recognize the flexibility offered in this learning environment for themselves and their students, but also discussed various challenges and obstacles that confront online instructors and explained that online teaching may not be a good fit for every instructor. Online collaborative learning is the heart of this case study and each participant defined and explained this type of learning. They described it as a process of working and learning together on an authentic endeavor to build mutual understanding and knowledge. The value of the themes and topics of inquiry are further explained in this section. The perceptions of, and experiences with, online learning, utilization of tools, and pedagogical approaches are used as headings to organize the discussion of the outcomes and summarize the value of the findings. Additionally, a cross comparison of the cases is provided to note commonalities, patterns, limitations, and future research implications.

Perceptions of Online Collaborative Learning

The overall perception (topic of inquiry 1) that participants expressed regarding collaborative learning in the online classroom is that it can be as effective and occur in the same manner as face-to-face collaborative learning, but requires accommodations that address various challenges of online learning, including distance. Each participant in this study continues to refine her approach to providing and improving online collaborative learning.

Susan and Catherine work for the same university and are systematic about their approach to collaborative learning. Their collaborative learning occurs in an asynchronous manner and they utilize an organized and more structured approach. Susan explained that a management-oriented approach works for online collaborative learning. The pedagogical work and clear outcomes Susan provides to students supports them in a manner that allows successful completion of collaborative learning activities. The videos that Catherine uses in her courses to introduce and conclude topics has helped her establish a human connection with her online students and provide an increased instructor presence. These approaches are consistent with prior research (Anderson, 2008; Aragon, 2003; Barkley et al., 2014). Creating an environment where students feel supported and confident is one way to increase teacher presence in the online classroom (Anderson, 2008). Aragon (2003) suggested the following to increase social presence: a. limiting the class size of an online classroom, b. including collaborative learning activities, and c. sharing personal stories and experiences in discussion threads.

In the online environment, instructors serve as both mentors and facilitators (Barr & Tagg, 1995; Rovai & Jordan, 2004). Abby and Elizabeth approach collaborative learning from this perspective. While structure in the form of establishing norms, discussing expectations, and objectives are a part of this process, the real time social interactions are essential to their approach. Learning is collaboratively achieved when students work on projects and instructors facilitate. Synchronous communication and activities through online meetings helps to facilitate this approach.

The four participants were exposed to face-to-face collaborative learning in their childhoods. They adapted this experience to the online environment and because of this, understand that students may need extra support to adapt to online collaborative learning and to the less direct instructional approach characteristic of collaborative learning. Susan believes that extra preparation and nurturing is needed for group work or collaborative projects because graduate students do not have the skills or experience working in this way. Abby assumes a facilitator role and believes that adult students know how to work together to collaborate online. She does not want to intervene in this process, but offers support if needed.

Mixed time zones, scheduling concerns, the lack of physical proximity, and technological issues were identified as concerns and challenges for students and instructors. Group projects, which facilitate collaborative learning, can present challenges because students are not in the same location, as they are in a traditional classroom, and because they may be uncomfortable working together as a group. These potential obstacles do not deter study participants in their commitment to collaborative learning. Each participant discussed situations where a collaborative learning activity did not go as anticipated, but these became learning experiences for participants, opportunities to reflect and improve their method for the benefit and success of their students.

Participants described relationships with online students as similar to those with face-to-face students. While each connects with students uniquely, all make it clear that they are available for their students and desire open lines of communication. Each participant in the study has a unique way to overcome the inherent challenges of the lack of physical proximity in the online classroom. Communication with their students is a priority, as well as being accessible and instilling instructor presence in their online courses. They are committed to assistance, support, and availability for their students.

Experiences with Online Collaborative Learning

The description of the collaborative learning experiences (topic of inquiry 2) in participants' online classrooms parallels the definition of collaborative learning in the literature. Students work in small groups with less than four members on authentic and real-world problems and projects. Although the level of structure provided varies among participants, all participants utilize scaffolding and/or modeling. Pre-instruction, examples, videos, and critique modeling are used, as "an instructor should provide the guidance required for learner to bridge the gap between their current skill levels and a desired skill level" (Driscoll, 2005, p. 258). The lack of physical proximity makes collaborative learning a challenge, but this can be remedied with increased scaffolding and modeling—creating a foundation for students upon which to build knowledge.

Tools for Online Collaborative Learning

While participants easily identified the tools they use and responded to questions regarding specific tools (sub-topic of inquiry 1), important discussions related to the effective use of tools. Susan explained that it is "not what the tool does, but how I best use that tool. How can I most effectively use that particular tool in a particular topic or content or assignment activity to help the students learn with that tool. Not from the tool, but with the tool." Elizabeth explained that, for her, each tool has different affordances and she said, "I think every tool has inherent benefits and inherent challenges associated with it. I think the key is using the tool appropriately for the circumstance."

First- and second-order barriers were identified regarding the usability and stability of the tools, the difficulty of managing group learning, and classroom management issues (Donna & Miller, 2013). Despite the barriers, a teacher who values the use of pedagogies that support collaborative learning is more likely to integrate the necessary tools to facilitate this type of learning (Donna & Miller, 2013). Abby, Elizabeth, and Catherine mentioned the challenges inherent in the use of technology in an online learning environment: bandwidth issues, Internet connections, and lag during online synchronous meetings. Susan explained that most tools within the Canvas LMS support collaborative learning while Abby instead uses the LMS as delivery of instruction. Synchronous tools, rather than the LMS, are her choice.

Approaches for Online Collaborative Learning

Participants were equally divided between synchronous and asynchronous collaborative learning opportunities (sub-topic of inquiry 2) and communications provided by the instructors. Catherine and Susan reported more asynchronous activities while Abby and Elizabeth offer more synchronous activities and communication. The asynchronous activities described by Catherine and Susan allow students to complete the activity during a time that is convenient for them, which maintains flexibility for their students. Hrastinski (2008) explained that many students take online courses for the flexible and asynchronous nature that this type of learning provides. Abby and Elizabeth believe synchronous online meetings bring as much of real-time connection to the online classroom as possible, which remove the delay factor.

The term “nurturing” was used in several interviews. Each participant felt strongly about helping and supporting students. Discussions during the demographic portion of each interview revealed the strong appeal of mentoring and camaraderie, which were felt to enhance each other. Creating better adults is a major goal of education (Noddings, 2015) and with the emerging theme of care at the core of online learner support from this case study, a deeper investigation into the research of care theory in online learning was defensible. Care theories that emerged in the 1980s with the works of Gilligan (1982) and Noddings (1984) centered on the experiences of women. Care ethics and care theories have been applied in the areas of education, communities, families, and, more recently, global affairs and justice, with the roots of care theory being the fundamental responsibility we have for one another (Noddings, 2012).

Velasquez, Graham, & Osguthorpe (2013) examined care pedagogy and how caring is experienced in a technology-mediated setting in an online high school. The findings revealed that continuous dialogue, promptness and clarity of the communications are a part of caring pedagogy. The theme *online caring presence* emerged in Mastel-Smith, Post & Lake’s (2015) study, similar to what emerged in this study with our participants. These studies, together with this case study, support similar findings on communications, affirmations, availability and presence of the instructor, and a human connection in an online setting.

Future Research and Implications for Practice

Students who work individually and are taught individually miss out on the value of collaborative learning and do not develop fundamental skills necessary for future collaborative work (Brown, Collins & Duguid, 1989). Students exposed to activities that require working closely with peers in online classes through meaningful collaborative learning and informal conversations acquire deeper thought development and knowledge construction (Barkley et al., 2014; Swan, 2005; Vygotsky, 1978). Approaches beyond direct instruction were integrated into the successful online instruction used by this study’s instructors. Therefore, courses should include “some invitation to gather and apply both intellectual and practical knowledge" (Noddings, 2015, p. 235). In an online environment, the manner of "gathering" is different than a traditional learning environment. As revealed here, the general challenges in online learning, including the lack of physical proximity, are hurdles to online collaborative learning. Catherine explained that "we often think about collaborative learning as being distinctively tied to group work, but I really think that in an online classroom that definitely takes on a different meaning." Participants explained that many considerations beyond group work are included in developing opportunities for successful collaborative learning.

The divide between instructor use of synchronous and asynchronous instructional approaches was prominent in the findings. Hrastinski (2008) found that while synchronous and asynchronous learning complement each other, asynchronous online learning better supports cognitive participation, such as increased reflection. A more recent study explained that past and even current research "may no longer be the status quo and online learning environment scholars need to be willing to conceptually change their understanding related to synchronous online learning" (Yamagata-Lynch, 2014, p. 204). Yamagata-Lynch used synchronous communications to engage students in spontaneous discussions and asynchronous communications that allowed students time to reflect and prepare a response to the discussion topics that were designed for a particular week (2014). In another study, it was found that the use of instruction with online constructivist theories that supports synchronous and asynchronous learning fulfills the need for interactive online learning and mitigates the isolation of online learners (Larreamendy-Joerns & Leinhardt, 2006). The use of both synchronous and asynchronous activities and learning are recommended for online learning, but synchronicity may be the best approach to alleviate the concern of "time" expressed by participants, especially for challenges expressed regarding the extra time needed for communications in the online environment and the issue of time or delay in interactions. Synchronous tools and online synchronous meetings remove the delay factor. Future research is recommended to ascertain how synchronous and asynchronous collaborative learning can be used together to better support collaborative learning opportunities.

Collaborative learning will endure and evolve in online learning settings. In keeping with this, Susan believes that students should be prepared for future courses that use collaborative learning. She explained that part of this preparation will require students to work together, a practice they do not typically like to do online. Teachers should therefore set expectations for how students can connect and work, including normative cues to govern their group-based interactions. These social interactions are at the center of the collaborative learning process. Further research should explore whether a progression of integration occurs when instructors move toward the use of collaborative learning in online learning. It is also valuable for instructors to understand whether a progression of acceptance and level of comfort happens for students learning to work together online and to identify potential concerns.

From a care-at-core of online learning perspective, Velasquez et al. suggested, "the technology-mediated context is sufficiently robust to facilitate caring interactions. It demonstrates how caring may be experienced online, including considerations that may differ from face-to face settings" (2013, p. 114). From this, research about online collaborative learning should be explored "through the lens of care" (Noddings, 2012, p. 244). An examination of the perceptions of, and experiences with, care-at-the-core of the learning process should include components of modeling, dialogue, practice, and confirmation, which may enhance perspectives that help improve collaborative learning in online learning. Further, such research can help the field develop a model of care in online teaching and learning from a cognitive perspective to guide the instructional design of individual courses as well as whole programs, as well as pedagogical practice. This model would be valuable for institutions that seek to implement academic coaching and professional development opportunities for online instructors.

Limitations

There were a few limitations to the study. First, it was conducted through a post-Positivist paradigm and the findings are not intended to generalize; therefore, readers should examine our findings through a lens of transferability to their own situation and context to determine its applicability. Further, this was an exploratory study, so there were only a few participants included prior to expansion in the future, which may be viewed to limit transferability; this challenge may also apply to male readers, because of their lack of participation in the study, although it was sought. Therefore, it is recommended that the same study be conducted with equal participation of male and female participants to determine the extent to which themes remain consistent across gender.

Recommendations

Based on the findings of this study, we recommend the following regarding the practice of online collaborative learning if the reader is in a similar setting:

- If one teaches courses around message or instructional design, as Catherine and Elizabeth discussed, consider an authentic or real-world design project that combines peer critique.
    - Modeling and scaffolding should be used to provide students with specific examples of the critique process. This can alleviate fear for students new to peer critique.
- Keep groups small, with only three to four students per group, as Susan does. Be flexible about how groups are formed and take into consideration varied time zones.
    - To support workload concerns, peer responsibilities, and the effectiveness of group work, consider a peer evaluation. Make students aware that their group members (peers) will evaluate them, such as the approach Abby takes.
- To increase instructor presence in predominantly asynchronous learning and to deliver a human component to your online classroom.
    - Consider using short instructor videos for your students, as Catherine does for introducing topics and for topic wrap-ups.
- If you want to utilize a new tool or collaborative learning activity, remember the pedagogical work needed for successful integration.
    - The tools integrated to accomplish collaborative learning activities require planning and pedagogical work more important than the tool itself.
- Consider the use of some form of synchronous learning in online courses.
    - Synchronous online meetings improve real-time communications, provide a space for groups to meet and interact, and are useful for providing the scaffolding and modeling essential to online collaborative learning.

- Approach the instruction and design of online collaborative learning mindfully, with an overall caring attitude and consideration for learners' experiences.

Conclusions

Exposing students to activities where they work closely with their peers in online classes through meaningful collaborative learning and informal conversations leads to deeper thought development and knowledge construction (Barkley et al., 2014; Swan, 2005; Vygotsky, 1978). Approaches beyond direct instruction were integrated into the online courses led by this study's participants. Therefore, courses should include "some invitation to gather and apply both intellectual and practical knowledge" (Noddings, 2015, p. 235). In an online environment, the manner of student "gathering" together in groups as well as their process of information seeking often differs from a traditional environment. As noted in our study, the general challenges in online learning, including the lack of physical proximity, are hurdles for online collaborative learning to occur, as has been noted elsewhere (Paulus, Payne, & Jahns, 2009; Junco, Heiberger, & Loken, 2011). As Catherine explained: "We often think about collaborative learning as being distinctively tied to group work, but I really think that in an online classroom that definitely takes on a different meaning." Participants discussed many considerations necessary to develop successful collaborative learning beyond group work, including additional time and nurturing, scaffolding, instructional design, and understanding students' comfort level working together online.

The unique contribution of this study is the emergence of care-at-the-core of online learner support, including nurturing, helping, and supporting students in collaborative learning. This emergent theme is an under-researched area of online learning. The presence of online care and online learning from the care perspective is woven into the findings and top themes in this study. Noddings' (1984; 2015) work on care theory is robust and expands across numerous decades and various fields of study. Care in collaborative learning is embedded in the genuine acts and authenticity of the participants of this study. The foundation of the care perspective in online learning helps students tap into their full potential, supports their individual qualities, and builds upon these strengths to aid in the overall success of the individual. By doing so, we hope that online learning can be improved, and student experience can grow and become increasingly positive in the future.

References

Al-Rahmi, W., Othman, M. S., & Yusuf, L. M. (2015). The role of social media for collaborative learning to improve academic performance of students and researchers in Malaysian higher education. *The International Review of Research in Open and Distributed Learning, 16*(4)

Ally, M. (2008). Foundations of educational theory for online learning. In T. Anderson & F. Elloumi (Eds.), *The theory and practice of online learning.* Edmonton, AB: Athabasca University Press.

Anderson, T. (2008). Towards a theory of online learning. In T. Anderson & F. Elloumi (Eds.), *The theory and practice of online learning.* Edmonton, AB: Athabasca University Press.

Barkley, E. F., Major, C. H., & Cross, K. P. (2014). *Collaborative learning techniques: A handbook for college faculty*. San Francisco, CA: Jossey-Bass.

Bednar, A. K., Cunningham, D., Duffy, T. M., & Perry, J. D. (1991). Theory into practice: How do we link? In G. J. Anglin (Ed.), *Instructional technology: Past, present and future*. Englewood, CO: Libraries Unlimited.

Capdeferro, N., & Romero, M. (2012). Are online learners frustrated with collaborative learning experiences? *The International Review of Research in Open and Distributed Learning*, *13*(2), 26-44.

Coll, C., Rochera, M. J., & de Gispert, I. (2014). Supporting online collaborative learning in small groups: Teacher feedback on learning content, academic task and social participation. *Computers & Education*, *75*, 53-64.

Cyrs, T. E. (1997). *Teaching and learning at a distance: What it takes to effectively design, deliver and evaluate programs.* San Francisco, CA: Jossey-Bass.

Dabbagh, N. (2005). Pedagogical models for e-learning: A theory based design framework. *International Journal of Technology in Teaching and Learning, 1*(1), 25-44.

Denzin, N. K., & Lincoln, Y. S. (2005). Introduction: The discipline and practice of qualitative research. In N. K. Denzin & Y. S. Lincoln (Eds.), *The Sage handbook of qualitative research* (pp. 1-32). Thousand Oaks, CA: Sage.

Driscoll, M. P. (1994). *Psychology of learning for instruction.* Boston, MA: Allyn & Bacon Publishers.

Erlandson, D. A., Skipper, B. L., Allen, S. D., & Harris, E. L. (1993). *Doing naturalistic inquiry: A guide to methods*. Newbury Park, CA: Sage Publications.

Flyvbjerg, B. (2005). Case study. In N. K. Denzin & Y. S. Lincoln (Eds.), *The Sage handbook of qualitative research.* Thousand Oaks, CA: Sage.

Gibson, J. J. (1977). The theory of affordances. In R. Shaw & J. Bransford (Eds.), *Perceiving, acting, and knowing: Toward on ecological psychology* (pp. 67–82). Book Section, Hillsdale, NJ: Erlbaum and Associates.

Gilligan, C. J. (1982). *In a different voice.* Cambridge, MA: Harvard University Press.

Glaser, B. G. & Strauss, A. L. (1967). *The discovery of grounded theory: Strategies for qualitative research.* Transaction Publishers.

Guba, E. G., & Lincoln, Y. S. (1994). Competing paradigms in qualitative research. In N. K. Denzin & Y.S. Lincoln (Eds.), *Handbook of qualitative research*, 105-117. Thousand Oaks, CA: Sage.

Hämäläinen, R., & Vähäsantanen, K. (2011). Theoretical and pedagogical perspectives on orchestrating creativity and collaborative learning. *Educational Research Review*, *6*(3), 169-184.

Hiltz, S. R., Coppola, N., Rotter, N., Turoff, M., & Benbunan-Fich, R. (2000). Measuring the importance of collaborative learning for the effectiveness of ALN: A multi-measure, multi-method approach. *Journal of Asynchronous Learning Networks, 4*(2), 103–125.

Hrastinski, S. (2009). A theory of online learning as online participation. *Computers & Education, 52*, 78–82.

Jonassen, D. H. (1999). Designing constructivist learning environments. In C. M. Reigeluth (Ed.), *Instructional design theories and models: A new paradigm of instructional theory* (Vol. 2, pp. 215–239). Book Section, Mahwah, NJ: Lawrence Erlbaum Associates, Publishers.

Junco, R., Heiberger, G., & Loken, E. (2011). The effect of Twitter on college student engagement and grades. *Journal of Computer Assisted Learning*, *27*(2), 119–132.

Kai-Wai Chu, S., & Kennedy, D. M. (2011). Using online collaborative tools for groups to co-construct knowledge. *Online Information Review*, *35*(4), 581-597.

Kang, M. & Im, T. (2005). Factors of learner-instructor interaction which predict perceived learning outcomes in online learning environment. *Journal of Computer Assisted Learning, 29,* 292-301.

Keengwe, J. & Georgina, D. (2012). The digital course training workshop for online learning and teaching. *Education and Information Technologies, 17*(4), 354-379.

Khwaja, T., & Eddy, P. L. (2015). Using Mendeley to support collaborative learning in the classroom. *I-Manager's Journal of Educational Technology, 12*(2), 19.

Kim, K., & Bonk, C. J. (2006). The future of online teaching and learning in higher education: The survey says. *Educause Quarterly*, *29*(4), 22.

Johnson, C. J. (2013). Evaluation of a hybrid mathematics methods course for novice teachers. *International Journal of Online Pedagogy and Course Design, 3*(1), 33-52.

Larreamendy-Joerns, J. & Leinhardt, G. (2006). Going the distance with online education. *Review of Educational Research, 76*(4), 567-605.

Leidner, D. E., & Jarvenpaa, S. L. (1995). The use of information technology to enhance management school education: A theoretical view. *MIS Quarterly, 19*(3), 265-291.

Lincoln, Y. S. (1985). *Naturalistic inquiry* (Vol. 75). Egon G. Guba (Ed.). Newbury Park, CA: Sage.

Major, C. H. (2015). *Teaching online: A guide to theory, research, and practice*. Baltimore, MD: JHU Press.

Mastel-Smith, B., Post, J., & Lake, P. (2015). Online teaching: Are you there, and do you care? *Journal of Nursing Education, 54*(3), 145-151.

Moore, M. G., & Kearsley, G. (2012). *Distance education: A systems view of online learning*. Belmont, CA: Wadsworth.

Noddings, N. (1984). Caring: *A feminine approach to ethics and moral education.* Berkeley and Los Angeles, CA: University of California Press.

Noddings, N. (2012). *Philosophy of education.* Boulder, CO: Westview Press.

Noddings, N. (2015). A richer, broader view of education. *Society, 52*(3), 232.

O'Neill, S., Scott, M., & Conboy, K. (2011). A Delphi study on collaborative learning in distance education: The faculty perspective. *British Journal of Educational Technology, 42*(6), 939-949.

Oncu, S., & Cakir, H. (2011). Research in online learning environments: Priorities and methodologies. *Computers & Education*, *57*(1), 1098-1108.

Palloff, R. & Pratt, K. (1999). *Building learning communities in cyberspace: Effective strategies for the online classroom.* San Francisco: Jossey-Bass.

Paulus, T. M., Payne, R. L., & Jahns, L. (2009). ""Am I making sense here?": What blogging reveals about undergraduate student understanding. *Journal of Interactive Online Learning*, *8*(1), 1–22. Retrieved from www.ncolr.org/jiol

Ravitch, S., & Mittenfelner Carl, N. (2016). *Qualitative research: Bridging the conceptual, theoretical, and methodological* (1st ed.). Los Angeles, CA: Sage Publications, Inc.

Rovai, A. P. (2004). A constructivist approach to online college learning. *The Internet and Higher Education*, *7*(2), 79-93.

Saldaña, J. (2009). *The coding manual for qualitative researchers*. Thousand Oaks, CA: Sage Publications.

Savery, J. R. & Duffy, T. M. (1995). Problem-based learning: An instructional model and its constructivist framework. *Educational Technology, 35*, 31-38.

Smith, P. L. & Ragan, T. J. (2005). *Instructional Design*. 3rd Edition. US: John Wiley & Sons.

Stake, R. E. (1995). *The art of case study research*. Thousand Oaks, CA: Sage Publications.

Stodel, E. J., Thompson, T. L., & MacDonald, C. J. (2006). Learners' perspectives on what is missing from online learning: Interpretations through the community of inquiry framework. *International Review of Research in Open and Distance Learning, 7*(3), 1-22.

Swan, K. (2005). A constructivist model for thinking about learning online. In J. Bourne & J. C. Moore (Eds.), *Elements of Quality Online Education: Engaging Communities*. Needham, MA: Sloan-C.

Tam, M. (2009). Constructivism, instructional design, and technology. In Willis, J. W. (Ed.). *Constructivist Instructional Design (C-ID): Foundations, Models, and Examples*. (61-81). Charlotte, NC: Information Age Publishing.

Thompson, L., & Ku, H. (2006). A case study of online collaborative learning. *The Quarterly Review of Distance Education*, *7*(4), 361-375.

Van Bruggen, J. (2005). Theory and practice of online learning. *British Journal of Educational Technology*, *36*(1), 111-112.

Velasquez, A., Graham, C. R., & Osguthorpe, R. (2013). Caring in a technology-mediated online high school context. *Distance Education*, *34*(1), 97-118.

Vonderwell, S. & Turner, S. (2005). Active learning and pre-service teachers' experience in an online course: A case study. *Journal of Technology and Teacher Education*, *13*, 65-84.

Von Glasersfeld, E. (1989). Cognition, construction of knowledge, and teaching. *Synthese*, *80*(1), 121-140.

Vuopala, E., Hyvönen, P., & Järvelä, S. (2016). Interaction forms in successful collaborative learning in virtual learning environments. *Active Learning in Higher Education, 17*(1), 25-38.

Vygotsky, L. (1978). *Mind in society*. Cambridge, MA: Harvard University Press.

Xiong, Y., So, H., & Toh, Y. (2015). Assessing learners' perceived readiness for computer-supported collaborative learning (CSCL): A study on initial development and validation. *Journal of Computing in Higher Education, 27*(3), 215-239.

Yin, R. K. (2014). *Case study research: Design and methods*. Thousand Oaks, CA: Sage Publications.

Student Actions and Community in Online Courses: The Roles Played by Course Length and Facilitation Method

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Abstract

Fostering a strong sense of community among students within online courses is essential to supporting their learning experience. However, there is little consensus about how different facilitation methods influence students' sense of community or behaviors. This lack of understanding means instructors do not have the information they need to select an appropriate facilitation method when teaching online. This challenge is further complicated by a poor sense of how community building is influenced by the length of an online course. To better understand the relationship between these factors, we explored students' sense of community across four graduate-level online courses. Two of these courses employed an instructor-led form of facilitation and two employed a peer-led form of facilitation. For each facilitation method, one course lasted an entire term (12 weeks) and the other lasted half a term (6 weeks). This two-by-two between-subjects design is augmented with interview data. This design enabled the study of both variables and possible interaction effects. The findings revealed students in instructor-facilitated courses experienced a stronger sense of community. Longer courses were also associated with a stronger sense of community, although the relationship was weaker than that of facilitation. No interaction effects were detected between facilitation method and course length. Follow-up analyses examined the relationship between facilitation style, course length, and a set of twelve student behaviors (e.g., note writing, note reading, and replying). The results revealed that both facilitation style and course length were associated with differences in students' note attributes including note length, the Flesch-Kincaid grade level of the text, and the frequency of their replies. Collectively, these findings offer evidence that both facilitation style and course length are related to students' sense of community and the behaviors they exhibit online.

Keywords: Online learning environments, community, facilitation method, course length

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Student Actions and Community in Online Courses: The Roles Played by Course Length and Facilitation Method

Distance learning was originally created with the hope of educating those who were denied access to education (Ticknor as cited in Harting & Erthal, 2005). Today, it holds the potential to meet the needs of people who cannot attend on-campus courses because of family and work obligations (Hirshhorn, 2011). With the increasing pressure to provide quality online learning experiences (Thompson & MacDonald, 2005), many instructors have become cognizant of the need to support the social dimension of learning. They recognize the importance of encouraging student interaction (Hew, 2015) and the adoption of practices that foster a sense of community, that is, a sense of belonging and interactivity in an online learning environment (Rovai, 2002a; Liu, Magjuka, Bonk, & Lee, 2007; Ouzts, 2006), because community is believed to enable a collaborative, supportive, and positive learning experience (Palloff & Pratt, 2007).

Current research suggests fostering a sense of community in online courses helps minimize feelings of isolation (Rovai, 2002a), build camaraderie (Conrad, 2005), improve student outcomes (Drouin, 2008), and lead to deeper learning (Hulon, 2013). According to theories of social constructivism, learning is fundamentally a social process and knowledge is developed through interaction (Vygotsky, 1978). New understandings and knowledge emerge when learners negotiate meaning by redefining their own ideas while considering the ideas of others (Richardson, 2003). Such processes can be encouraged in online courses through the development of a course-wide learning community (Song & McNary, 2011), where community members are responsible for sharing knowledge, co-developing ideas, and supporting one another.

How to best facilitate students' sense of community is a question that requires extensive research. In this paper, we examine the impact of two factors: length of course (regular twelve-week courses vs. concentrated six-week courses) and facilitation method. For the latter, we compared two broad facilitation methods: peer-facilitation and instructor-facilitation. Both methods of facilitation are consistent with socio-constructivist approaches, but they place different responsibilities on the stakeholders. In instructor-facilitated courses, the instructor is responsible for managing many of the aspects of the discourse process, whereas in peer-facilitated courses, the instructor takes a background role and allows students to manage their online discourse (Hew, 2015). It is not clear which facilitation style is pedagogically superior. As a result, some scholars are questioning which role the instructor should adopt (Arend, 2009; Correia & Baran, 2010).

To make headway on these problems, the current study employs a mixed-methods explanatory design to uncover how students' sense of community is related to facilitation style and course length. It also examines the relationship between facilitation style, course length, and the incidence of specific linguistic behaviors exhibited online, such as the sophistication of their prose as represented through the Flesch-Kincaid grade level, and student forum posting behaviors.

Review of Related Literature

A wealth of previous research has explored how online courses might be better designed to support student learning and their engagement in communal discourse. A variety of factors have been considered, including discussion group size (Hewitt & Brett, 2007; Rovai, 2007), facilitation methods (MacKnight, 2000; Rovai, 2007; Wise & Chiu, 2011), course length (Ferguson & DeFelice, 2010; Seamon, 2004), and software design (Brooks, Panesar, & Greer, 2006; Hewitt, 2005; Swan, 2004). In this paper, we focus on two of these factors: course length and facilitation method. We begin by reviewing the literature on each of these topics.

Course Length

Many post-secondary institutions offer intensive courses that have the same curriculum as regular courses but take place over half of a semester instead of a full semester. This is typically achieved by scheduling classes twice as often, so the same amount of material can be covered in half the time. For example, a course taught during a regular fall semester might consist of twelve classes, taught once per week, while the same course taught in an accelerated summer term might require only six weeks, with two classes scheduled each week.

Prior research on course length has largely focused on face-to-face courses. As Anastasi (2007) observes, instructors generally assume courses are less effective when offered in an intensive format. However, the literature offers little evidence to support this assumption (e.g., Anastasi, 2007; Austin & Gustafson, 2006; Daniel, 2000; Seamon, 2004). Most studies have failed to find significant differences between the two formats. In cases where a difference is found, the intensive courses tend to be superior (Seamon, 2004), with students in short courses earning higher mean grades when the same course was compared across lengths (Ferguson & DeFelice, 2010). This pattern held even when controlling for a variety of individual student attributes such as GPA, age, and affinity for learning (Seamon, 2004). It appears there is little evidence to support the assumption that condensed or short courses are less effective than full-length or long courses, and compelling evidence exists that they may be more effective.

In addition to studying the relationship between course length and student grades, some researchers have examined how course length relates to student satisfaction (Richardson, Maeda, Lv, & Caskurlu, 2017). While there is a relationship between student satisfaction that varies by online course length (Richardson et al., 2017), the findings from investigations directly comparing courses of different lengths are less clear. One study of online courses by Ferguson and DeFelice (2010) found students in a shorter intensive course were significantly more satisfied with student-student communication than those in the longer full-semester version of the course were, but they were less satisfied with student-professor communication. The same researchers detected no significant differences in terms of the students' perceived learning or their intentions to take additional online courses in the future (Ferguson & DeFelice, 2010). Anastasi (2007), in contrast, found that student ratings of instructors were similar across the two conditions, although they rated the intensive short courses as more challenging. Scott (2003) suggests student satisfaction is highly dependent upon the skill of the instructor, arguing that it is important to establish an atmosphere and relationships early in a short course to help students stay focused and perform better. While Scott (2003) was referring to face-to-face courses, it is plausible to suggest online instructors might need to be similarly prepared to adapt their instruction to an accelerated schedule.

Considered collectively, the literature offers no evidence that intensive courses are less effective than full semester courses, and some studies suggest an intensive course format can yield superior academic results. However, most of the research in this area is concerned with studies conducted on face-to-face courses, and that done in online settings has largely ignored many of the aspects of how the course is managed, making the applicability of these findings to online courses less clear.

Facilitation Methods

The educational literature describes many different strategies for facilitating asynchronous online discussions (e.g., Ghadirian & Ayub, 2017; MacKnight, 2000; Rovai, 2007; Wise & Chiu, 2011). The current study is concerned with two broad categories of facilitation described by Hew (2015): peer facilitation and instructor facilitation. Instructor facilitation involves the instructor taking responsibility for moderating the ongoing class discussions. This is the traditional role played by instructors in online courses (Hew, 2015). Peer facilitation, in contrast, involves turning over most of the moderating duties to students.

Some scholars struggle with the idea that instructors should facilitate online courses (Arend, 2009; Correia & Baran, 2010) in part because of the amount of time required to properly monitor student discussions (Correia & Baran, 2010), and in part because they feel that a peer-facilitated approach confers educational advantages. The proposed educational advantages are twofold. First, peer facilitation is thought to engage students at a deeper cognitive level. The reduced involvement of the instructor requires students to take ownership of high-level cognitive processes, such as synthesizing and summarizing content, challenging and negotiating ideas, relating course content to personal experiences, and posing meaningful questions (Belcher, Hall, Kelley, & Pressey, 2015). Second, peer facilitation reduces the instructor's "authoritarian presence" in the discourse (Rourke & Anderson 2002, p. 4), thereby fostering more open, authentic discussion among students. Indeed, some research suggests students feel more comfortable expressing their opinions in peer-facilitated discussions (Baran & Correia, 2009; Bull, Greer, McCalla, & Kettel, 2001; Cheung & Hew, 2010; Correia & Davis, 2007; Rourke & Anderson, 2002). Limited evidence suggests students may post longer messages and post messages more frequently (Poole, 2000). However, other studies have shown the quality of peer facilitation can vary widely (Ghadirian & Ayub, 2017) depending upon the skills of the peer facilitators.

Other researchers argue that an instructor-led approach is preferable in many situations (Hew, 2015; Phirangee, Demmans Epp, & Hewitt, 2016b). West (2010) asserts that both instructors and students are responsible for developing the connections that define a community. Students' sense of connectedness and learning are related to instructors having a strong presence, and taking an active role in guiding discourse (Shea, Li, & Pickett, 2006). This perspective is supported by Hew's (2015) study of three different populations taking online courses: full-time undergraduates (n = 39), full-time postgraduate diploma students (n = 65), and practicing professionals in training settings (n = 64). Hew (2015) discovered students in all three groups tended to prefer instructor facilitation to peer facilitation. When asked to explain their preferences, students reported instructors were better at keeping discussions on track, were better positioned to resolve disputes, had better knowledge of relevant information and resources, and were more skilled at reviving discussions when participation began to wane (Hew, 2015). In general, learners had more confidence in the knowledge and the expertise of instructors. Students only preferred peer facilitation in situations where they wanted greater freedom to explore a variety of different perspectives or wanted more say in determining the topics that would be discussed (Hew, 2015).

Summary

The aforementioned research provides a good understanding of how facilitation style and course length may impact online learning. However, there are several notable gaps in the literature. The research comparing learning across course lengths has focused primarily on face-to-face courses. Investigations of facilitation style and online course length have tended to focus on student perceptions rather than behaviors, and the combined influence of course length and facilitation method has not been explicitly explored. In an effort to shed light on these gaps, we posed the following research questions:

- How does student sense of community differ based on online course length and facilitation method?
- How do student behaviors differ based on online course length and facilitation method?

Through an exploration of these questions, we hope to deepen our understanding of how online courses can be designed to enhance student sense of online community.

Methods

This study employed a mixed-methods explanatory design to explore how the length of online courses and the facilitation method used to support student learning interact with respect to student experiences and behaviors. The study used archival data that had been purposively sampled from a larger project exploring students' sense of community in online learning.

In keeping with this study's goal, students' sense of community and student behaviors within an online learning environment (i.e., the PeppeR learning management system) were considered the dependent variables. The independent variables were the facilitation method instructors chose to use in their online course and the number of weeks the course was scheduled to last. In addition to these measures, interview data was used to help explain differences between study conditions.

Participants

Four online graduate courses were selected from those offered at a research-intensive North American university. These seminar-style courses were offered in the same faculty of education and used PeppeR. These courses were purposively sampled to ensure equal representation of short courses, which lasted 6 weeks, and long courses, which lasted a full term (12 weeks). Because archival data was being used, the courses were also selected to ensure equal representation of facilitation methods across course lengths. That is, one long course and one short course employed instructor facilitation to manage student discourse through the online learning environment. The other two courses used peer-facilitation.

There were 67 students registered in these courses: 32 students were enrolled in instructor-facilitated courses and 35 were enrolled in peer-facilitated courses. A similar split was found between short (n = 31) and long (n = 36) courses.

Classroom Community Scale

Rovai's (2002b) classroom community scale (CCS) was used to measure learner sense of community because it is an established and reliable instrument, as indicated by the reported Cronbach's alpha ($\alpha = .93$).

The CCS was distributed near the end of the term to all the students enrolled in participating courses: 64% of students completed the questionnaire. This response rate is well above commonly reported response rates, which range from below 20% (Fowler, 2009) to the typically observed response rate of 33% in higher education contexts (Nully, 2008).

The standard scoring procedures were followed for the CCS as well as its connectedness and learning subscales. For this scale, connectedness refers to "the feelings of the community of students regarding their connectedness, cohesion, spirit, trust, and interdependence" (Rovai, 2002c, p. 325). In other words, connectedness is about students' sense of belonging and feeling comfortable to be an active member because the community accepts them. Learning refers to the "feelings of community members regarding interaction with each other as they pursue the construction of understanding and the degree to which members share values and beliefs concerning the extent to which their educational goals and expectations are being satisfied" (Rovai, 2002c, p. 206-207).

Student scores on each of these scales were then divided by the maximum possible score for that scale to obtain a percentage score. We report these percentages because they are easier to interpret, with higher numbers being better, and provide the full picture. Mean and standard deviation are used to describe student responses since the data was normally distributed. Two-Way ANOVA tests were used to look for differences between groups after checking to see if the data met the necessary assumptions (i.e., normality and equality of variances).

Interviews

Archival interview data from students and instructors were used for this study. Participants were invited via email to take part in one-on-one semi-structured interviews that focused on instructor and student perspectives of their online experiences and the course they had participated in. All instructors and one student from each course were interviewed. Researchers purposefully selected four students (one per online course) in order to go more in-depth with each participant's experiences in and perceptions of online courses (Creswell & Clark, 2011).

The analysis first examined the transcriptions to determine the facilitation method that had been employed in each course. Hew's (2015) definitions were used to determine whether the online course had been instructor- or peer-facilitated. The second analysis examined the transcriptions to explain the patterns found in the quantitative data relating to student behaviors, which provided insight into why students may have behaved in certain ways.

Student Activity Measures: System Logging

In PeppeR, students interact with each other using both notes and private messages. Notes are text-based posts on a class-wide discussion board that can either stand alone or be designated as a reply to an earlier note. Notes generally have a single author, but students can choose to share authorship with others if they like. In some cases, students can post notes on the discussion board that only a select subset of their peers can see. These notes are referred to as private shared notes. In addition to notes, students can send private messages to other people in their class through a messaging system that operates in a fashion similar to email. Unlike notes, which are visible to the entire class, a message is a directed form of communication and it is strictly used for private exchanges.

Each student note and each student message is saved in a time-stamped record in a database. For the current study of student activity, we examined the following note and message measures:

- *Notes per week*: The number of discussion forum posts an author makes each week.
- *Private shared notes by week*: The number of posts the author chooses not to make public, but instead shares with a subset of his or her peers. Those who have access to the note can edit it.

- *Notes re-read per week*: The number of times an author re-visits a note each week. The first view of the note is excluded from this measure regardless of when this view occurred.
- *Edits per note*: The number of times an author revises and saves a note.
- *Words per note*: The average length of an author's notes in number of words.
- *Sentiment*: The mean amount of emotional vocabulary present in an author's notes as determined using Linguistic Inquiry and Word Count (LIWC).
- *Grade level*: The mean Flesch-Kincaid grade level of an author's notes. This represents how much education one needs in order to understand what an author has written.
- *Replies (%)*: The percent of notes written by a student in reply to another note.
- *Likes received per note*: The average number of likes an author's notes received. A like in PeppeR works in a fashion similar to that in Facebook or other social media environments.
- *Likes created per note read*: The proportion of the notes that a learner both read and liked, relative to the total number of notes read.
- *Links created per note*: The number of times an author links from their own notes to other people's notes, relative to the total number of notes the author has written. Links can be thought of as similar to social-media tags.
- *Messages to instructors by week*: The number of private email-like messages sent from a student to the instructor.

Many of the preceding measures have been employed by other studies as measures of student online activity (e.g., Davie, 1988; Guzdial, 1997). These measures are unitized (i.e., measured on a *per-week* or *per-note* basis) to permit more meaningful comparisons between courses of different lengths or sizes.

Since prior research suggests student behaviors vary based on the course facilitation method (Phirangee et al., 2016b) or length (Haythornthwaite, Kazmer, Robins, & Shoemaker, 2006), the log data were analyzed to explore whether student behaviors varied based on these attributes. Mean and standard deviation are used to describe student behaviors. A 2-Way ANOVA was not used to look for group differences because the data did not satisfy all the assumptions upon which this statistical test is based. As a result, the non-parametric equivalent of a t-test, the Mann-Whitney U test, is used to see whether there are differences between groups based on course length or facilitation method. Graphical approaches are then used to investigate whether course length and facilitation method interact for each of the logged behaviors (dependent variables).

Results

Classroom Community Scale

Student responses (see Table 1) to the CCS were reliable ($\alpha = .90$), as were their responses to its connectedness ($\alpha = .88$) and learning subscales ($\alpha = .83$). This reliability allowed for the further analysis of any differences that may have existed based on course characteristics that include the employed facilitation method and the amount of time the course lasted.

When investigating student connectedness as it is manifested through students' sense of social support, the results of a 2-Way ANOVA revealed a main effect of moderate magnitude approaching significance for the facilitation method employed, $F(1,39) = 3.69$, $p = .065$, $\eta^2 = .084$. No significant interaction ($F < 1$) and no main effect of course length, $F(1,39) = 2.31$, $p = .136$, η^2

= .056, were found. This suggests the minimum level of social support that is needed to enable the establishment of a sense of community can develop rapidly if the correct conditions are created.

Course	n	Learning		Connectedness		CCS		Facilitator Type	Term Length
		M	*SD*	*M*	*SD*	*M*	*SD*		
Long_I	15	80.62	10.13	55.83	16.88	68.23	12.95	Instructor	12
Short_P	14	58.90	15.53	40.00	17.00	49.45	13.00	Peer	6
Short_I	17	73.75	14.75	51.58	10.60	62.66	11.39	Instructor	6
Long_P	21	68.58	10.40	49.83	13.43	59.20	10.59	Peer	12

Table 1. CCS and Subscale Scores (%) by Course**,** Facilitator Type**,** and Term Length (Number of Weeks)

Another 2-Way ANOVA was used to determine how students' sense of having their learning supported differed based on course length and facilitation method. This test indicated main effects for facilitation method, $F(1,39) = 12.07$, $p = .001$, $\eta^2 = .236$, and course length, $F(1,39) = 4.57$, $p = .039$, $\eta^2 = .105$. No interaction was found ($F < 1$). Students felt their learning was better supported in instructor-facilitated courses. The facilitation method appears to influence student perceptions more than course length: facilitation method had a large effect size ($\eta^2 > .14$) whereas course length had a moderate effect size ($\eta^2 > .06$). Students in long courses felt their learning was better supported than those in short courses. This may be partly due to their sense of needing interaction to support their learning through exposure to different perspectives and others challenging their ideas. As one student stated,

> That person would be able to validate and help you see through what you're reading and doing and make your learning [pause]. Enrich it. Make it more accessible in the sense that you might be able to deconstruct certain ideas with a group and understand it from different perspectives. You might benefit from an enriched experience because other people would suggest different resources that you haven't heard of if you were just doing it by yourself, and I guess knowing that I have the teacher is very important.

To investigate students' overall sense of the strength of their community, the full CCS was analyzed. The two-way ANOVA revealed similar insight to that obtained from the learning subscale. That is, there was no interaction ($F < 1$) and moderate to large main effects were found for both course length, $F(1,39) = 4.21$, $p = .047$, $\eta^2 = .097$, and facilitation method, $F(1,39) = 8.87$, $p = .005$, $\eta^2 = .185$. Again, a stronger sense of community was felt by those taking instructor-facilitated courses and those enrolled in long courses. If we consider the effect sizes (η^2) of these two factors, we can see facilitation method plays a larger role than course length for both the CCS and the learning subscale.

While course length had less of an influence on student experience than facilitation method, student interviews indicated course length (6 weeks vs. 12 weeks) may have hindered the development of their sense of community by limiting the interactions they have online with their instructor and peers. For instance, one student emphasized it is more difficult to create community in online summer courses because these courses are shorter, and short courses leave too little time to interact with others and build a sense of community: "So, what I'm saying is that a community takes longer to develop sometimes, you know to be created online, especially in the shorter courses, and it doesn't always work for all students, some students won't experience it."

Observed Student Behaviors

The difference in CCS that is attributed to facilitation method, led us to analyze student actions within the online courses from the perspective of the facilitation method used within each course. The descriptive statistics and results of these analyses can be seen in Table 2.

	Instructor-Facilitated		**Peer-Facilitated**		**Mann-Whitney Test**		
Student Activity	*M*	*SD*	*M*	*SD*	*U*	*p*	*r*
Notes per week	4.12	2.59	3.03	1.32	424.50	.089	.07
Private shared notes by week	0.03	0.07	0.10	0.22	521.50	.470	.09
Notes reread per week	12.79	7.79	9.30	7.26	402.50	.048	.25
Edits per note	0.23	0.42	0.26	0.33	491.00	.382	.22
Words per note	237.6	84.57	197.0	52.53	391.00	.034	.25
Sentiment	6.28	0.13	6.50	0.13	123.00	< .001	.69
Grade level	11.82	1.20	10.67	1.12	282.50	< .001	.44
Replies (%)	48.73	25.35	77.22	12.85	163.50	< .001	.63
Likes received per note	0.14	0.14	0.62	0.29	65.50	< .001	.78
Likes created per note read	0.015	0.034	0.021	0.028	402.50	.038	.25
Links created per note	0.002	0.009	0.01	0.04	514.00	.277	.13
Messages to instructor by week	0.16	0.24	0.30	0.43	383.00	.022	.36

Table 2. Descriptive and Inferential Statistics of Learner Use of the PeppeR OLE by Facilitation Method

From Table 2, we can see many differences in student activity that are associated with the facilitation method employed in the studied online courses. These differences (Mann-Whitney Test columns) varied from being relatively small ($r < .3$), as was the case for note rereading and links created per note read, to large ($r > .5$), as was the case for likes received per note and replies. Those in instructor-facilitated courses created more content (words per note) and that content tended to be more academic (i.e., had a higher grade level) than the content created by those in peer-facilitated courses. In contrast, students in peer-facilitated courses performed more activities that might be associated with creating a sense of connectedness: they expressed more sentiment, liked more of the notes they read, and replied to a greater proportion of the notes they read. However, the higher levels of engagement in activities that should have supported the development of a sense of community did not mean students' learning was sufficiently supported. This lack of support for students in peer-facilitated courses was indicated through the learning subscale of the CCS (see Table 1) and their communicating more with their instructor through private channels (messages to instructor by week).

Table 3 describes student behaviors based on the length of their course. It also shows the results of inferential statistics comparing long to short courses. The small to moderate ($r < .5$) differences associated with course length have a smaller magnitude than those associated with facilitation method, where some behaviors differed by a factor of more than four (e.g., likes received per note).

	Short		Long		Mann-Whitney Test		
Student Activity	*M*	*SD*	*M*	*SD*	*U*	*p*	*r*
Notes per week	3.6	1.93	3.5	2.23	517.00	.606	.06
Private shared notes by week	0.13	0.23	0.01	0.028	402.00	.003	.36
Notes reread per week	9.2	5.60	10.8	7.92	528.50	.711	.05
Edits per note	0.3	0.44	0.2	0.30	423.00	.086	.21
Words per note	241.4	80.11	194.8	57.17	360.00	.013	.30
Sentiment	6.4	0.18	6.4	0.16	530.00	.725	.04
Grade level	11.6	1.35	10.9	1.13	373.50	.020	.28
Replies (%)	47.9	23.05	77.2	15.94	121.50	< .001	.25
Likes received per note	0.5	0.46	0.3	0.16	538.00	.801	.03
Likes created per note read	0.1	0.17	0.3	0.37	299.00	.001	.42
Links created per note	0.002	0.009	0.012	0.042	515.50	.314	.12
Messages to instructor by week	0.3	0.46	0.2	0.17	494.50	.412	.10

Table 3. Descriptive and Inferential Statistics of Learner Use of the PeppeR OLE by Course Length

The differences in student behavior found based on course length are not perfectly aligned with those found when analyzing the data from the perspective of the facilitation method employed. For instance, those taking short courses wrote moderately more private shared notes, but no difference was detected when analyzing the data by facilitation method.

Given the dissimilarities in between-group differences that are found across Table 2 and Table 3, it is likely course length and facilitation method interact with one another. To consider the potential interplay between course length and facilitation method, we graph student behaviors by these factors to better understand their roles. Only behaviors where differences were found for one or both factors were analyzed in this manner.

We begin with the linguistic features of student notes. By mentally extending the lines in Figure 1 and Figure 2, it becomes apparent the slopes of these lines will result in their crossing. This indicates the length of student posts (Figure 1) is influenced by an interaction between course length and facilitation method. Similarly, the Flesch-Kincaid grade-level of student posts (Figure 2) is influenced by some combination of facilitation method and course length.

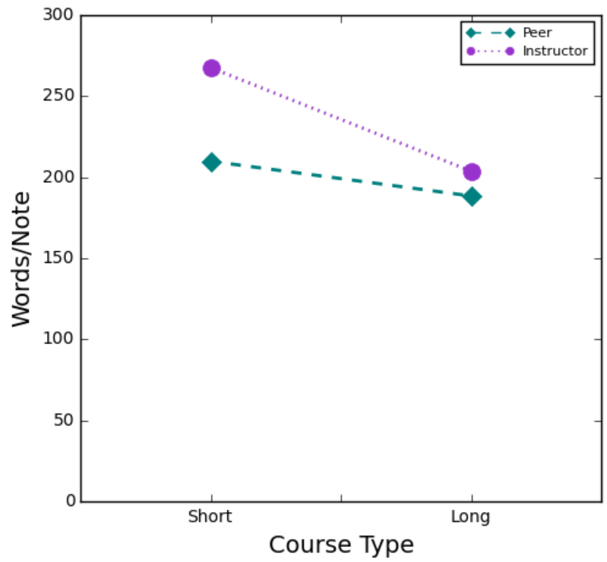

Figure 1. The length of student notes by facilitation method and course type

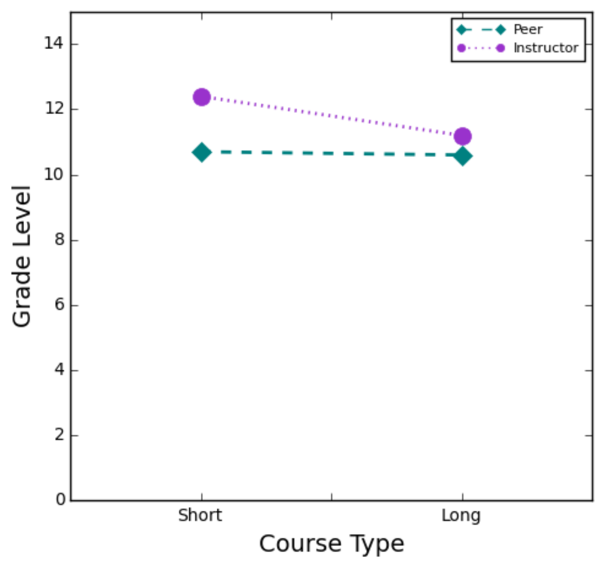

Figure 2. The average grade-level of the writing in student posts

In contrast, the horizontal lines in Figure 3 indicate the higher level of sentiment that is found in students posts from peer-facilitated courses can be attributed to the facilitation method employed, with course length seeming to have no influence on the sentiment expressed in student posts.

Student reading habits (Figure 4), like the grade-level and length of their notes, seemed to be linked to both course facilitation method and course length. The amount of re-reading students performed each week appears to be directly linked to the facilitation method being used, with those from instructor-facilitated courses re-reading their classmates' notes more across course lengths.

In peer-facilitated courses, student re-reading activities were additionally linked to course length, where they paid more attention to their classmates' notes in longer courses.

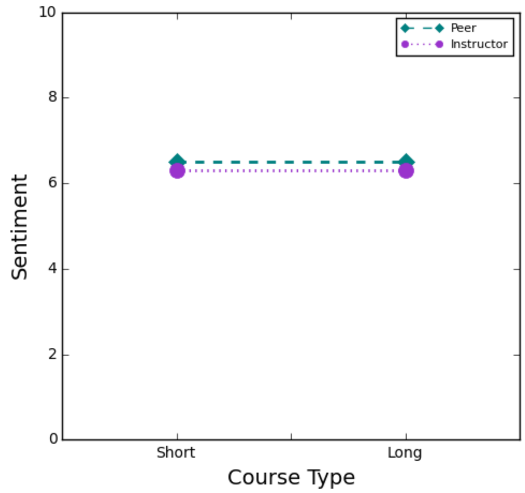

Figure 3. The average sentiment level of student posts

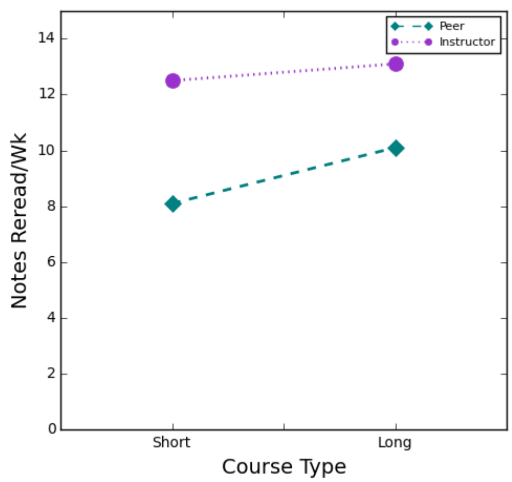

Figure 4. The number of notes students re-read each week

Figure 5 indicates the differences in student reply habits are directly tied to the facilitation method and the length of the course. From this chart, we can see there is a tendency for a smaller proportion of notes to receive replies in short courses. The same is true of instructor-facilitated courses. However, the difference that is tied to facilitation method can be attributed to a feature of how these instructors enacted peer-facilitation: they required students to reply to anyone who had replied to one of their notes. This requirement made the percent of notes replied to artificially high for the peer-facilitated group, especially when considering that specific posting requirements (e.g., number of posts or an obligation to reply to posts in a discussion the student started) were not made explicit for those taking instructor-facilitated courses.

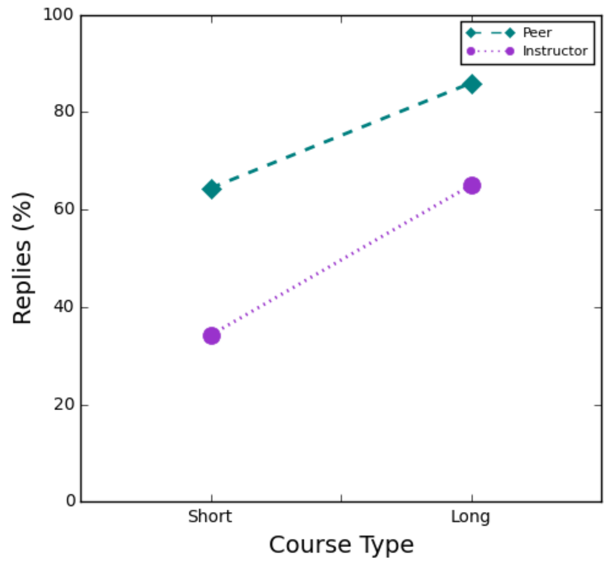

Figure 5. Student replies to their peers as the percent of notes they wrote in response to another

Moving from the above public communication sphere to more private approaches to communicating with instructors and fellow students, the complicated nature of how course length and facilitation method interact becomes apparent. Figure 6 shows how strongly private requests for instructor support are linked to facilitation method in short courses. As one student reported,

> If you had questions, he [the instructor] said you could post it on PeppeR which he prefers because others can see it too. But he also said you can email him because some people might be too embarrassed to post or ask their questions publicly. So, he'll write "I've been asked…" and this will be posted in PeppeR without saying who asked the question.

This relationship between course length and facilitation method was absent in long courses, where student requests for instructor support through email-like messages were similar across facilitation methods. This similarity suggests other methods for obtaining support were available in longer courses or students felt less urgency. Student reports of the support mechanisms employed by instructors suggest both factors may have played a role since they knew when they could obtain additional support:

> With the phone calls, I felt it was really helpful and she would say these calls were not mandatory and if you don't have any questions feel free to not log in. It's sort of, if you had a question she made herself available. But I called in every time just because I liked to hear what she had to say.

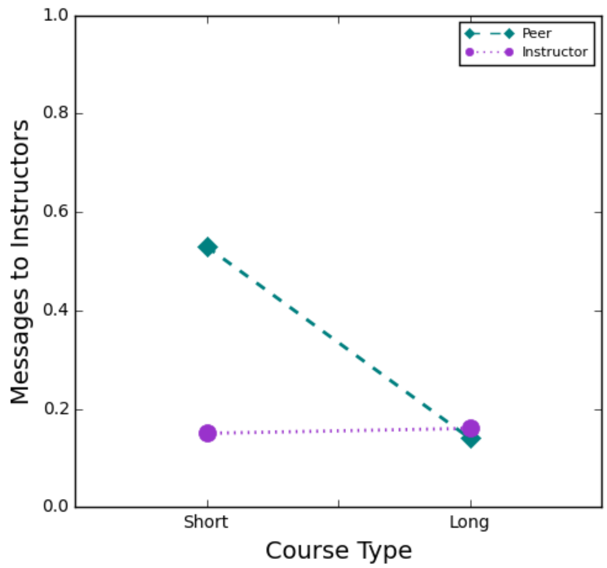

Figure 6. The number of email-like messages students sent to instructors each week

Private communication among students also seems to be influenced by both course length and facilitation method (Figure 7). This type of communication, as seen through students' use of private shared notes, was more common in peer-facilitated courses even though the instructor's lack of involvement might suggest this type of backchannel communication is unnecessary. During the interviews, students indicated they used private channels, such as chat and messaging, for coordinating "assignments and for revolt [laugh]. I'm a distance student living in Montreal, but if I was living closer to the campus I probably would have said 'Hey. Let's meet up. Go for some coffee'." Essentially, students used private communication to deal with problems when they did not want the whole group and instructor to be aware of what was being discussed. Concern over excluding classmates from learning opportunities was also why students resisted the use of other forms of private communication (e.g., messaging and chat tools): "I guess I really wasn't sure if I should. Like would my conversation with that peer take away from the course, maybe our conversation would have been valid for our course and could have helped others." Unlike student sending of messages to instructors, differences in their use of private shared notes across facilitation methods persisted for long courses even though these differences were smaller. This pattern in message sending indicates course length cannot fully close the gap between facilitation methods for this communication behavior.

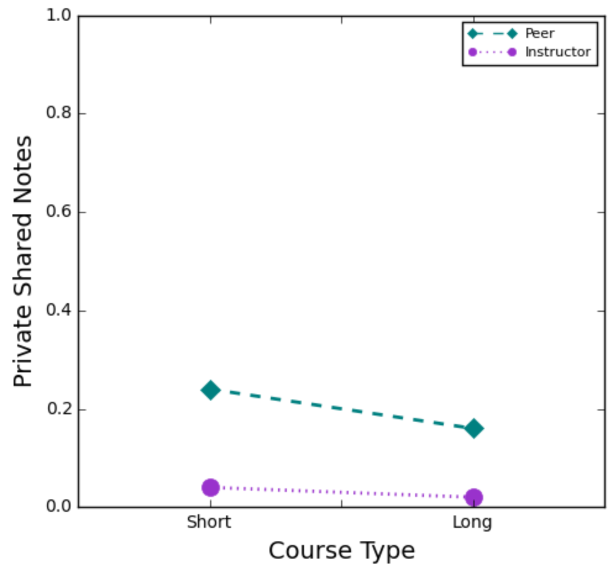

Figure 7. The number of private shared notes students posted

Going beyond the targeted communication that is enabled through private shared notes, use of the like feature holds the potential to support community development. However, like many of the other behavioral measures, course length and facilitation method interact with respect to student liking of others' notes (Figure 8). Those in peer-facilitated courses liked one another's notes less in long courses than they did in short courses. This change in liking behaviors shows how time gives the opportunity for other factors to influence student activities, including whether students provide explicit support to their peers. The more level use of liking by those in instructor-facilitated courses implies instructor involvement encouraged more consistency in student behaviors across conditions.

More dramatic differences are seen in the number of likes students from peer-facilitated courses received (Figure 9) between long and short courses. They also received more likes per note posted than those from instructor-facilitated courses did even though this gap is considerably smaller for long courses. For those who took instructor-facilitated courses, we see a substantial increase in the number of likes they received between short and long courses. This difference suggests students may need time to develop and appreciate their classmates' work or the support provided by those same peers.

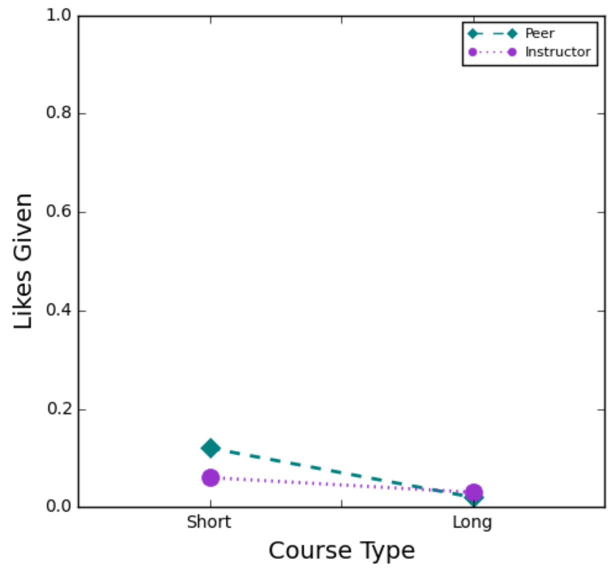

Figure 8. The number of notes students read and liked

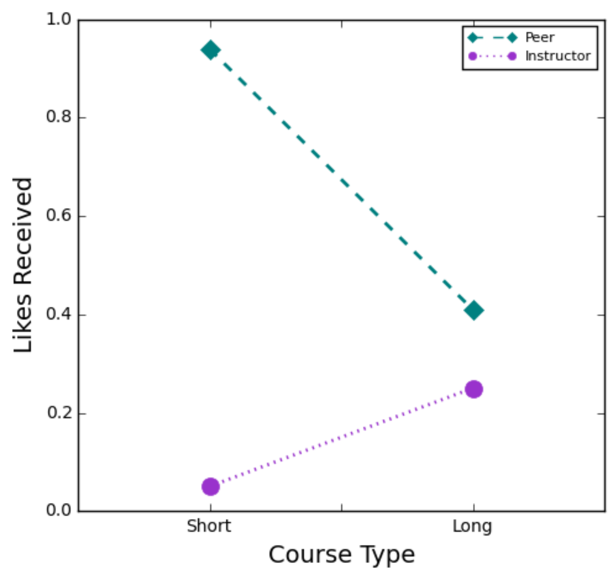

Figure 9. The number of likes students received for each note they posted

Summary

The preceding research identified several relationships among course length, facilitation method, and students' sense of community. Overall, a stronger sense of community is associated with long courses and the use of instructor-facilitation. For the most part, students' sense of community is stronger because they feel their learning is better supported (as opposed to feeling more connected to others). Collectively, these findings suggest students' sense of community is stronger in long courses and in courses where instructor facilitation is used.

A deeper look at the facilitation method used revealed student behaviors differed across instructor-facilitated and peer-facilitated courses. Students in instructor-facilitated courses wrote longer notes, wrote at a higher grade level, re-read more notes, expressed less sentiment, and received fewer likes from their classmates. Students in long courses behaved differently than students in short courses in many of the same ways as those observed based on facilitation method. Students in long courses wrote longer notes, wrote at a higher grade level, and gave fewer likes to their classmates. However, there were notable differences (e.g., students in long courses wrote proportionately fewer private shared notes).

Follow-up analyses revealed interactions between facilitation method and course length across the following measures: length of student posts, the average grade-level of student writing, the mean number of notes re-read, the percentage of replies, the number of private messages to instructors, and their use of the like feature. The cause of these interactions is unclear, but it is apparent that both the length of a course and how it is facilitated influenced student behaviors.

Discussion

The interactions between course length and facilitation method and their moderating effect on several learner behaviors indicate the importance of jointly investigating these two potential influences on student behavior. However, the majority of prior work has not considered the joint relationship of these variables with student behaviors in online learning environments. For this reason, we discuss our results in light of research considering either facilitation method or course length. Where possible, we also compare findings from this study to those that considered both factors.

When considering facilitation method, several student behaviors were consistent with prior work. Similar to the results reported by Phirangee and colleagues (2016a), those taking instructor-facilitated courses were observed re-reading their classmates' notes more than those in peer-facilitated courses. This activity is consistent with the types of online listening practices that are associated with discourse that supports collaborative learning (Wise, Hausknecht, & Zhao, 2014). The additional exhibition of a greater sense of community among those in instructor-facilitated courses is consistent with prior results showing the strong relationship between behaviors that are indicative of teaching presence, such as instructor involvement in the forums, and students' sense of community (Shea, Li, & Pickett, 2006). This type of instructor involvement is argued to promote collaboration (Agosto, Copeland, & Zach, 2013), which can lead students to feel more supported and like they belong to a learning community.

The higher use of sentiment, lower grade level, higher response rate, greater use of liking, and higher number of messages sent to instructors by students from peer-facilitated courses were also consistent with Phirangee et al.'s (2016a) results. Although students seem to support their peers (i.e., response rate and liking), the lower grade level and higher number of messages to the instructor seem to indicate that students need the instructor's guidance, input, and support in understanding and dissecting the content. This aligns with Hew's (2015) findings of students viewing the instructors as the "subject matter experts" who are able to keep discussions on topic, ensure equity, and guide learning more effectively.

Several student behaviors were inconsistent with prior results from studies investigating the relationship between facilitation method and student behaviors (Phirangee et al., 2016b). These inconsistencies (e.g., student posting and editing habits or their linking to others' posts) are partially attributable to limitations in the study design. The effect sizes associated with these behaviors were too small for differences to be detected given the sample size. However, this is not the only reason differences were not detected. As can be seen by Figure 7 and the private shared notes row in Table 2, course length also played a role in muddling the signal that can be attributed to facilitation method for some of these non-results, thus lending weight to the argument that these variables need to be investigated together if we are to better understand online learning.

It appears course length may have a compensatory influence on some student behaviors. From Figure 4, we can see that both peer and instructor facilitation seem to follow similar paths, with students in both courses rereading their classmates' posts more when taking longer courses. A similar pattern is seen for student replies (Figure 5). However, the slopes of the lines indicate course length may have a stronger influence on student reply habits when the instructor facilitates the course. In contrast, course length seems to have a stronger influence on student rereading habits in peer-facilitated courses, where they may not feel they have the time to pay as careful attention to their peers' posts because they are busy co-managing a discussion and need the first part of the course to coordinate and manage this peer-facilitation process. This difference is further supported by longitudinal research into computer science course forums where "participation of the instructor and of paid tutors ... is critical at the outset of a course to stimulate usage of the system" (Vassileva et al., 2001, p. 419).

Consistent with the theory that time may help compensate for the weaknesses of one approach, several behaviors went from differing for a particular course length and facilitation combination to being the same or aligning for another combination. For example, student sending of messages to instructors is the same across facilitation methods for long courses but three times higher for short peer-facilitated courses (Figure 6). In contrast, student interaction with instructors via the messaging feature was consistent across course lengths for those in instructor-facilitated courses, suggesting these students had more consistent support needs likely because the instructors provided additional support through the forum. Other behavioral alignment, like that from Figure 6, was observed in student posts. The length of notes from both peer and instructor facilitation decrease from short to long courses (Figure 1), but the steeper slope of the instructor-facilitation condition shows how student notes became shorter to the point where those written in long instructor-facilitated courses were of comparable length to those from short peer-facilitated courses. The grade level of student writing (Figure 2) exhibited a similar pattern for instructor facilitation: long instructor facilitation was comparable to long peer facilitation, but short courses differed between the two facilitation methods. In this case, student behaviors were consistent across course lengths for peer-facilitation. The above evidence suggests course length and facilitation method; both influence certain behaviors which need to be accounted for going forward.

These behavioral patterns suggest it is possible to indirectly encourage particular interactions by selecting the combination of course length and facilitation method that seems to best promote desired behaviors. Encouraging and enabling particular behaviors, such as group awareness and recognition for one's contributions, can help improve student learning experiences and help them become a learning community (Brooks, Panesar, & Greer, 2006; Vassileva, McCalla, & Greer, 2016). For instance, the collected data revealed sentiment was only influenced by facilitation method and not by course length, thus highlighting that some interactions are either encouraged or discouraged by the instructor. According to Phirangee and Hewitt (2016), students strategically used specific cues such as emoticons, punctuation, and the like button "to express their feelings about the content and peer feedback, as well as to project a particular emotional tone in their online notes" (p.82). Within the larger project from which this data was drawn, these students admitted to feeling conflicted about using such cues in an academic setting, even though it was helpful to their learning and online communication (Phirangee & Hewitt, 2016). They also likely would have stopped using these explicit signals of their feelings if the instructor had communicated they were perceived as inappropriate or unacademic. Therefore, sentiment, the expression of emotion, and other behaviors seem to be substantively influenced by instructor behavior.

These and other behaviors are known to have relationships with student perceptions of their sense of community and the course facilitation method (Phirangee et al., 2016b). Differences found based on course length expand this understanding and enable the more detailed exploration of student sense of community based on course length and facilitation method. From the results of the classroom community scale, it would appear sufficient group awareness can be created by both facilitation methods regardless of course length since all groups sensed similar levels of social connectedness. This result conflicts with prior reports of an artefact-based measure of group connectedness where those in short courses exhibited greater cohesion than those in long courses (Akyol, Vaughan, & Garrison, 2011). However, the lack of difference in students' sense of connectedness alongside the differences in the learning support they felt they received indicates enough of a social connection existed to enable their engagement in the online learning community. Unlike students' sense of social connectedness, the perception that their learning was supported, and their overall sense of community differed by condition. Like the results of over a decade of research into computer science course forums (Vassileva et al., 2016), instructor facilitation was associated with higher levels of learning support and a greater sense of being engaged in a learning community. These findings were also consistent with a recent meta-analysis (Richardson et al., 2017): course length was associated with students' sense of learning support and overall sense of community. In our case, longer courses received higher scores than shorter courses.

Limitations

The instrument used to measure student perceptions is widely used and reliable, but there is limited evidence of the validity of its subscales (Barnard-Brak & Shiu, 2010). This concern is related to the factor loadings of sub-scale items. However, this scale has been used to measure the level of community development within groups of adult learners (Shea et al., 2006; Rovai, 2002c; Graff, 2006) and teacher-education students (Overbaugh & Lin, 2006; Dawson, 2006), showing its applicability in spite of its shortcomings.

This small study analyses archival data to gain insight into student learning. The sampling procedures used fail to guarantee the sample was representative of the population, which limits the generalizability of findings. That said, the data was carefully collected and provides evidence for the interaction of two variables that can now be studied using an experimental design to reduce the influence of the confounds that can sometimes arise from exploratory work that uses historical data.

Conclusion

Many instructors are familiar with the interactive behaviors that meet learning objectives and support student-learning needs in a classroom-based course. However, teaching online may be unfamiliar territory for some instructors who struggle with choosing task designs to effectively support online learners since teaching approaches used in classroom-based courses may be less effective in online environments (Horspool & Lange, 2012). If instructors want to foster a sense of community, they need to understand which interactive behaviors are effective across all course lengths and facilitation methods.

To contribute to this understanding, our study introduced course length as a variable influencing student sense of community alongside more traditionally studied variables, including facilitation method and student behaviors. Previous work has considered these factors separately and has described courses by the term in which they were offered (e.g., Shea et al., 2006; Shackelford & Maxwell, 2012; Dueber & Misanchuk, 2001; Brown, 2001), student activities (e.g., Drouin, 2008), or facilitation method (e.g., Phirangee et al., 2016a, b). Our findings build on this work by detailing how course length and facilitation method interact, suggesting their joint relationship to several student communication behaviors that include students' reading of classmates' posts, use of private forms of communication, and propensity to respond to their classmates' posts. Our findings build on Phirangee et al. (2016a, b) work by examining the role course length and facilitation method plays in creating a community online. This study confirms students' belief in the critical role instructors play in developing effective communities online. More specifically, students in instructor-facilitated online courses had a higher sense of community and felt their learning was better supported when compared against those in peer-facilitated online courses. These findings further explain the role of course length, which is weaker than that of facilitation method. In this case, greater course lengths were associated with a higher sense of community and learning support. Thus, suggesting connectedness can develop quickly but learning support requires more time and instructor effort. Consistent with our findings, Richardson et al.'s meta-analysis (2017) found social presence and student satisfaction had a weaker link in short courses, whereas social presence and perceived learning had a stronger relationship in longer courses.

Therefore, we argue the adoption of instructor facilitation is likely to better support student learning and their sense of community, especially in short courses. Knowing students' sense of community is influenced by both the facilitation method used and course length, with the facilitation method playing a larger role, is important for instructors when designing their courses and supporting students in an online context because this can allow them to choose an approach that better promotes the student activities they wish to encourage.

References

Agosto, D. E., Copeland, A. J., & Zach, L. (2013). Testing the benefits of blended education: Using social technology to foster collaboration and knowledge sharing in face-to-face LIS courses. *Journal of Education for Library and Information Science*, *54*(2), 94.

Akyol, Z., Vaughan, N., & Garrison, D. R. (2011). The impact of course duration on the development of a community of inquiry. *Interactive Learning Environments*, *19*(3), 231–246. https://doi.org/10.1080/10494820902809147

Anastasi, J.S. (2007). Full semester and abbreviated summer courses: An evaluation of student performance. *Teaching of Psychology*, *34*(1), 19-22. https://doi.org/10.1080/00986280709336643

Arend, B. (2009). Encouraging critical thinking in online threaded discussions. *The Journal of Educators Online, 6*(1), 1-23.

Austin, A.M. & Gustafson, L. (2006). Impact of course length on student learning. *The Journal of Economics and Finance Education, 5*(1), 26-37.

Baran, E., & Correia, A-P. (2009). Student-led facilitation strategies in online discussions. *Distance Education, 30*(3), 339–361. http://dx.doi.org/10.1080/01587910903236510

Barnard-Brak, L., & Shiu, W. (2010). Classroom community scale in the blended learning environment: A psychometric review. *International Journal on E-Learning*, *9*(3), 303-311.

Belcher, A., Hall, B., Kelley, K., & Pressey, K. (2015). An analysis of faculty promotion of critical thinking and peer interaction within threaded discussions. *Online Learning*, 19 (4), 37–44. http://dx.doi.org/10.24059/olj.v19i4.544

Brooks, C., Panesar, R., & Greer, J. (2006). Awareness and collaboration in the iHelp courses content management system. In W. Nejdl & K. Tochtermann (Eds.), *Innovative Approaches for Learning and Knowledge Sharing* (pp. 34–44). Springer Berlin Heidelberg. https://doi.org/10.1007/11876663_5

Brown, R. E. (2001). The process of community-building in distance learning classes. *Journal of Asynchronous Learning Networks*, *5*(2), 18-35.

Bull, S., Greer, J. E., McCalla, G. I., & Kettel, L. (2001). Help-seeking in an asynchronous help forum. In Proceedings of Workshop on Help Provision and Help Seeking in Interactive Learning Environments of the International Conference on Artificial Intelligence in Education (AIED). San Antonio, TX, USA. Retrieved from http://users.sussex.ac.uk/~bend/aied2001/bull.pdf

Cheung, W. S., & Hew, K. F. (2010). Asynchronous online discussion: instructor facilitation vs. peer facilitation. In C.H. Steel, M.J. Keppell, P. Gerbic & S. Housego (Eds.), *Curriculum, technology & transformation for an unknown future. Proceedings ASCILITE*. Sydney, Australia (pp.179-183). Retrieved from https://repository.nie.edu.sg/bitstream/10497/4658/1/ChuengWS_HewKF_2010_a.pdf

Conrad, D. (2005). Building and maintaining community in cohort-based online learning. *Journal of Distance Education*, *20*(1), 1–20.

Correia, A. P., & Baran, E. (2010). Lessons learned on facilitating asynchronous discussions for online learning. *Educação, Formação & Tecnologias-ISSN 1646-933X*, *3*(1), 59-67.

Correia, A. P., & Davis, N. E. (2007). The design of collaboration in the virtual classroom. In M. Simonson (Ed.), *30th Annual Proceedings of Selected Papers on the Practice of Educational Communications and Technology* (pp. 84–87). Bloomington: Association for Educational Communications and Technology. Retrieved from http://www.aect.org/pdf/proceedings07/2007I/07_12.pdf

Creswell, J. W., & Clark, V. L. P. (2011). *Designing and conducting mixed methods research*. Thousand Oaks, CA: Sage Publications.

Daniel, E. L. 2000. A review of time-shortened courses across disciplines. *College Student Journal 34*(2), 298-306.

Davie, L. (1988). Facilitating adult learning through computer-mediated distance education. *Journal of Distance Education 3*(2), 55-69.

Dawson, S. (2006). A study of the relationship between student communication interaction and sense of community. *The Internet and Higher Education*, *9*(3), 153-162.

Drouin, M. A. (2008). The relationship between students' perceived sense of community and satisfaction, achievement, and retention in an online course. *Quarterly Review of Distance Education*, *9*, 267–284.

Dueber, B. & Misanchuk, M, (2001). Sense of community in a distance education Course. Paper presented at the Mid South Instructional Technology Conference, 8-10 April, Murfreesboro, TN. [verified 17 Qct 2006] http://bill.dueber.com/ dueber-misanchuk.pdf

Ferguson, J. M., & DeFelice, A. E. (2010). Length of online course and student satisfaction, perceived learning, and academic performance. *The International Review of Research in Open and Distributed Learning*, *11*(2), 73-84. http://dx.doi.org/10.19173/irrodl.v11i2.772

Fowler, F. J. (2009). *Survey research methods* (4th ed). Thousand Oaks: Sage Publications.

Graff, M. (2006). The importance of online community in student academic performance. *The Electronic Journal of E-Learning*, *4*(2), 127-132.

Ghadirian, H., & Ayub, A. F. M. (2017). Peer moderation of asynchronous online discussions: An exploratory study of peer e-moderating behaviour. *Australasian Journal of Educational Technology*, *33*(1), 1–18. https://doi.org/10.14742/ajet.2882

Guzdial, M. (1997). Information ecology of collaborations in educational settings: Influence of tool. In R. Hall, N. Miyake, & N. Enyedy (Eds.), *Computer-Supported Collaborative Learning* (pp. 83-90). Toronto, Ontario, Canada.

Harting, K., & Erthal, M. J. (2005). History of distance learning. *Information Technology Learning and Performance Journal, 23*(1), 35.

Haythornthwaite, C., Kazmer, M. M., Robins, J., & Shoemaker, S. (2006). Community Development Among Distance Learners: Temporal and Technological Dimensions. *Journal of Computer-Mediated Communication*, *6*(1), 0–0. http://doi.org/10.1111/j.1083-6101.2000.tb00114.x

Hew, K. F. (2015). Student perceptions of peer versus instructor facilitation of asynchronous online discussions: further findings from three cases. *Instructional Science*, *43*(1), 19-38. https://doi.org/10.1007/s11251-014-9329-2

Hewitt, J. (2005). Toward an understanding of how threads die in asynchronous computer conferences. *Journal of the Learning Sciences, 14(*4), 567-589. http://dx.doi.org/10.1207/s15327809jls1404_4

Hewitt, J., & Brett, C. (2007). The relationship between class size and online activity patterns in asynchronous computer conferencing environments. *Computers & Education, 49,* 1258-1271. https://doi.org/10.1016/j.compedu.2006.02.001

Hirshhorn, R. (2011). Assessing the economic impact of copyright reform in the area of technology-enhanced learning. Retrieved from http://www.ic.gc.ca/eic/site/ippd-dppi.nsf/eng/h_ip01074.html

Horspool, A., & Lange, C. (2012). Applying the scholarship of teaching and learning: student perceptions, behaviours and success online and face-to-face. *Assessment & Evaluation in Higher Education*, *37*(1), 73-88. http://dx.doi.org/10.1080/02602938.2010.496532

Hulon, S. (2013). Face-to-face discussions versus online threaded discussions: Can we have the best of both worlds? In R. McBride & M. Searson (Eds.), *Proceedings of Society for Information Technology & Teacher Education International Conference* (pp. 577-582). Chesapeake, VA: Association for the Advancement of Computing in Education.

Liu, X., Magjuka, R. J., Bonk, C. J., & Lee, S. (2007). Does sense of community matter? *Quarterly Review of Distance Education*, *8*, 9–24.

MacKnight, C. B. (2000). Teaching critical thinking through online discussion. *Educause Quarterly, 4*, 38−41

Nully, D. D. (2008). The adequacy of response rates to online and paper surveys: What can be done? *Assessment & Evaluation in Higher Education*, 33(3), 301–314. http://dx.doi.org/10.1080/02602930701293231

Ouzts, K. (2006). Sense of community in online courses. *Quarterly Review of Distance Education*, *7*, 285–296.

Overbaugh, R. C., & Lin, S. (2006). Student characteristics, sense of community, and cognitive achievement in web-based and lab-based learning environments. *Journal of Research on Technology in Education*, *39*(2), 205-223.

Palloff, R. M., & Pratt, K. (2007). *Building online learning communities: Effective strategies for the virtual classroom*. San Francisco, CA: John Wiley & Sons.

Phirangee, K., Demmans Epp, C., & Hewitt, J. (2016a). Exploring how peer and instructor facilitation relates to students' activity patterns in online learning communities. In *American Educational Research Association (AERA) Annual Meeting*. Washington, D.C.: AERA.

Phirangee, K., Demmans Epp, C., & Hewitt, J. (2016b). Exploring the relationships between facilitation methods, students' sense of community and their online behaviours. *Special Issue on Online Learning Analytics. Online Learning Journal*, *20*(2). http://dx.doi.org/10.24059/olj.v20i2.775

Phirangee, K. & Hewitt, J. (2016). Loving This Dialogue!!!! J: Expressing Emotion Through the Strategic Manipulation of Limited Nonverbal Cues in Online Learning Environments. In S. Tettegah and M. McCreery (Eds.), *Emotions, Technology, and Learning* (vol. 1). New York: Elsevier, 69-85. https://doi.org/10.1016/B978-0-12-800649-8.00010-9

Poole, D.M. (2000). Student participation in a discussion-oriented online course: A case study. *Journal of Research on Computing in Education, 33*(2), 162 – 177

Richardson, V. (2003). Constructive pedagogy. *Teachers College Record, 105*(9), 1623- 1640

Richardson, J. C., Maeda, Y., Lv, J., & Caskurlu, S. (2017). Social presence in relation to students' satisfaction and learning in the online environment: A meta-analysis. *Computers in Human Behavior*, *71*, 402–417. https://doi.org/10.1016/j.chb.2017.02.001

Rourke, L., & Anderson, T. (2002). Using peer teams to lead online discussions. *Journal of interactive media in education*, *2002*(1). Retrieved from http://jime.open.ac.uk/articles/10.5334/2002-1/

Rovai, A. P. (2002a). Building sense of community at a distance. *The International Review of Research in Open and Distance Learning*, 3(1), 1-16

Rovai, A. P. (2002b). Development of an instrument to measure classroom community. *The Internet and Higher Education*, *5*(3), 197–211. https://doi.org/10.1016/S1096-7516(02)00102-1

Rovai, A. P. (2002c). Sense of community, perceived cognitive learning, and persistence in asynchronous learning networks. *The Internet and Higher Education*, *5*(4), 319-332.

Rovai, A. P. (2007). Facilitating online discussions effectively. *The Internet and Higher Education 10*, 77–88. https://doi.org/10.1016/j.iheduc.2006.10.001

Seamon, M. (2004). Short and long-term differences in instructional effectiveness between intensive and semester-length courses. *Teachers College Record, 106*(4), 852-874.

Scott, P. A. 2003. Attributes of high-quality intensive courses. *New Directions for Adult and Continuing Education*, *2003*(97), 29–38. https://doi.org/10.1002/ace.86

Shackelford, J. L., & Maxwell, M. (2012). Sense of community in graduate online education: Contribution of learner to learner interaction. *International Review of Research in Open & Distance Learning, 13*(4), 228-249.

Shea, P., Li, C. S., & Pickett, A. (2006). A study of teaching presence and student sense of learning community in fully online and web-enhanced college courses. *The Internet and Higher Education*, *9*(3), 175-190. https://doi.org/10.1016/j.iheduc.2006.06.005

Song, L., & McNary, S.W. (2011). Understanding students' online interaction: Analysis of discussion board postings. *Journal of Interactive Online Learning, 19*(1), 1-14.

Swan, K. (2004). Learning online: current research on issues of interface, teaching presence and learner characteristics. In J. Bourne & J. C. Moore (Eds.) *Elements of Quality Online Education, Into the Mainstream*. Needham, MA: Sloan Center for Online Education, 63-79.

Thompson, T. L., & MacDonald, C. J. (2005). Community building, emergent design and expecting the unexpected: Creating a quality elearning experience. *Internet and Higher Education, 8*(3), 233−249. https://doi.org/10.1016/j.iheduc.2005.06.004

Vassileva, J., Deters, R., Greer, J., McCalla, G., Bull, S., & Kettel, L. (2001). Lessons Learned in Deploying a Multi-Agent Learning Support System: The I-Help Experience. In J. D. Moore, C. L. Redfield, & W. L. Johnson (Eds.), *International Conference on Artificial Intelligence in Education (AIED)* (pp. 410–421). San Antonio, TX, USA: IOS Press. Retrieved from http://publicat.bham.ac.uk/7565/

Vassileva, J., McCalla, G. I., & Greer, J. E. (2016). From small seeds grow fruitful trees: How the PHelpS peer help system stimulated a diverse and innovative research agenda over 15 years. *International Journal of Artificial Intelligence in Education*, *26*(1), 431–447. https://doi.org/10.1007/s40593-015-0073-9

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Cambridge, MA, USA: Harvard University Press.

West, R. E. (2010). A student's guide to strengthening an online community. *TechTrends*, *54*(5), 69

Wise, A. F., & Chiu, M. M. (2011). Analyzing temporal patterns of knowledge construction in a role-based online discussion. *Computer-Supported Collaborative Learning, 6*, 445–470. https://doi.org/10.1007/s11412-011-9120-1

Wise, A. F., Hausknecht, S. N., & Zhao, Y. (2014). Attending to others' posts in asynchronous discussions: Learners' online "listening" and its relationship to speaking. *International Journal of Computer-Supported Collaborative Learning*, *9*(2), 185–209. https://doi.org/10.1007/s11412-014-9192-9

Self-Reflection and Math Performance in an Online Learning Environment

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Abstract

According to recent reports, K-12 full-time virtual school students have shown lower performance in math than their counterparts in brick-and-mortar schools. However, research is lacking in what kind of programmatic interventions virtual schools might be particularly well-suited to provide to improve math performance. Engaging students in self-reflection is a potentially promising pedagogical approach for supporting math learning. Nonetheless, it is unclear how models for math learning in brick and mortar classrooms translate in an online learning environment. The purpose of this study was to (a) analyze assessment data from virtual schools to explore the association between self-reflection and math performance, (b) compare the patterns found in student self-reflection across elementary, middle, and high school levels, and (c) examine whether providing opportunities for self-reflection had positive impact on math performance in an online learning environment.

In this study, the self-reflection assessments were developed and administered multiple times within several math courses during the 2014-15 school year. These assessments included 4-7 questions that asked students to reflect on their understanding of the knowledge and skills they learned in the preceding lessons and units. Using these assessments, multiple constructs and indicators were measured, which included confidence about the topic knowledge/understanding, general feelings towards math, accuracy of self-judgment against actual test performance, and frequency of self-reflection. Through a series of three retrospective studies, data were collected from full-time virtual school students who took three math courses (one elementary, one middle, and one high school math course) in eight virtual schools in the United States during the 2013-14 and 2014-15 school years. The results showed that (a) participation in self-reflection varied by grade, unit test performance level, and course/topic difficulty; (b) more frequent participation in self-reflection and higher self-confidence level were associated with higher final course performance; and (c) self-reflection, as was implemented here, showed limited impact for more difficult topics, higher grade courses, and higher performing students. Implications for future research are provided.

Keywords: Self-reflection, learning mathematics, online learning

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Self-Reflection and Math Performance in an Online Learning Environment

Virtual schools in the United States in general have shown relatively weak math results. Several studies (e.g., Woodworth, Raymond, Chirbas, Gonzalez, Negassi, Snow, & Van Donge, 2015; Ahn, 2016) showed that virtual school students had lower average state assessment scores in math for all grade span than their counterparts in brick-and-mortar schools and that the gaps between student groups were greater for higher grade levels.

While these are notable results from rigorous, carefully controlled studies, it is possible to find suggestions for study improvement, such as matching on mobility metrics (e.g., moving from school to school) or understanding motivations for enrollment (Horn, 2016). Also, in a field that grows rapidly and continuously with programmatic improvements to address student academic performance, more recent trends may not have been captured with data examined in these studies (Choi, Belenky, DiCerbo, Lai, & Wardlow, 2016). For example, the ratio of virtual schools with acceptable school performance ratings improved from 33 percent to 41 percent in a recent three-year period (Barbour, 2015; Huerta, Shafer, Barbour, Miron, & Gulosino, 2015; Miron & Gulosino, 2016).

Research shows that there is a lack of rigor on the practices of successful virtual schools that may be helpful to encourage school-level strategies to improve outcomes (Choi et al., 2016). Given that not all virtual schools have the same performance, research is needed to understand what types of school-level interventions are positively impacting student performance in different subjects for certain cohorts of students (e.g., elementary vs. high school, gifted vs. ELL, special education, at-risk). Also, research is needed to validate whether the findings from the learning science literature apply to an online learning environment. Although the learning science literature suggests that some interventions have an impact on math performance in classrooms (for example, self-regulation intervention; Perels, Dignath, & Schmitz, 2009), it is not clear how pedagogical models for math in brick-and-mortar environments translate to an online learning environment.

In this study, we focus on one such school-level intervention for math improvement: providing opportunities for self-reflection. Recently, faced with a goal of improving math performance for students in grades K-12, an online learning provider has launched a comprehensive effort to apply learning science research to its math curriculum. One aspect of this initiative is a focus on student engagement: understanding how to ensure students are engaged not only in their curriculum, but in their personal daily learning. This questioning led to an exploration of self-reflection. Dewey (1933) introduced reflective thinking as it applies to the learning process and posited that understanding happens when one acquires information and grasp how information relates to one another by constantly reflecting on the meaning of what is studied (p. 78) As a part of this initiative, during the 2014-15 school year, reflection activities were added to an Algebra 1 course as a pilot at a virtual school that the provider supported. For the 2015–16 school year, reflection activities were added to all Kindergarten – Algebra 2 math courses in multiple virtual schools.

Review of Related Literature

Self-reflection, Related Concepts, and Academic Performance

Conducting an empirical study on a learning strategy is important, as many learning strategies are implemented and never tested for their impact on learning in an online learning environment. Self-reflection is one which research generally supports as an effective learning strategy (e.g., May & Etkina, 2002; Perels et al., 2009; Zimmerman, Moylan, Hudesman, White, & Flugman, 2011) that may have significant impact on learning.

Self-reflection as a learning strategy involves purposeful self-monitoring of one's own learning goals, plans, process, experience and outcomes, as well as understanding and making judgments regarding one's own learning performance related to problem solving, deepened understanding, or acquiring new perspectives (Atkins & Murphy, 1993; Boud, Keogh, & Walker, 1985; Davis, 2003; Dewey, 1933; Lin, Hmelo, Kinzer, & Secules, 1999; Mezirow, 1990; Moon, 1999; Schön, 1983; Piaget, 2001; Zimmerman, 2000).

As reviewed by Lai (2006), literature suggests that the self-reflection process involves multiple phases. Different theories and models exist about the process of reflection. For example, Dewey (1933) suggested that one makes meaning from experience through the five stages of reflective thinking: (a) suggesting a solution, (b) intellectualizing the difficulty or perplexity that one felt, (c) making hypothesis as a leading idea about the situation, (d) reasoning about and elaborating the idea, and (e) testing the hypothesis through overt or imaginative action. Atkins and Murphy (1993) suggested three stages of reflection: (a) becoming aware of perplexing feelings and thoughts, (b) analyzing and examining the situation, feelings, and knowledge, and (c) developing a new perspective on the situation. As a basis of proper instructional support for self-reflection, Moon (1999) characterized the nine stages of reflection as (a) experience, (b) need to resolve, (c) clarification of issue, (d) reviewing and recollecting, (e) reviewing the emotional state, (f) processing knowledge and ideas, (g) resolution, (h) transformation, and (i) possible action. Schön (1983) introduced the notions of reflection-in-action and reflection-on-action to describe the grounding of professional knowledge and practice. Reflection-in-action occurs when the situation is unfolding—one looks into experiences, connects with their own feelings, attends to the theories in use, and develops further actions. Reflection-on-action is the process of thinking about the experience after the encounter, exploring what happened and why one took certain actions, developing a repertoire or collection of ideas, examples, understandings, and actions to build theories and practices for a new situation. Across different theories, a common idea seems to be that for any experience, one can reflect on the experience following different cognitive stages, and eventually reach possible resolution and further actions.

Self-reflection is slightly different but closely related to a few other concepts including self-efficacy belief and self-evaluative judgement. Bandura (1997) defined perceived self-efficacy as the belief in one's capabilities to organize and execute courses of action to attain designated goals. Self-evaluation is related to judging the outcomes based on certain standards that one sets about one's own learning. Research shows that self-efficacy beliefs directly predict academic performance (Pajares, 1996; Zimmerman, 2002) and students who engage in frequent self-evaluation tend to attain higher academic outcomes than those who do not self-evaluate (Kitsantas, Reiser, & Doster, 2004; Schunk, 1996; Schunk & Ertmer, 1999). However, struggling students often report more inflated self-appraisals than successful students (Bol & Hacker, 2001; Campillo, Zimmerman, & Hudesman, 1999; Chen & Zimmerman, 2007; Klassen, 2002).

Overall, the education research literature suggests that students who reflect on their learning have better outcomes than students who do not, possibly because having knowledge that is appropriate epistemologically as well as conceptually, and being better at reflecting on what they learn and how they learn it together, contribute to higher performance (May & Etkina, 2002; Perels et al., 2009; Zimmerman et al., 2011). Interestingly, a meta-analysis found that a tool or feature prompting students to reflect on their learning was effective in improving learning outcomes in chemistry, language learning, physics, and math problem solving (Means, Toyama, Murphy, Bakia, & Jones, 2009).

Gaps in the Literature

A recent report on relatively weak math results in virtual schools (Woodworth et al., 2015) called for greater focus on the impact of pedagogical interventions on math performance in online learning environments. However, in the literature, less is known about what kinds of math interventions are effective, particularly in online learning environments. Much of the theory regarding the impact of such interventions, including self-reflection, is based on research in regular brick-and-mortar classrooms (e.g., Labuhn, Zimmerman, & Hasselhorn, 2010). Moreover, a gap in the literature exists regarding whether self-reflection is related to online math performance and how to support self-reflection of different student groups to improve math performance in an online learning environment.

There is only a limited number of studies related particularly to the effect of self-reflection on online math learning. For example, Bixler (2008), using an experimental study, found that question prompts asking students to reflect on their math problem-solving activities had a positive effect on college students' online learning outcomes. More research is needed to understand whether this finding can be generalized to a broader range of student groups such as those in K-12, as well as to a broader range of math topics (i.e. elementary to high school level topics) taught in an online learning environment.

Online learning environments can provide data that shed light on differences in content difficulties, progress during the coursework, and characteristics of student groups such as high- and low-achieving groups. However, many questions remain unanswered regarding how exactly we can support different groups of students with self-reflection to improve learning of different topics. When the content becomes more difficult, does self-reflection help in terms of performance? Does self-reflection help all student groups or only the low-achieving group? What kinds of instructional and assessment strategies work best in supporting self-reflection that transfers to improved performance? Without further understanding, it is difficult to provide appropriate support for self-reflection for those groups. Research is needed about how self-reflection is associated with increased math performance in an online learning environment.

In addition, while there are multiple models and methods about how to support self-reflection, the evidence of their effectiveness seems to be either lacking or mixed. For example, reflective questioning is one way to support self-reflection that can cause a temporary pause in a thinking process, or monitor a thinking process, justify a decision, appraise different perspectives, and evaluate an overall problem solving-process (Lai, 2006). Schoenfeld (1985) found that periodical self-reflection questions helped students to focus on the learning process, which resulted in improved performance. On the other hand, Davis (2003) reported that when the wording of the reflective prompts limits the students to only identify the weakness (e.g., "Piece of evidence we didn't understand very well included…"), instead of generically prompting further reflection (e.g., "Right now I am thinking."), it was not sufficient for developing coherent understandings. Results indicated the use of more generic prompts worked better in engaging students in reflections than the directed prompts, which may not have corresponded well to learners' understanding. More research is needed to understand which strategies indeed support reflection and improve performance in online learning environments.

In this study, we use datasets from three math courses offered at multiple virtual schools at the elementary, middle, and high school levels. We added end-of-unit reflective question prompts to support self-reflection and self-assessment of students' own feelings and understanding of the content they just learned before proceeding to the next unit. The reflective questions were provided periodically throughout the course. While the question prompts were encouraging reflection on students' understanding, we limited the response options to measure students' location on a fixed number of constructs such as confidence in a topic. We then examined the reflection and performance patterns found within the coursework in which the content topics become increasingly difficult towards the end of the semester.

Research Questions

In this study, we examine how self-reflection supports math learning in an online learning environment by analyzing assessment data from virtual elementary, middle, and high schools. The purpose of this research is to explore the role of self-reflection in learning of math in an online learning environment, and to examine whether providing opportunities for self-reflection impacts math performance.

We aim to answer the following research questions: (a) What are the patterns found in student reflections in an online learning environment? (b) Is there a difference in self-reflections among students in elementary, middle, and high school? (c) Lastly, is there a relationship between self-reflection and performance in the course?

Methods

Participants

Three studies were conducted retrospectively to address the research questions. The participants in the first (pilot) study were high school students who took an Algebra 1 course in the 2014-15 school year at a virtual public school in a midwestern state in the United States (N = 355). The second (extended) study participants were 5th, 7th, and 9th grade students (that is, elementary, middle, and high school students) at eight virtual public schools across the United States who took three math courses (Math 5 A, Math 7 A, and Algebra 1 A) in Fall of the 2015-16 school year. The total number of students were N = 2,250 (461 elementary, 653 middle, and 1,137 high school students). The number of students in each school ranged from 72 to 515. The third study included not only the sample of students from the first two studies, but also the matched sample of students who took the same courses at the same schools in the previous year, when the reflection assessments were not added to the courses. We first removed students from the pilot and extended study samples if students did not respond to any of the multiple reflection assessments. Then we selected comparable cohort from the previous year. The resulted clean pilot sample and the matched cohort sample included N = 283 each (145 for Algebra 1 A and 138 for Algebra 1 B). The resulted clean extended sample and the matched cohort sample included N = 2,040 in each sample (428 for Math 5 A, 580 for Math 7 A, 1,032 Algebra 1 A).

Instruments

Before the 2014-15 school year, a set of reflection items were developed to encourage self-reflection at the end of lessons and/or units within a course. Each reflection assessment typically included 4-7 questions that asked students to reflect on their understanding of the knowledge and skills they learned in the preceding lessons and/or units. During the pilot, only one type of reflection question was used to measure the confidence level associated with the understanding of topics. The question asked students to rate their confidence with a topic and gave four options of different confidence levels. The content of the question only varied in terms of the topics; the rating scale stayed the same across topics. For the extended study sample, four different types of questions were created: (a) general feelings towards math, (b) the use and preference of learning strategies, (c) self-judgment of skill level, and (d) identifying skills as strengths and/or weaknesses. See Table 1 for the examples of each type of question. The first two question types were designed to support reflection about students' own feelings and use of strategies in math learning. The last two types of questions were designed to support self-evaluation of their confidence and understanding in learning of the math topics.

For an index of instrument quality, we found the reliability of 0.837 for the feelings towards math items, 0.896 for elementary skill level items, 0.852 for middle school skill level items, 0.804 for high school skill level items, 0.868 for middle school strength/weakness items and 0.822 for high school strength/weakness items. We did not obtain reliability for learning strategy items because we only looked at response counts for each question. In the context of IRT-based measurement models, reliability can be expressed as 1-s/v where v denotes the variance of ability estimates and s denotes the average of the squared error (Adams, 2005). A value close to 1 is evidence of a highly accurate measurement, and a value close to 0 is evidence of a less accurate measurement.

As measures of math performance, we collected the unit test data and final course score. The unit tests were administered at the end of each unit after the reflections. Each unit test included 20-27 multiple choice items related to the unit topic. The final course scores were calculated based on multiple performance indicators including unit tests and participation in the course discussions.

Design

Three retrospective studies were designed and conducted to answer the research questions. First, in the pilot study, we examined data from Algebra 1 (Algebra 1 A in Fall semester and Algebra 1 B in Spring semester) students in one virtual school. We instituted the reflection assessments once or twice in each unit in the course (each course had seven units, and each unit had seven to nine lessons), sometimes in the middle and sometimes at the end of each unit. For each reflection assessment that followed certain lessons, we modified the reflection questions to be appropriate for the topics taught in those lessons. We collected responses to each reflection assessment at the lesson level and aggregated the ratings to the unit and course level. We also collected course performance scores: unit test scores and final course scores. The background variables were also collected: math pretest scores, whether the student was enrolled in the same virtual school in the previous year (as a proxy for students' experience in online learning environments), whether the student was enrolled in the course on time at the beginning of the semester, and whether the student completed the course requirements at the end of the semester.

In study 2, we extended the study to examine data from students who took Math 5 A, Math 7 A, and Algebra 1 A courses (all offered in Fall semester) in eight virtual schools. The reflection assessment was instituted slightly differently across courses. For the elementary school, one reflection assessment was placed at the end of each unit, while the middle and high school courses had two reflection assessments in each unit: mid-unit and end-unit.

In study 3, we collected student data from the school year prior to the implementation of the reflection assessments. In particular, we collected the covariates and math performance data necessary for the propensity score matching (Rubin, 1973; Rosenbaum & Rubin, 1983; Ho, Imai, King, & Stuart, 2011), in order to explore the causal effect of self-reflection on math performance. The covariates included gender, grade, whether the student is eligible for individual education plan (IEP), whether the student is eligible for free and reduced meal plan, whether the student enrolled on time, whether the student completed the course, whether the student previously enrolled in the same virtual school, and whether the student's pretest score was "low" based on set criteria. We performed the matched comparison analysis for both the pilot study sample and the extended study sample, after dropping cases that did not have data for the full list of covariates and the outcome variable.

Types	Example
Feelings towards math	Choose the option that best describes how you feel about math. **I like math**. strongly agree, agree, disagree, strongly disagree Choose the option that best describes how you feel about math. **I am good at math**. strongly agree, agree, disagree, strongly disagree
Use and preference of learning strategies	I understand math problems better when I **read them aloud**. strongly agree, agree, disagree, strongly disagree **Which strategies do you use** to help learn math vocabulary? Select all that apply. I remember words when I learn them. I do not need to study them. I make flash cards. I have a partner quiz me on math vocabulary. I review math vocabulary before quizzes. I review math vocabulary before tests. I review math vocabulary every day.
Self-judgment of skill level	**Which best describes your ability to** add and subtract rational numbers? I can add and subtract positive and negative fractions, mixed numbers, and decimals without making mistakes. I can teach someone else how to do this. I can add and subtract positive and negative fractions, mixed numbers, and decimals. Sometimes I make mistakes. I can sometimes add and subtract positive and negative fractions, mixed numbers, and decimals, but I often make mistakes. I need more help understanding some of these concepts. I have a lot of trouble adding and subtracting rational numbers. I need help.
Identifying skills as strengths or weaknesses	**Which of these skills do you think you could teach someone else**? Select all that apply. multiplying and dividing decimals comparing and ordering integers finding absolute values describing data using mean, median, mode, and range creating and interpreting box-and-whisker plots **Which of these skills do you need more help with?** Select all that apply. multiplying and dividing decimals comparing and ordering integers finding absolute values describing data using mean, median, mode, and range creating and interpreting box-and-whisker plots

Table 1. Examples of the Four Types of Reflection Questions

Analysis

Measurement Models. Overall, we applied three types of methods to analyze the assessment data and the matched sample data. First, we used measurement models to analyze the item response data from the reflection assessments. This resulted in defining and quantifying several constructs and indicators related to self-reflection. For example, continuous scale measures were constructed using multidimensional item response modeling (Adams, Wilson & Wu, 1997; Adams & Wu, 2007; Kiefer, Robitzch, & Wu, 2016). Among the many benefits of the multidimensional item response modeling is that it can provide best estimates of the construct after taking into account the varying characteristics of items and the measurement errors. The scales we defined included confidence (how highly the students self-judged their confidence in their knowledge and skills) and positive feeling towards math (how strongly students agreed with the statements such as "I like math," and "I am good at math"). The confidence scale was intended to capture the product of self-reflection regarding students' beliefs and judgment about their understanding of the unit topic. The feeling construct was intended to capture the product of self-reflection regarding students' general feeling towards the experience of learning math. The item response model used partial credit scoring of the discrete polytomous responses (for example, rating 1, 2, 3, or 4 to the questions are not continuous but ordered, and not dichotomous or correct/incorrect), and considered the units associated with the set of reflection questions as the multiple dimensions that are correlated with each other. By assuming multidimensionality of the self-reflection questions in the course, we were able to compare scaling results (e.g., confidence) across the unit topics of varying difficulties. The resulting scale measures were constructed on a logit scale, which ranged from -6 to 6 with mean zero.

We also used the item response data to measure engagement (frequency with which students chose to answer reflection questions throughout the course) and accuracy (how closely the confidence level matched the actual test performance). One's engagement in a reflection assessment was counted as yes when one provided a valid response to at least one question in the reflection assessment. We also calculated the number of unit reflection assessments the students "engaged in" during the course as a course-level engagement metric. The accuracy measures were calculated in two ways: Uni-directional measures represented the proximity between one's reflected confidence in unit topics and actual performance on unit tests. Bi-directional measures represented how much one overestimated or underestimated their confidence level as compared to the actual performance. Specifically, the accuracy measure was defined as a difference between the unit test t score and the unit-level reflection confidence t score, where the t scores are the difference between one's score and the mean score divided by the standard deviation of the scores across all the students. The resulting bi-directional measure ranged from about -4 to 4 with mean zero. In order to construct a measure that can be interpretable in later analyses such as regression, we constructed the uni-directional measure by squaring the bi-directional accuracy measures, resulting in the values ranging from 0 to 16. All of these scales were created at the unit level and also at the course level. We then examined overall distributions and trends found with these measures.

Significance Testing. Second, to investigate the association between self-reflection and course performance using available reflection data, we fitted multiple regression models in which student covariates, as well as the measures related with self-reflection, explain the variance in the final course performance. Specifically, we selected and used the student background covariates such as gender, whether students were on an IEP, whether students were eligible for the free and/or reduced meal (FARM) plan, whether students enrolled on time, whether students completed the course, whether students had enrolled in the same school in the previous year, and whether students had scored lower on the math pretest. We also included overall reflection confidence, overall reflection accuracy squared, variance in reflection ratings, and answered reflection item count. We used F tests and Welch's two sample t-tests to examine whether the use and preference of a particular learning strategy was significantly associated with higher course performance (results not reported in this article). In addition, we compared the results across elementary, middle, and high schools by cross-examining the model fits (not reported) and statistical significance of the reflection-related effects on the final course score.

Propensity Score Matching. Third, to further explore the effect of the self-reflection implementation in a nonexperimental setting, we used the propensity score matching method. Although there are limitations in using the propensity score matching for causal inference (such as losing the rigor of strict experiments and omitting the influence of unobserved variables), the key advantage of propensity score matching is that it can calculate a score that represents a linear combination of a large number of covariates and balances the two comparison groups without losing a large number of observations.

In performing the propensity score matching, we used the same set of student background covariates that we used in the multiple regression models we described above. Before matching, the initial year-to-year differences in most covariates were not statistically significant (not reported here), while the later-year student group (who received the self-reflection intervention) scored slightly lower on the pretests and the result was significant at alpha = 0.05 level. This means that the later-year cohort was lower performing in math than the previous year cohort, regardless of the intervention they received in the course. In terms of the final performance, before matching, the final course scores for the two-year cohorts were overall not significantly different at alpha=0.05 level for both the pilot data matching sample and the extended matching sample. One noticeable exception was that for the highest-level course (Algebra 1 B for the pilot sample and Algebra 1 A for the extended sample), the later-year cohort (that received the reflection assessments) had a lower average final course score than the previous year cohort. This means that again, the later-year cohort showed lower performance in more difficult math courses than the previous-year cohort. This difference was not significant for the pilot sample. Meanwhile for the extended sample, this difference was significant at alpha = 0.05 level.

Among the different matching algorithms, we selected the nearest neighbor matching method because it yielded the most number of matched samples as well as the largest variance explained in the final outcome analysis. Figure 1 shows the results of the propensity score matching: how close the covariates were after matching, between the previous-year and the later-year cohorts. After matching, the difference between the two-year cohorts in terms of their covariates was small to moderate: about 0.23 average absolute standard deviation. Our evaluation from the standardized difference and the graphs led to conclusion that most covariates are balanced across the groups within strata of the propensity score. Especially, even though the pretest performance levels were slightly lower for the later-year cohort before matching, the graph for "low pretest" showed that the two groups were balanced after matching. Thus, we determined that matching was acceptable and proceeded with further comparison.

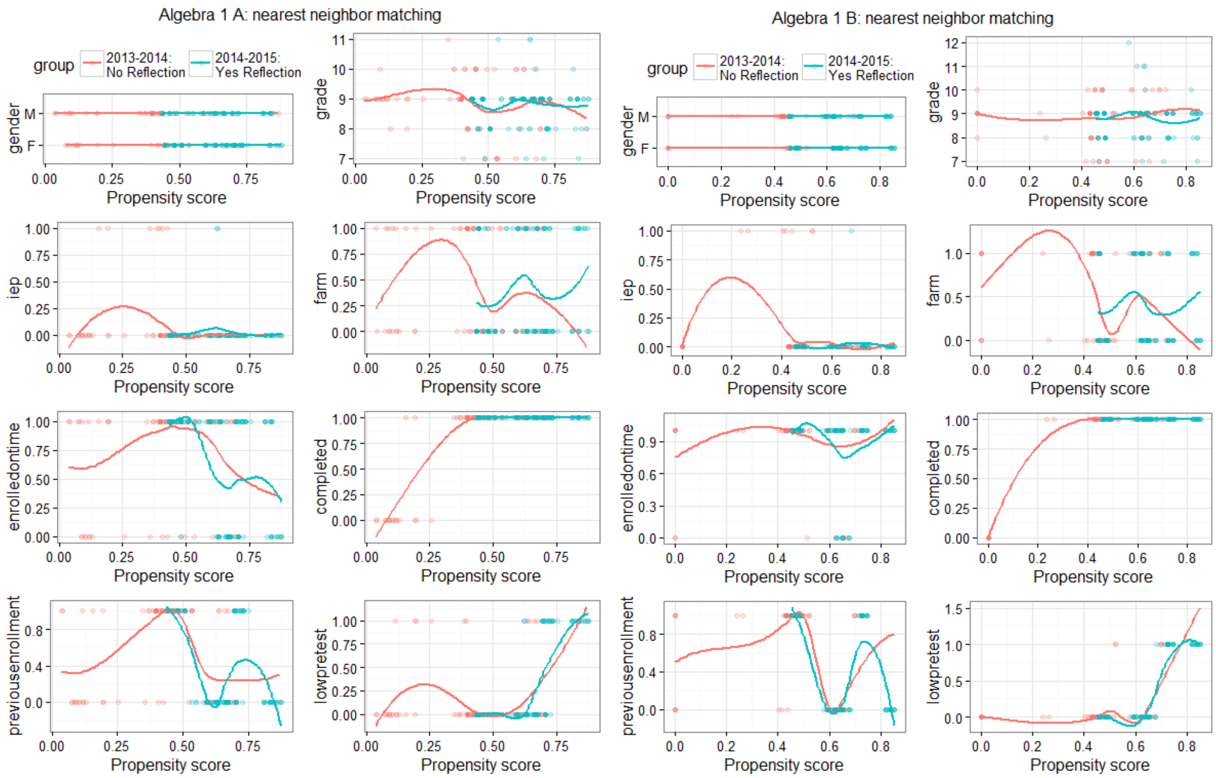

Figure 1. Result of propensity score matching for the pilot sample: the mean of each covariate is plotted against the estimated propensity score, separately by treatment status. If matching is done well, the treatment and control groups will have (near) identical means of each covariate at each value of the propensity score.

Results

In this section, we present the findings in order of the research questions. We present general patterns first; and when necessary, we highlight the differences found between the student groups and the varying content topics.

What Are the Patterns Found in Student Reflections?

Engagement and Accuracy. First, we examined the patterns found in the distribution of the constructs and related indicators we measured from self-reflection assessments. Overall, students' participation in self-reflection and accuracy level was generally high. About 80% of the students answered at least one reflection question throughout the course, although these rates were lower for individual units and lessons. Most students appeared to take the reflections seriously; there was little evidence from the pilot study that students simply gave themselves the same rating across all skills. On average, within-student variance of reflection ratings was 0.33 (on 0 to 3 scale), and only about 5% of students gave the same ratings for all reflection items they answered. In terms of accuracy, most students' self-judged skill level accurately matched their actual performance level, as the high peaks in Figure 2 show.

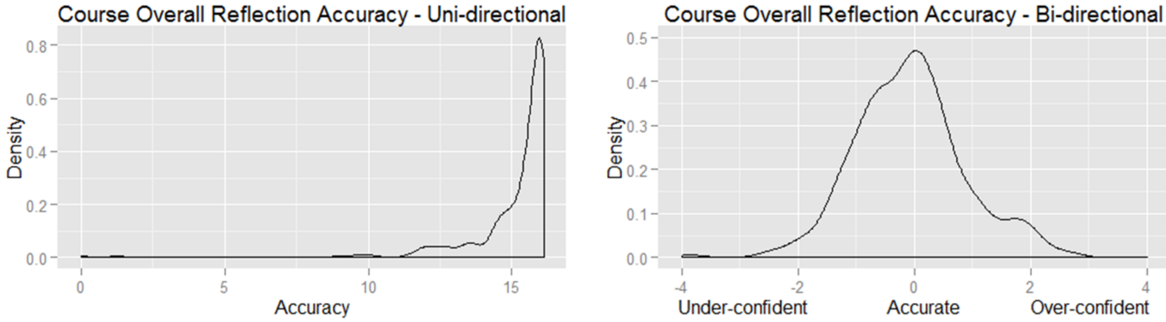

Figure 2. Density of overall reflection accuracy based on uni-directional (low to high accuracy) and bi-directional (under-confident, accurate, and over-confident) scales from the pilot study

Confidence. Next, we looked closely at the confidence levels and the trend across different unit topics. From the pilot study, the trend across the unit topics showed that students' confidence level measured by the reflection items generally increased over time, even when we calculated the confidence scores considering the different difficulties of the unit topics. On the other hand, the confidence levels that were measured twice about a single unit topic did not necessarily increase over time. When we examined the extended study data, we observed that self-judged skill levels (a proxy to confidence) reflected at the end of the units were not necessarily higher than those reflected in the middle of the units.

Confidence as was measured, and the accuracy of self-assessment had almost zero correlation ($r = 0.04$). In other words, students with high and low confidence had similar levels of accuracy in their self-ratings.

Covariate	Group	t	DF	p-value	95% CI lower bound	95% CI upper bound
Course completion	Completed course vs. not completed course	-0.943	230.75	0.347	-0.701	0.247
On-time enrollment	On-time vs. not on-time enrollment	-1.335	143.18	0.184	-0.848	0.164
Pretest performance	Low pretest vs. high pretest	4.305	166.05	0.000	0.650	1.750
Previous enrollment	Enrolled vs. not enrolled in the previous year	-3.706	257.89	0.000	-1.328	-0.407

Table 2. Test of Significance: Mean Differences in Reflected Confidence

We also examined confidence levels between the student groups. Based on the test of significance of the group mean differences at alpha = 0.05, students whose pretest scores were higher showed significantly higher confidence than the others. Also, students who enrolled in the same school in the previous year showed higher confidence than others who did not (Table 2).

Feelings and Learning Strategies. Other constructs we measured, such as feelings towards math (how much they liked math, how strongly they agreed that they are good at math) showed that students generally had positive feelings towards math (over 70% answered "agree" or "strongly agree" to the questions across all units that these questions were asked). Also, the responses to learning strategy items revealed that students generally used or preferred certain learning strategies such as visualization (e.g., 87.4% of respondents answered "agree" or "strongly agree" to a question "I can draw a picture to help me solve a multiplication problem"). However, the positive feeling variable showed close-to-zero correlations with final course performance ($r = .076$). Also, actual final course performances were not significantly different across the student groups who used different learning strategies (e.g., significance test for average test scores between groups of students with different answers to visualization strategy: $F(3, 248) = 1.17$, p-value = 0.322).

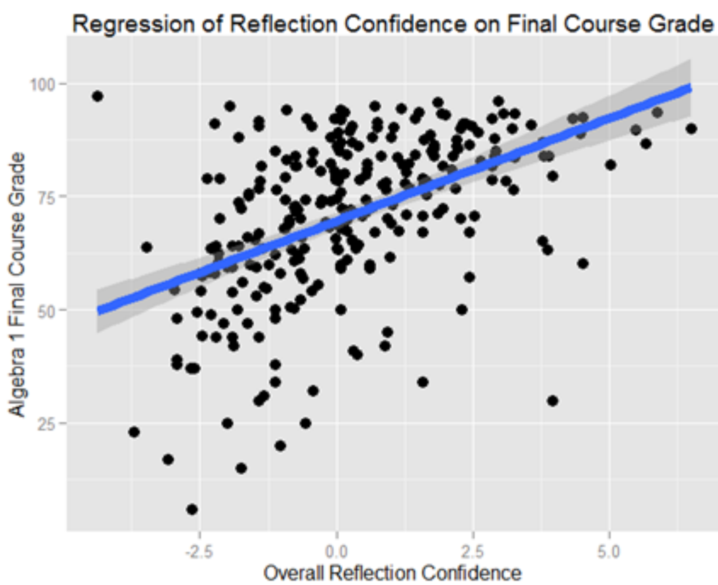

Figure 3. Scatterplot and regression line: overall course-level self-reflected confidence and final course score from the pilot study

Relationship with Course Performance. Next, we looked at the Pearson correlations between the constructs measured in the reflection assessments and course performance measures. In the pilot study, the correlations between confidence scores and "unit test" scores were 0.42 on average, and the correlation between confidence scores and final course performance scores was 0.495. When we looked across elementary, middle, and high school data, both self-judged skill level and confidence based on identified strengths were positively correlated with the course performance. The correlation was stronger for middle school (r = 0.425~0.501) than for elementary (r = 0.258) and high school (r = 0.340~0.354).

Additional regression results showed that higher confidence is positively associated with higher course performance (Table 3 and Figure 3), after controlling for the other variables. We also found that frequency of reflection mattered for performance. We counted how many times the students took the reflection assessments during the course, and examined whether it was associated with final course performance. The results showed that the more the students reflected, the higher their final course performances were (estimate of beta = 0.18, SE = 0.05, t = 3.84, p-value = 0.000).

	Estimate	**SE**	**t**	**Pr(>|t|)**	
(Intercept)	70.13	7.63	9.20	0.000	***
Overall reflection confidence	2.16	0.55	3.94	0.000	***
Overall reflection accuracy squared	-0.53	0.51	-1.04	0.302	
Variance in reflection ratings	0.60	4.34	0.14	0.891	
Answered reflection item count	0.18	0.05	3.84	0.000	***
Gender – male	0.35	1.87	0.19	0.854	
Individual education plan eligible – yes	-1.00	5.55	-0.18	0.857	
Free and reduced meal eligible – yes	-4.94	1.90	-2.60	0.010	*
Grade – 7th	9.06	5.67	1.60	0.112	
Grade – 8th	11.62	2.38	4.87	0.000	***
Grade – 10th	5.85	5.91	0.99	0.324	
Previous year enrollment – yes	3.33	2.08	1.60	0.111	
Completed course – yes	3.22	3.17	1.02	0.311	
On-time enrollment – yes	-1.05	2.72	-0.39	0.699	
Low pretest – yes	-4.14	2.01	-2.05	0.042	*
Adjusted r-squared	0.441				
F-statistic (14, 166)	11.15			0.000	***

(Significance codes: 0 “***” 0.001 “**” 0.01 “*” 0.05 “.” 0.1 “ ” 1)

Table 3. Effects of Self-reflection on Final Course Score: Multiple Regression Analysis Using the Pilot Sample

Is There a Difference in Self-Reflections Between Students in Elementary, Middle, and High School?

Difference in Participation. We found interesting patterns across the school levels. Overall, in terms of the participation, younger students reflected more across all four types of reflection questions. The percentage of “reflected students” (answered at least one item in a reflection assessment) across the units within the courses stayed high for younger students (more than 98% for elementary and more than 81% for middle). When they took the assessments, most elementary and middle school students (more than 73% for elementary, more than 72% for middle) answered all reflection items in the assessments.

For high school students, the percentage of students who reflected went down for the later units in the courses (from about 92% to 43%). Also, the data showed that many students stopped reflecting (dropped below 40%) at many different points in the course. Also, we found that high school students' participation in self-reflection was related with the difficulty of the unit topics and students' performance levels. Figure 4 illustrates the interaction effect on the test scores between the topic difficulty and reflection participation. The average test scores shown in the vertical axis were calculated using the estimated regression coefficients after controlling for the course units, and all other reflection-related and student background covariates. The horizontal axis indicates the unit sequence in high school Algebra 1 A and Algebra 1 B. The graph shows that for more difficult math topics, students who participated in reflections were performing lower on their unit tests than students who did not participate in reflections.

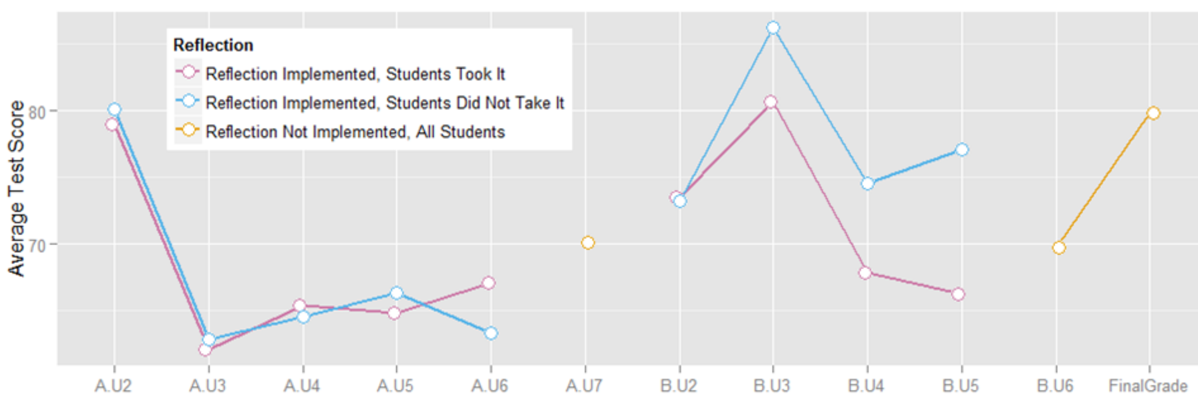

Figure 4. Comparison of average test scores among student groups based on reflection implementation and reflection behavior using the pilot study sample

Middle School Effect. The extended study revealed a simpler distinction between school levels. Middle school results among all three school levels showed the strongest linear association (r = .258 for elementary, .501 for middle, .340 for high) when it comes to how self-reflection is related to final course performance. Also, for middle school, the average unit test scores for the students who "reflected" were significantly higher for all units (Figure 5). In middle school, students' overall confidence level increased towards the end of the course (graph not reported). All of these patterns were not evident in elementary and high schools.

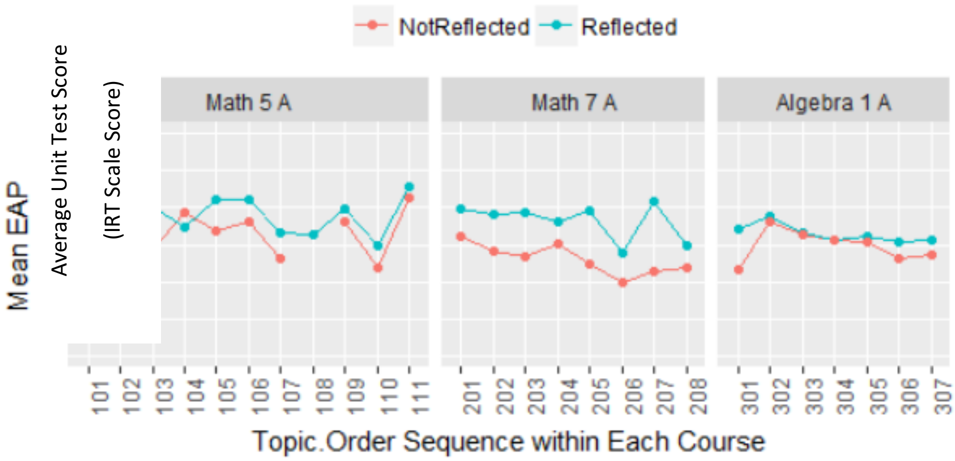

Figure 5. Comparison of average unit test IRT scores between "reflected" (answered at least one item in the reflection assessment) group and "not reflected" group. The horizontal axis indicates the unit topic sequence in each course. The vertical axis indicates average unit test IRT scores.

Is There a Relationship Between Self-Reflection and Course Performance When We Compare to a Previous-Year Matched Student Cohort?

After propensity score matching, we conducted outcome analysis using multiple regression models within which all the covariates were included as independent variables. The results showed different patterns in elementary, middle, and high school levels. Generally, the evidence was more significant for more difficult courses at higher school levels. The effects varied much between schools.

In elementary and middle school levels, we did not observe significant evidence that there is a difference between the final course performances of the previous-year cohort and the later-year cohort. We broke down the extended sample analyses to the school level to examine further. After controlling for the covariates, for the elementary course, all 8 schools did not show any significant difference between the two year cohorts. For the middle school course, two schools showed significantly higher final course scores in the later year, while three schools showed significantly lower scores than the previous year (alpha = 0.05). The remaining three schools did not show any significant difference between the two year cohorts.

	Algebra 1 A (N=145 for each year)					Algebra 1 B (N=138 for each year)				
	Est	SE	t value	Pr(>|t|)		Est	SE	t value	Pr(>|t|)	
(Intercept)	-2.319	0.230	-10.086	0.000	***	-2.669	0.356	-7.501	0.000	***
2013-14 Cohort (No self-reflection)	0.031	0.103	0.302	0.763		0.293	0.116	2.529	0.012	*
Male	-0.073	0.091	-0.806	0.421		-0.058	0.104	-0.561	0.575	
Grade7	0.924	0.221	4.179	0.000	***	0.882	0.244	3.617	0.000	***
Grade8	0.718	0.126	5.694	0.000	***	0.909	0.139	6.556	0.000	***
Grade10	-0.303	0.188	-1.609	0.109		-0.324	0.207	-1.565	0.119	
Grade11	0.549	0.388	1.417	0.158		0.780	0.497	1.570	0.118	
Grade12	.	.	.	.		-0.496	0.849	-0.584	0.560	
IEP	0.144	0.268	0.538	0.591		0.302	0.310	0.976	0.330	
FARM	-0.164	0.094	-1.739	0.083	.	-0.188	0.104	-1.797	0.074	.
Enrolled on time	0.381	0.137	2.787	0.006	**	0.804	0.208	3.873	0.000	***
Completed	1.977	0.212	9.316	0.000	***	1.756	0.309	5.685	0.000	***
Previous enrollment	0.200	0.120	1.666	0.097	.	0.068	0.111	0.613	0.540	
Low pretest	-0.207	0.117	-1.764	0.079	.	-0.219	0.140	-1.568	0.118	
Adjusted R Squared	0.433					0.312				
F Statistic	19.36 (DF =12, 277), p-value = 0.000					10.57 (DF =13, 262), p-value = 0.000				

Table 4. Effects of Self-reflection on Final Course Score after Matching: Multiple Regression Analysis Using the Pilot Sample

However, at the high school level, for more difficult course, we observed significant and negative effects. The overall performance of the later-year cohort was lower than the previous-year cohort. The same type of analysis showed that after controlling for the covariates, the difference was significant at alpha = 0.05. This pattern was true for both the pilot sample and the extended sample (Table 4, Table 5). For Algebra 1 A, when we broke down the extended sample analyses to the school level, we observed a significant and positive effect for one out of eight schools, and significant and negative effects for three out of eight schools. When we combined all eight school data together, we observed a significant and negative effect. For Algebra 1 B, we observed a significant and negative effect. It is worthwhile to note again that before matching, the later-year cohort showed lower performance in terms of their pretest and final course scores especially in more difficult math course than the previous-year cohort. The results showed that the descriptive patterns shown before matching still persisted after matching.

	School	Math 5 A	Math 7 A	Algebra 1 A	Algebra 1 B
Pilot Sample	1			**Y1 ≈ Y2** Not significant	**Y1** > Y2 **Significant**
Extended Sample	1	Y1 < **Y2** Not significant	**Y1** > Y2 Not significant	**Y1** > Y2 Not significant	
	2	Y1 < **Y2** Not significant	Y1 < **Y2** **Significant**	**Y1** > Y2 Not significant	
	3	Y1 < **Y2** Not significant	Y1 < **Y2** **Significant**		
	4	**Y1** > Y2 Not significant	Y1 < **Y2** Not significant	**Y1** > Y2 **Significant**	
	5	**Y1** > Y2 Not significant	**Y1** > Y2 Not significant	Y1 < **Y2** Not significant	
	6	**Y1** > Y2 Not significant	**Y1** > Y2 **Significant**	**Y1** > Y2 **Significant**	
	7	**Y1** > Y2 Not significant	**Y1** > Y2 **Significant**	Y1 < **Y2** **Significant**	
	8	**Y1** > Y2 Not significant	**Y1** > Y2 **Significant**	**Y1** > Y2 **Significant**	
	All 8 schools	**Y1** > Y2 Not significant	**Y1** > Y2 Not significant	**Y1** > Y2 **Significant**	

Table 5. Year-to-year difference in final course scores after matching: summary of multiple regression analyses using the pilot and extended samples (alpha = 0.05)

Conclusion

In this study, we examined the role of self-reflection in math performance in an online learning environment, and whether providing opportunities for self-reflection impacts math performance, by analyzing assessment data from virtual schools. The main results were highly consistent with the literature that is not specific to the online learning environment: participation in reflection, more frequent reflection, and high confidence level were positively associated with higher course performance. When students participated in self-reflection in an online learning environment, most of them seemed to be well engaged, were serious in answering the reflection questions, and their confidence level generally increased over the units in the course. However, participation in self-reflection varied by grade level, students' performance level, and course/topic difficulty. Results showed that younger students and lower performing students engaged more in the reflections. When they took the reflection assessments, their confidence level was moderate-to-strongly correlated with their course performances, unlike high school students. Among the three school levels, middle school students showed the strongest association between their reflection participation, reflected confidence, and actual performance level. Lastly, we observed low participation in self-reflection among high school students, and those who did participate performed lower on more difficult math topics.

One of the noticeable results is that high school performance in students who took the most difficult (Algebra 1B) course in the study after the reflection assessments were instituted, were significantly lower than those students from the previous school year. This finding suggests a possible limitation of the positive impact of reflections as it seems to contrast to the previous results that instituting self-reflection is related with and promotes high performance (e.g., Chi, Bassok, Lewis, Reimann, & Glaser, 1989; Ertmer, Newby, & MacDougal, 1996; May & Etkina, 2002; Perels et al., 2009; Zimmerman, Moylan, Hudesman, White, & Flugman, 2011).

A few possible explanations for this result exist. First, between the current study and the previous studies, there are noteworthy differences in sample, discipline, methodology, and whether or not the study was situated in an online learning environment. The propensity score matching study controlled for initial achievement of the students, so that the effect we found here represents the causal relationship between reflecting and performance. Chi and colleagues (1989) first grouped students based on their performance levels and used qualitative analyses to profile their use of learning strategies. Ertmer and colleagues (1996) examined students' usage of reflective learning strategies by making students self-report on whether they reflect on their own learning or not. The study analyzed data from a face-to-face biochemistry classroom. May and Etkina (2002) and Zimmerman and colleagues (2011) focused only on college samples and physics learning in face-to-face learning environment. Perels and colleagues (2009) looked at math learning but only for the sixth graders in regular face-to-face math classes. These studies and the current study only have small overlap in terms of the age group of the sample, and none of these studies looked at online learning environment.

Second, this finding may be related to engagement patterns that varied by student skill-level. We found that at the high school level, for more difficult math topics within the course, low-performing students were more likely to respond to reflection assessments at least once than were high-performing students. Also from overall analyses of participation using the extended sample, we observed that high school students are dropping from the reflection assessments more than the elementary and middle school students. Together it may imply that as students grow older and become better in their understanding of more difficult math topics, they tend to skip supplementary learning opportunities such as reflection assessments. This may be an interesting topic to explore in a future study, as the current analysis did not investigate what motivates students to take the reflection assessments.

Third, unobserved covariates may influence the results. The current analysis does not follow a strict experimental design. We depend on the propensity score matching method to make a causal inference. One of the known disadvantages of the propensity score matching method is that the propensity scores are calculated based on the observed variables, thus the influence of unobserved covariates are not considered in matching. That implies the control (the previous year) and treatment (the later year) groups may have more differences than what we observed and matched for. For example, students in the later year group may represent the majority of students who move their schools multiple times ("high mobility").

Fourth, one can also speculate that reflecting students showing lower performance on difficult tasks has something to do either with (a) cognitive load (when one is trying to learn difficult math topics, resources are too limited or exhausted to go off task and reflect) or (b) in more difficult math, interventions will only be effective if it is highly content-specific (for example, one-on-one tutoring on solving a difficult problem): one can be shown the steps to solving a problem or one would not reach the solution. Even if the self-reflection process is done correctly and well, when one does not understand the actual content, the reflection still may not be effective.

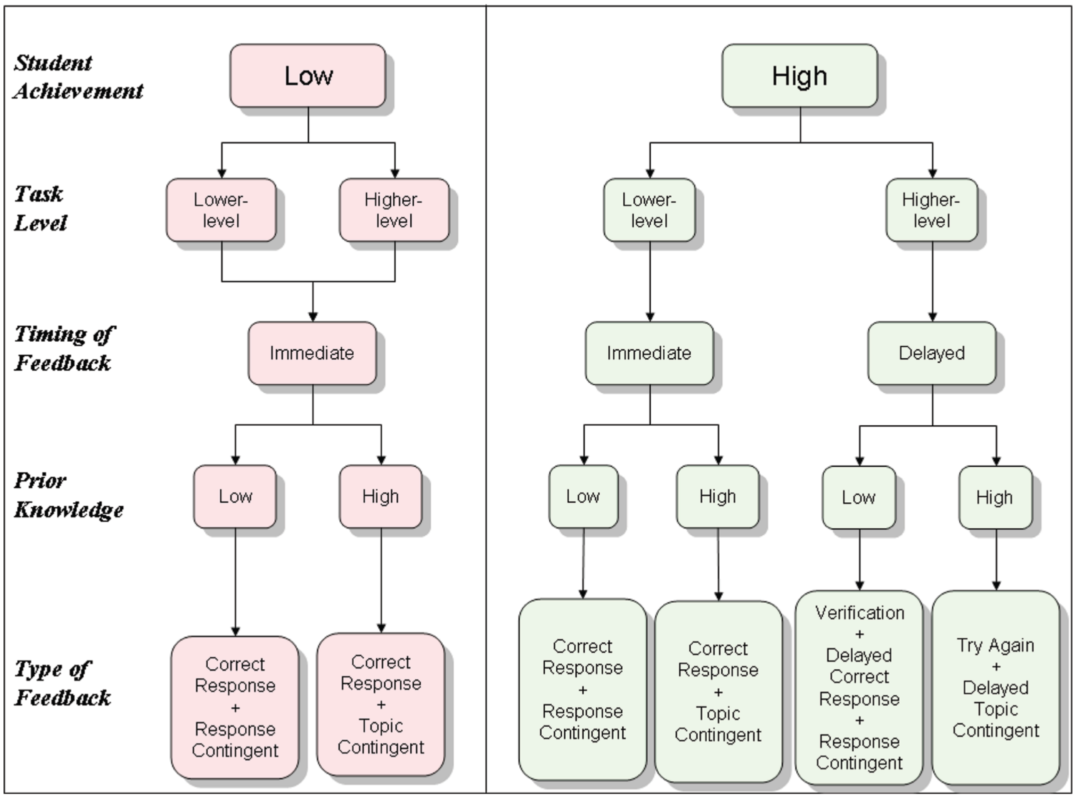

Figure 6. Feedback variables for decision making in computer-based instruction. Excerpted from Shute (2007), p. 28

For more difficult topics, how we currently encourage self-reflection may not be as effective for already high-performing students as for low-performing students. It may suggest the limits of the positive impact of reflection; for students behind in more advanced courses, even with reflection the prerequisite skills are missing. The result suggests that self-reflection strategies need to be appropriately differentiated to support improvement in math. Differentiated instructional support is not a new idea. For example, a literature review of the feedback research (Shute, 2007) showed that different types of feedback were differentially effective, depending on learner ability, task complexity, timing, and prior knowledge (Figure 6). In order for the self-reflection to be effective, one may need to consider multiple factors including in which stage of self-reflection does the learner need to be in order to reach the learning outcome, what kinds of self-reflection tools are most effective in supporting what kinds of math knowledge and skill acquisition, and how students progress over time in terms of their self-reflection process and their mastery of math knowledge and skills. As reviewed in the previous section, there can be multiple phases in how people reflect. Perhaps, according to Schön (1983), reflection-on-action may be a way to understand the self-reflection effect on high-performance students. The instructors need to be aware of what kinds of reflection opportunities one can provide for the different math topics and tasks (e.g., conceptual understanding vs. problem solving). Lai and Land (2009) reviewed two strategies for supporting reflection in online learning environments, focusing on journaling and small group asynchronous discussion. Building upon the previous findings that showed the usefulness of journal writing as a reflection tool in face-to-face math courses (e.g., Jurdak & Zein (1998), Meel (1999)), they suggested online tools such as blogging, email, and discussion forums as well as several instructional strategies (e.g., giving quality feedback, examples, and clear instructions) to support reflective journaling in online learning environments. It is worth noting that the self-reflection activities in literature varies much from very open-ended and generic self-reflection activities to more content-specific, forced choice type of assessments. These different types of activities entail different cognitive demands. It is perhaps not all that surprising that we see different effects for different types of reflection activities. A future effort is needed to understand how differentiated support for reflection activities are related with improvement in performance.

Building on the findings from this study, a follow-up study can further examine why the positive effects of implementing reflection assessments on math performance was limited to lower grades. The results may be useful to inform how online education providers approach the design of math instruction and to allow us to control for some of these factors and enable us to determine more robustly whether there is a causative link between the student performance and response to reflection questions. Further research can also consider the degree to which what we have learned about the role of self-reflection in learning could be generalized across other subjects and student groups.

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References

Adams, R. J. (2005). Reliability as a measurement design effect. *Studies in Educational Evaluation, 31*(2), 162-172.

Adams, R. J., Wilson, M., & Wu, M. (1997). Multilevel item response models: An approach to errors in variables regression. *Journal of Educational and Behavioral Statistics, 22*, 47-76.

Adams, R. J., & Wu, M. L. (2007). The mixed-coefficients multinomial logit model. A generalized form of the Rasch model. In M. von Davier & C. H. Carstensen (Eds.): Multivariate and mixture distribution Rasch models: Extensions and applications (pp. 55-76). New York: Springer.

Ahn, J. (2016). Enrollment and Achievement in Ohio's Virtual Charter Schools. Thomas B. Fordham Institute.

Atkins, S., & Murphy, K. (1993). Reflection: A review of the literature. *Journal of Advanced Nursing, 18*, 1188-1192.

Choi, J., Belenky, D., DiCerbo, K., Lai, E., & Wardlow, L. (2016). Learners and learning in virtual schools: A literature review. Pearson Efficacy & Research.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. Macmillan.

Barbour, M.K. (2015). Section II: Limited Evidence, Little Guidance: Research to Guide Virtual School Policy. In A. Molnar (ed.). Virtual Schools in the U.S. 2015: Politics, Performance, Policy, and Research Evidence. Boulder, CO: National Education Policy Center.

Bixler, B. A. (2008). The effects of scaffolding student's problem-solving process via question prompts on problem solving and intrinsic motivation in an online learning environment. Doctoral dissertation, The Pennsylvania State University, State College, Pennsylvania.

Bol, L., & Hacker, D. J. (2001). A comparison of the effects of practice tests and traditional review on performance and calibration. *The Journal of Experimental Education*, 69(2), 133-151.

Boud, D., Keogh, R., Walker, D. (1985). What is reflection in learning? In D. Boud, R. Keogh, & D. Walker (Eds.), *Reflection: Turning experience into learning* (pp. 7-17): London: Kogan.

Campillo, M., Zimmerman, B. J., & Hudesman, J. (1999). Enhancing academic study skill, self-efficacy, and achievement through self-regulatory training. In annual meeting of the American Psychological Association, Boston, MA.

Chen, P., & Zimmerman, B. (2007). A cross-national comparison study on the accuracy of self-efficacy beliefs of middle-school mathematics students. *The Journal of Experimental Education*, 75(3), 221-244.

Chi, M. T., Bassok, M., Lewis, M. W., Reimann, P., & Glaser, R. (1989). Self-explanations: How students study and use examples in learning to solve problems. *Cognitive Science*, *13*(2), 145-182.

Dabbagh, N., & Kitsantas, A. (2012). Personal Learning Environments, social media, and self-regulated learning: A natural formula for connecting formal and informal learning. *The Internet and Higher Education*, 15(1), 3-8.

Davis, E. A. (2003). Prompting middle school science students for productive reflection: Generic and directed prompts. *Journal of the Learning Sciences, 12*(1), 91-142.

Dewey, J. (1933). *How we think: A restatement of the relation of reflective thinking to the educative process.* Boston; New York, D. C. Heath and Co.

Ertmer, P. A., Newby, T. J., & MacDougall, M. (1996). Students' responses and approaches to case-based instruction: The role of reflective self-regulation. *American Educational Research Journal*, *33*(3), 719-752.

Fisher, M., & Baird, D. E. (2005). Online learning design that fosters student support, self-regulation, and retention. *Campus-Wide Information Systems,* 22(2), 88-107.

Ho, D. E., Imai, K., King, G., Stuart, E. A. (2011). MatchIt: Nonparametric Preprocessing for Parametric Causal Inference. *Journal of Statistical Software,* Vol. 42, No. 8, pp. 1-28. URL http://www.jstatsoft.org/v42/i08/

Horn, M. (2016, August 25). Harnessing Benefits, Reining in Downsides of Virtual Schools. Forbes. Retrieved from http://www.forbes.com/sites/michaelhorn/2016/08/25/harnessing-benefits-reigning-in-downsides-of-virtual-schools

Huerta, L., Shafer, S. R., Barbour, M.K., Miron, G., Gulosino, C. (2015). Virtual Schools in the U.S. 2015: Politics, Performance, Policy, and Research Evidence. Boulder, CO: National Education Policy Center.

Jurdak, M., & Abu Zein, R. (1998). The effect of journal writing on achievement in and attitudes toward mathematics. *School Science and Mathematics*, *98*(8), 412-419.

Kiefer, T., Robitzsch, A. & Wu, M. (2016). TAM: Test Analysis Modules. R package version 1.995-0. https://CRAN.R-project.org/package=TAM

Kitsantas, A., Reiser, B., & Doster, J. (2004). Goal setting, cues, and evaluation during acquisition of procedural skills: Empowering students' learning during independent practice. *Journal of Experimental Education*, 72(4), 269-287.

Klassen, R. (2002). A question of calibration: A review of the self-efficacy beliefs of students with learning disabilities. *Learning Disability Quarterly*, 25(2), 88-102.

Labuhn, A. S., Zimmerman, B. J., & Hasselhorn, M. (2010). Enhancing students' self-regulation and mathematics performance: The influence of feedback and self-evaluative standards. *Metacognition and Learning, 5*(2), 173-194.

Lai, T. L. (2006). The effect of using peer discussion, learning journals and question prompts to support reflection in a distance learning environment. Doctoral dissertation, The Pennsylvania State University.

Lai, T. L., & Land, S. M. (2009). Supporting reflection in online learning environments. In *Educational media and technology yearbook* (pp. 141-154). Springer US.

Lin, X., Hmelo, C., Kinzer, C. K., & Secules, T. J. (1999). Designing technology to support reflection. *Educational Technology Research and Development, 47*(3), 43-62.

May, D. B., & Etkina, E. (2002). College physics students' epistemological self-reflection and its relationship to conceptual learning. *American Journal of Physics, 70*(12), 1249-1258.

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2009). Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies. US Department of Education.

Mezirow, J. (1990). *Fostering critical reflection in adulthood: A guide to transformative and emancipatory learning (1st ed.).* San Francisco: Jossey-Bass Publishers.

Meel, D. E. (1999). Email dialogue journals in a college calculus classroom: A look at the implementation and benefits. *Journal of Computers in Mathematics and Science Teaching*, *18*(4), 387-414.

Miron, G. & Gulosino, C. (2016). Virtual Schools Report 2016: Directory and Performance Review. Boulder, CO: National Education Policy Center.

Moon, J. A. (1999). *Reflection in learning and professional development: Theory and practice.* London: Kogan Page.

Pajares, F. (1996). Self-efficacy beliefs in academic settings. *Review of Educational Research, 66*(4), 543-578.

Perels, F., Dignath, C., & Schmitz, B. (2009). Is it possible to improve mathematical achievement by means of self-regulation strategies? Evaluation of an intervention in regular math classes. *European Journal of Psychology of Education*, *24*(1), 17-31.

Piaget, J. (2001). Studies in reflecting abstraction. Hove, UK: Psychology Press.

Rosenbaum, P. R., & Rubin, D. B. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika*, 41-55.

Rubin, D. B. (1973). The use of matched sampling and regression adjustment to remove bias in observational studies. *Biometrics*, 185-203.

Schön, D. A. (1983). *The reflective practitioner: How professionals think in action.* New York: Basic Books.

Schoenfeld, A. H. (1985). Metacognitive and epistemological issues in mathematical understanding. *Teaching and learning mathematical problem solving: Multiple research perspectives*, 361-380.

Schunk, D. H. (1996). Goal and self-evaluative influences during children's cognitive skill learning. *American Educational Research Journal, 33*(2), 359-382.

Schunk, D. H., & Ertmer, P. A. (1999). Self-regulatory processes during computer skill acquisition: Goal and self-evaluative influences. *Journal of Educational Psychology*, *91*(2), 251.

Shute, V. J. (2007). Focus on formative feedback. *ETS Research Report Series*, *2007*(1).

Smith, M. K. (2001, 2011). Donald Schön: learning, reflection and change. Retrieved from www.infed.org/thinkers/et-schon.htm

Woodworth, J. L., Raymond, M. E., Chirbas, K., Gonzalez, M., Negassi, Y., Snow, W., & Van Donge, C. (2015). Online charter school study. Stanford, CA: Center for Research on Education Outcomes.

Zimmerman, B. J. (2000). Attainment of self-regulation: A social cognitive perspective. In M. Boekaerts, P. Pintrich, & M. Zeidner (Eds.), *Self-regulation: Theory, research, and applications* (pp. 13–39). Orlando, FL: Academic Press.

Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory into Practice, 41*(2), 64-70.

Zimmerman, B. J., Moylan, A., Hudesman, J., White, N., & Flugman, B. (2011). Enhancing self-reflection and mathematics achievement of at-risk urban technical college students. *Psychological Test and Assessment Modeling, 53*(1), 141-160.

Few and Far Between: Describing K-12 Online Teachers' Online Professional Development Opportunities for Students with Disabilities

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Abstract

Online teacher professional development (oTPD) researchers have been concerned with design features, teacher change in practice, and student learning, as well as establishing guidelines for directing funding support. Even so, previous work suggests that high-quality instructional support for all students with disabilities is still on the horizon. As a response to the need for better instruction, professional development for SWD has emerged in all settings, including teachers who are not just receiving oTPD, but who are online teachers themselves. The purpose of this study was to use online teachers' descriptions of their oTPD for SWD to learn about the professional learning opportunities available to teachers around serving SWD and their families. Teachers and administrators from various online/virtual learning schools around the country participated in this study. Even though teachers had SWD in their courses and were directly responsible for SWD, most teachers and administrators described few professional development opportunities for learning to teach SWD in the online learning environment beyond giving and receiving information about legal compliance. Findings also raise concerns about the tensions between macro- and micro-development opportunities available to teachers and whether they are positioned to take advantage of these to build strong professional networks.

Keywords: Online teacher professional development, K-12 online teaching, online administration, professional development for students with disabilities

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Few and Far Between: Describing K-12 Online Teachers' Online Professional Development Opportunities for Students with Disabilities

Political pressures to provide high-quality education for all students, including those with disabilities, have strengthened in the wake of federal intervention in curriculum and the ever-intensifying criticism of teachers and the ways in which they are prepared (Berliner, 2000; Cochran-Smith & Dudley-Marling, 2009; Cochran-Smith & Zeichner, 2009). Most recently, the United States Supreme Court ruled that minimal compliance was insufficient to ensure that students with disabilities would receive the education that IDEA guarantees to them (U.S.C. §§ 2017, 580, 15-827). While researchers have worked to uncover effective educational innovations for students with disabilities, including innovations that rely heavily on technology and the characteristics of effective teachers, these improvements have yet to yield achievement gains for students with disabilities (Feng & Sass, 2013). At the same time, increasingly passionate debates take place about the enormous and perplexing problem of finding personnel and monetary resources necessary for the effective transformation of teaching and learning for all students (Brownell, Sindelar, Kiely, & Danielson, 2010).

One potential option for offering better teaching with fewer resources has been to increase access to online learning, where instructional delivery takes place primarily using Internet technologies. While online learning is more than 30 years old, it was part of the distance education models that helped institutions of higher education provide coursework to students who were place-bound or who, for other reasons, could not attend traditional classes (Brown, 2012). However, online learning in K-12 education emerged much more recently and expanded rapidly, with all 50 states and the District of Columbia offering online learning at the beginning of the current decade (Watson, Murin, Vashaw, Gemin, & Rapp, 2011). Students receiving special education services are part of this expansion; an estimated 10% of online learners have disabilities (Molnar, Miron, Huerta, King-Rice, Cuban, Horvitz, & Rankin-Shafer, 2013). However, students with disabilities are particularly vulnerable to attrition (Freidoff, 2015) and they underperform in many online programs (Deshler, Rice, & Greer, 2014).

To support the achievement and persistence of students with disabilities in finishing courses, online learning for teachers may be part of the solution, where K-12 online teachers themselves learn online as part of their professional development (oTPD). While such learning is in keeping with the online learning mode of education, oTPD is also practical since an online school could employ certified teachers living anywhere in the world. To learn about oTPD for teachers working with students with disabilities, data were collected from special education administrators and teachers about their oTPD experiences, along with their perceptions of the goals and purpose of professional development. The purpose of this study was to use both online administrators' descriptions and teachers' accounts of the oTPD in their schools relevant to students with disabilities to discover how oTPD for students with disabilities occurred in online/virtual school contexts. Two research questions governed this study.

1. What professional opportunities do online educators of students with disabilities participate in at their virtual schools?
2. What are the topics of this professional development for students with disabilities?

The findings of this study have implications for the continuing efforts of online schools as they plan professional development for their teachers about working with students with disabilities, for research on oTPD to meet the needs of students with disabilities, and for the standards around professional development recommended by various entities for quality online programs and courses.

Conceptual Framework for Defining Professional Development Online

Soine and Lumpe (2014) broadly defined *teacher professional development* as opportunities to learn from and about classroom practice, regardless of the format. Research in oTPD has sought to identify the best design features for inclusion in development opportunities, support teachers in exchanging less effective practices for better ones, and establish guidelines for directing funding support (Dede, Ketelhut, Whitehouse, Breit, & McCloskey, 2009). Each of these goals has implications for what administrators, who determine what online schools offer for professional development, can do to optimize oTPD, how these opportunities enhance teacher effectiveness, and whether funding for future professional development endeavors should be available based on their perceptions of what was successful.

Teacher professional development can be completed online using multiple modes of digital information, including photographs, videos, and interactive tools (Mayer, 2002). Further, online learning creates accessible opportunities since it utilizes platforms that deliver information irrespective of time, place, and situational barriers (Kanuka & Nocente, 2003). Studies of online learning opportunities for teachers have identified positive effects and even changes in teachers' pedagogical and content knowledge, classroom practice, and student outcomes (Weschke & Barclay, 2011). In fact, even teachers in traditional settings seem to prefer the Internet for their professional learning (Charalambousa & Ioannou, 2011; Kao, Wu, & Tsai, 2011). In addition, teachers can use various protocols on professional development websites to take charge of their own learning (Beach & Willows, 2017).

While administrators have a primary concern with improved student learning as an outcome of professional development, teacher professional development literature has also considered increased teacher knowledge and mindful self-regulation of work responsibilities as important intermittent outcomes (Butler, Lauscher, Jarvis-Selinger & Beckingham, 2004; Darling-Hammond, 1998; Roeser, Skinner, Beers, & Jennings, 2012). These conceptions of professional development and how they might translate to online learning informed this study.

Review of Related Literature

The Individuals with Disabilities in Education Act (IDEA) granted access to personnel with special training and other services necessary to support learning to individuals who need them (Giangreco, Edelman, Broer, & Doyle, 2001). However, high-quality instructional support for students with disabilities has not always occurred in brick-and-mortar settings (Giangreco, Carter, Doyle, & Suter, 2010; Zigmond, 2003). For teachers of students with disabilities who complete coursework in online educational environments, the need for teachers to demonstrate competency in these fully online settings is particularly acute. Even so, teacher preparation in this regard has been minimal, especially around issues of accommodation and instruction (Smith, Basham, Rice, & Carter, 2016). That leaves professional development as the primary mechanism by which teachers might learn to teach students with disabilities online.

Further, the legal aspects of including students with disabilities in school settings have meaning, not just for teachers, but also for administrators. Administrators, functioning as representatives of Local Educational Authorities (LEAs) guarantee funding for the services promised in the IEP. In terms of the administrator's role in providing professional development for teachers of students with disabilities, Pazey and Cole (2013) suggested that administrators need to know about (1) social justice, (2) legalities, (3) support models, (4) referral, and (5) evaluation to effectively serve as an LEA.

In the online setting, students with disabilities are at risk for equally dismal learning outcomes. Sometimes, students with disabilities cannot enroll in courses in the first place. When they are unsuccessful in the course, sometimes online educators suggest lower course loads, easier classes, or that students leave the school entirely (Rice & Carter, 2015). In addition, parents report spending more than three hours per day working directly with their children, even though they have not been prepared to provide the kinds of special education services mandated under an IEP (Burdette & Greer, 2014).

Taking on teacher professional development in a way that engages them in their own learning requires careful planning when teachers learn online and then return to teach in traditional classrooms with colleagues in shared time and physical space. However, another layer of complexity emerges when teachers both learn and teach online. Their lack of face-to-face interaction presents a unique challenge to achieve ongoing benefits from professional development in such areas as continued involvement with colleagues, on-going relationships with facilitators or staff developers, or opportunities to discuss shared students with colleagues (Butler, 2007; Sicilliano, 2016; Wilhelm, Chen, Smith, & Frank, 2016).

To improve instruction in traditional settings for students with disabilities, Cook and Odom (2013) noted a dire need for professional development around the creation and implementation of support plans. However, little research has suggested what professional development might look like in an online format to improve teaching, learning, and the implementation of disability service plans such as an IEP developed under the Individuals with Disabilities Rehabilitation Act (IDEA, 2004). However, it seems logical that if online teachers had more access to information and support about how to serve students with disabilities, then more students with disabilities might enroll and fewer would have to leave the school without experiencing success.

Therefore, numerous layers of topical complexity are at work in this study. These layers appear in Figure 1.

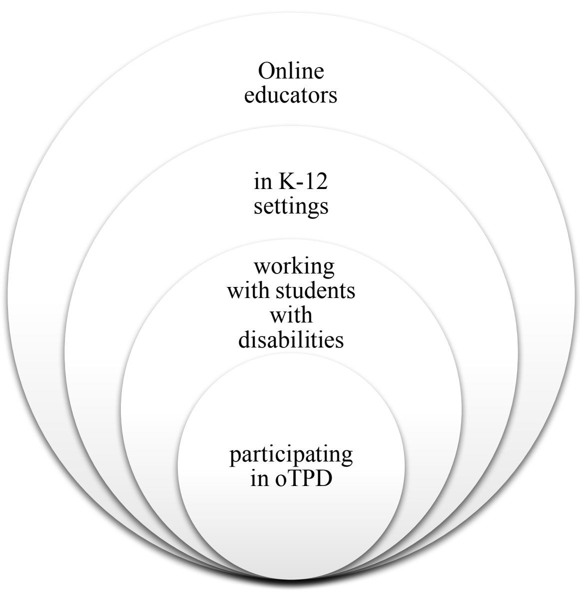

Figure 1. Narrowing the Topical Complexity of this Study

Due to the layers of topical complexity in this study, these layers are grouped into two pieces: (1) professional development of special education teachers and (2) oTPD for K-12 teachers. Where possible, studies of oTPD featuring special education teachers who also teach in online contexts are referenced, but unfortunately, the research base for both these topics is highly limited.

To locate this literature, I conducted a search of major educational databases, including Education Resources Information Center (ERIC) and Education Full Text. I chose both ERIC and Education Full Text because of their breadth in educational research. The major topical keywords and the related subtopic keywords appear in Table 1.

Major topics	Related subtopics
Special education/educators	K-12 teachers, disability/disabilities, exceptional children
Professional development	in-service preparation, teacher learning, reflection
Online	technologically mediated, Internet, distance education

Table 1. Major topical keywords and related subtopics

The articles that emerged from the search focused on (1) identifying a research agenda for oTPD and (2) learning what teachers desired in oTPD.

Identifying an Initial Research Agenda

Early work on oTPD by Dede, Ketelhut, Whitehouse, Breit, & McCloskey (2008) set a research agenda for oTPD. The highlights of their agenda focused on the following:

- Identifying design features that enabled oTPD
- Supporting improved teacher practices through oTPD
- Documenting student-learning outcomes because of oTPD
- Justifying funding decisions

However, several factors have made this agenda difficult to implement for students with disabilities. First, online learning assumes many forms, from fully online to supplemental versions. Researchers are only now beginning to understand what constitutes high quality practice from teachers and administrators on behalf of students with disabilities in online settings (Greer, Rice, & Dykman, 2014; Rice & Dykman, in press). In addition, funding decisions that would determine professional development opportunities are not straightforward since monies for students with disabilities are allocated in a multitude of ways, all dependent on the constellation of state policies and priorities for online education, charter school funding, and IDEA funding disbursement (Oritz, Rice, Deschaine, Lancaster, & Mellard, 2017). Even so, the core tenets of this agenda around design, teacher improvement, student improvement, and funding have resonated in research.

Teachers' Desired oTPD

Another critical research topic on oTPD has been to identify topics that teachers care about. One survey of teachers (McConnell, Parker, Eberhardt, Koehler, & Lundenberg, 2012) found that teachers desired oTPD around four major topics: (1) collaboration, (2) discussion, (3) learning, and (4) sharing. Each of these has a social or relational component that overlaps to some extent with work in teacher presence (Garrison, 2007). Researchers have also found that teachers who participated in oTPD expected to form communities of inquiry that are mutually supportive and that sustain teachers in learning over time (Sugar & van Tryon, 2014). For the most part, however, these communities failed to actualize. In fact, a recent study of oTPD specifically found that teachers felt motivated to participate in oTPD not merely for professional community formation, but also to meet administrative expectations (Vu, Cao, Vu, & Capero, 2014). This lack of community might be exacerbated when it comes to online teachers who work with students with disabilities because teachers in traditional settings who do so experience high levels of frustration and burn out (Brunsting, Sreckovic, & Lane, 2014). Thus, while the online environment may have the *potential* to lessen alienation and frustration for teachers, there is no guarantee that it will necessarily do so.

Finally, Beach and Willows (2014) found that teachers were willing to engage in higher order cognitive processes when using professional development websites if they perceived that the information was of high quality, useful to their practice, and easy to navigate. Later, Beach and Willows (2017) conducted further research into the cognitive processes of professional development for elementary teachers wherein they sought to identify think aloud protocols as research tools that gave the most information about teacher thinking about instruction. They found that asking teachers to engage with the materials and then think aloud while revising them produced the most elaborate descriptions of their thinking. In addition to mapping a research strategy, Beach and Willows also suggest that teachers' opportunity to revisit and re-engage with materials may also be a useful practice for helping teachers optimize oTPD. Having online teachers engage in this type of complex exercise might provide potential models for oTPD, especially for diverse and underserved student populations like those with disabilities. However, there is no guidance at present for the practical application of the theoretical model as it relates to online teachers.

Conclusions from Literature

A review of the literature around what oTPD should look like structurally and what should be included as content raises a question as to whether online schools can provide opportunities to learn about working with students with disabilities. To answer this question, the perspective of teachers engaged in the oTPD as well as the administrators who should provide access to it required consideration. Further, it was important to learn how educators experienced the online format of professional development as additional preparation and support to work with this population.

Methods

This study drew on phenomenological strategies in educational contexts for describing what happens in specific educational settings (van Manen, 1990). Phenomenology carries with it the understanding that ontological knowing—the knowing embedded in contexts—emerges as shared ideas and stories in social contexts (Jakubik, 2007). Such sharing in an ontological frame contributes to learning in action (Orr, 1990). When seeking ontological knowing, phenomenology is often helpful because of the hermeneutic (meaning-making) goals. Willis (2001) communicated this as well in his explanation of the relationship between cognition and other ways of interpreting ontological experiences:

> Before human activities and events can be subjected to analytical abstracting knowledge, they are received as experiences. [Reality] is presented as an

> 'experienced' thing in which what is placed before the mind for naming is, as it were, a result of a mixture of sensory experiences, emotional responses, memories, prejudices and the like (p. 2).

Phenomenology was an appropriate methodology for this study because of its historic use as a methodology to describe newly emerging phenomena. Further, Halling (2008) suggested that phenomenologists look ideographically at individuals to identify, not essences, but general structures within a phenomenon among the individual participants. These general structures are not essences in the same way as are conclusions based on direct thematic treatment. Achieving this understanding of the phenomenon requires researchers to move back and forth between individual experience and abstraction. In so doing, a researcher carefully balances description with interpretation in accounts of research.

Participants

The participants in this study were administrators and teachers from various states working in diverse types of online learning programs. Eighteen administrators from 15 states representing 25 schools participated in this study (some administrators had responsibilities at more than one school). Each had functioned as an administrator for a least one year prior to participation in the study. The most experienced had more than 20 years of involvement in administration (including experience in brick-and-mortar schools) and 8 years of experience in fully online and/or supplemental online programs. Administrators in the study were nominated by curriculum vendors who supplied instructional materials to the schools, the charter network operations managers in the upper echelons of management, or the state online school superintendents. This resulted in 25 nominations. Of those nominated, 22 accepted the invitation to participate, but four left the study early because of administrative turnover. Some left online education and others went to other programs and schools and did not want to participate during their transition.

Fourteen teachers from seven states also participated. Each of these teachers had at least two years of experience teaching online. The most experienced teacher had taught online for 10 years (15 years total, including brick-and-mortar experiences). Recommendations for participation came from administrators with responsibilities for special education teachers, although administrators were reluctant to make nominations out of concern for the burden that study participation would place on teachers already overtaxed with teaching responsibilities. Many online teachers begin grading at 6 or 7 A.M., and are then "on call" or teaching virtual classes until the afternoon. During the evening, many teachers grade or contact students. Ultimately, 20 teacher nominations were received and 16 agreed to participate. During the study, 2 teachers were laid off because of budget cuts and did not wish to continue their participation. At their request, their data were removed from the corpus.

Data Collection

The major form of data collection in this study was semi-structured interviews. The semi-structured interview is designed to obtain objective responses from participants about their perceptions and/or experiences with phenomena (Marshall & Rossman, 2014). Teachers and administrators participated between one and eight times, depending on their consent and availability. These interviews lasted between 15 to 45 minutes. Administrators and teachers were asked to identify (1) types of professional development provided at their schools in the last year, (2) duration and frequency of these events, and the (3) topics covered. Thereafter, they were invited to tell stories, provide artifacts, or list specific things they learned.

Data Analysis

After the interviews, participants evaluated their transcripts and were invited to make clarifications and/or corrections, at which time they shared additional stories or artifacts. Administrators made a few clarifications about content and frequency of their events which were reflected in the final report of the findings. Teachers told additional stories. The trajectory of data analysis appears in Figure 2.

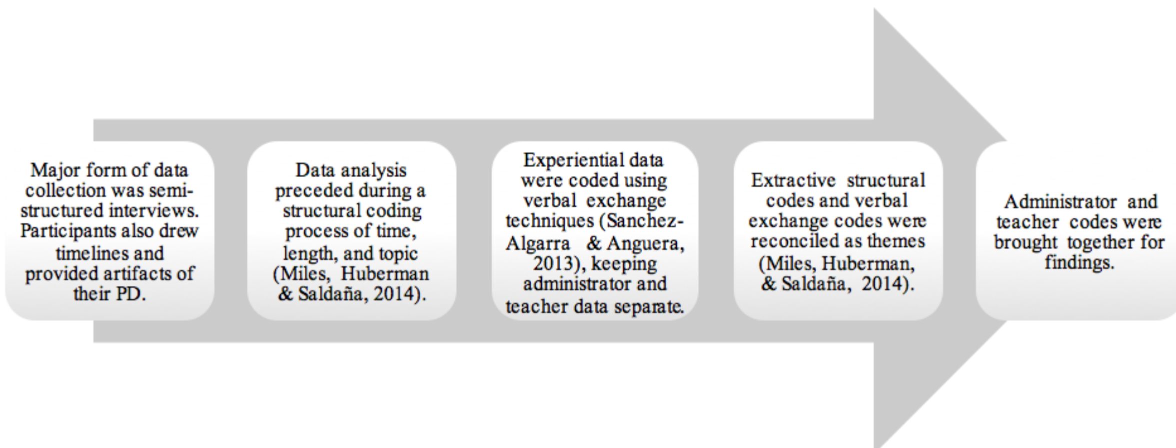

Figure 2. Data analysis process

Data analysis occurred by extracting the structural information (type and length of time) and content in the structural coding process (Miles, Huberman & Saldaña, 2014). The findings were captured for both administrators and teachers as tables. Then the interview data were coded using verbal exchange techniques (Sanchez-Algarra & Anguera, 2013), keeping administrator and teacher data about professional development separate. In this technique, coders sought and isolated information and exposition of data. Finally, the extractive structural codes and the verbal exchange codes were reconciled into themes (Miles, Huberman, & Saldaña, 2014). In this final step, administrator and teacher codes were merged.

Results

The findings of this study regarding the types of oTPD offered to teachers and the content in the oTPD as perceived by administrators and teachers are presented in this section. First, general findings are presented as to time configurations and types. Second, a table is presented of data from the administrator participants. Third, a table is presented of data from teacher participants. The fourth section presents the merged themes from administrator and teacher codes.

General Findings

Figure 3 represents the increments of time described for the oTPD activities.

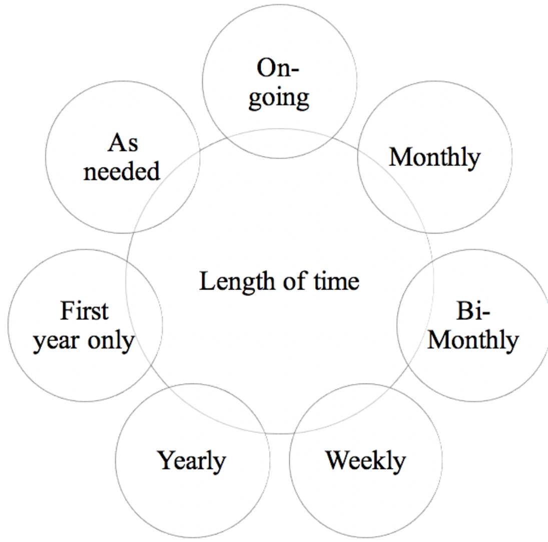

Figure 3. Time configurations for oTPD activities

Both teachers and administrators reported oTPD occurring in various length configurations. However, the most often reported time was "as needed," which can be seen in Tables 2 and 3. Figure 4 summarizes the activities most often reported types of oTPD.

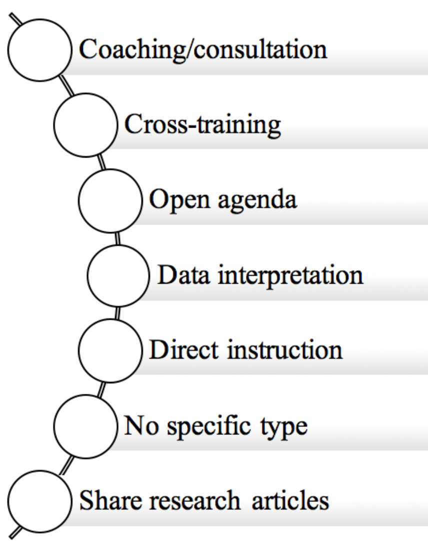

Figure 4. Summary of the types of oTPD reported

Discussions with participants clarified that the "as needed" oTPD typically assumed the form of consultation, which will be highlighted in the themes from both groups. In this scenario, teachers with immediate questions about working with students with disabilities contacted their administrator using digital technologies and their administrator provided an answer.

Data from Administrators

Table 2 summarizes information obtained about professional development from administrators.

Aspects of oTPD		
oTPD Structure		
Type of development	Length of time	Content
Coaching/consultation (n=5)	On-going (n=1)	Performance accountability (n=1)
Cross-training (n=1)	Monthly (n=1)	Common core curriculum standards (n=1)
Open agenda (n=2)	Bi-monthly (n=1)	Curriculum materials modification (n=1)
Data disaggregation (n=1)	Weekly (n=1)	Emotional support (n=2)
Direct instruction (n=2)	Yearly (n=1)	IEP compliance (n=4)
No specific type (n=2)	First-year teachers only (n=2)	School policy updates (n=2)
Share research articles (n=1)	As needed (n=6)	State policy updates (n=1)
		Subject matter knowledge (e.g., English, math) (n=1)
		Team building (n=2)

Table 2. Administrators' Reported oTPD Structure and Content

For administrators, the most common type of oTPD mentioned is consultation. This usually occurred via Skype or email. Further, this occurred on an as-needed basis. The most often mentioned topics were IEP compliance and policy updates from the school or state. Although some oTPD may be provided on an occasional basis around content knowledge and accommodations, this is not the norm according to the administrators that participated in this study.

Data from Teachers

Table 3 depicts the information obtained about professional development from teachers.

Aspects of oTPD		
oTPD Structure		
Type of development	Length of time	Content
Coaching/consultation (n=5)	Monthly (n=1)	Common core curriculum standards (n=1)
Open agenda (n=2)	Weekly (n=3)	Curriculum materials modification (n=1)
Data disaggregation (n=1)	Yearly (n=1)	Emotional support (n=6)
Direct instruction (n=2)	First-year teachers only (n=3)	IEP compliance (n=10)
No specific type (n=2)	As needed (n=8)	School policy updates (n=6)
Share research articles (n=1)		State policy updates (n=1)
		Subject matter knowledge (e.g., English, math) (n=4)
		Team building (n=4)
		Technology (n=3)

Table 3. Teachers' Reported oTPD Structure and Content

Although fewer in number, teachers described more types of oTPD than did administrators. Teachers tended to discuss team building, school policies, and emotional support from administrators, although the numbers overall were not very large. Finally, teachers agreed that most of their professional development occurred on an *as needed* basis and that the most common type was *coaching and consultation*.

Themes from Teachers and Administrator Data Combined

The themes that emerged from combining the data from both groups were (1) Compliance (2) Consultation, and (3) choice.

Compliance. Compliance took on several forms in the interviews. The first form was in terms of the legal compliance to special education law. The second involved school and, to a lesser degree, state, policies. The third was compliance to the curriculum created by outside vendors. Professional development also occurred around standards like the Common Core Curriculum Standards. Betty, an administrator illustrates this.

> [We address] what is legal, what is compliant, what do we need to be doing for students with an IEP to support them in our environment, and in our program. And so, we're saying: "So this is why we do this!" or, you know, providing them with the why so that as they're developing ways to work within the GE environment to make sure that our school wide program is compliant with the law, and is as student-centered as possible. (Administrator)

Note that the goal of the oTPD in this case was to help general education teachers be mindful of students with disabilities, fulfill legal requirements, and understand why procedures were integral, even obligatory.

Consultation. The second theme was consultation. Not only was this the dominant method mentioned by the teachers, it was also preferred by administrators. It seemed that administrators preferred to answer questions about specific cases and teachers wanted to bring their questions to administrators at will. Ava, an administrator discussed the consultation services she provides the teachers she supervises.

> We do data meetings where the teachers are with me for 15 to 30 minutes and we open test results and I look at the data from the caseload with teachers. And we talk about strengths and weakness. We also say, "What can we do to tailor this instruction for these students?" And then we also filter for small groups and see the effectiveness of educational practices. (Administrator)

In addition to this consultation around student learning, teachers and administrators provided emotional support as a form of consultation. Whether this consultation came from administrators or other teachers, teachers remembered and described incredible appreciation for it. This emotional support came in the form of "just in time" moments when teachers needed it, particularly after a negative experience with a student, but also occurred as jokes and memes from administrators.

Choice. The last theme was that of choice. At some schools, teachers were offered professional development in multiple areas and they were supposed to take classes that fit what their current needs. One teacher offered a description of the range of opportunities available to her.

> There's probably a handful every week of other professional development opportunities. There's a whole calendar that you can seek out to fit whatever you might be working on. If you are an elementary teacher and you need to do the Dibels® assessment on your students to assess their reading ability, then you can take a class on that, or if you are at the high school level and you're preparing your kids for state tests or math – you know there's a lot of focus on math right now, there's a ton of math professional development always available. There's a lot on ELL and special ed., writing workshops – yeah there's a lot of stuff. (Teacher)

The range of choices described illustrates why teachers might report oTPD in regular intervals of some sort (week, month, or year) but almost all also said "as needed." Rather than a comprehensive program of professional development, when there are offerings they are considered *a la carte*. Teachers can decide what sorts of these micro-development opportunities might fit their situation. Further, it became apparent that the *needed* part of the term *as needed* does not always mean a crisis is occurring; it may just mean that a teacher wants to learn about a topic. The goal of a school in an *a la carte* orientation might be to ensure that topics are offered often and they reflect current areas of concern for teachers. Also noteworthy is the notion that although some schools were offering multiple micro-development opportunities, there was consensus with the participating teachers and administrators that these were underutilized or they did not always answer the question at hand. In such cases, teachers sought consultation.

Discussion

This study asked two questions: What are the opportunities for oTPD for online teachers of students with disabilities? and What topics dominate these opportunities? As to the first question, the findings suggest that, while some schools have formal oTPD courses, there is no consistency to opportunity and that most oTPD occurs via consultation with individual administrators and other teachers. The fact that teachers can seek help when they want it and take the courses they desire is positive *if* teachers can take advantage of these opportunities. However, it also seemed that the teachers did not have opportunities to engage in technologically supported professional development to direct their own learning. This is unfortunate since Beach and Willows (2014; 2017) have found that teachers benefit from engaging with online information on their own and *then* talking through it again. If this is true, then web-based content about working with students with disabilities would be helpful to improve teacher learning as well as free administrators from some of their current consultation responsibilities.

For the second question, the content of oTPD is generally driven by compliance to special education legalities or school policies. Teachers and administrators agreed that teachers had few formal professional development opportunities beyond receiving information about legal compliance. Even so, some teachers reported that they formed informal collaborative communities to learn about effective instructional practices for students with disabilities. The content knowledge offerings at some schools were vast, but discussions with participants about these offerings revealed that courses were not attuned to the needs of students with disabilities and the teachers who worked with them. Further, a surprising lack of emphasis on technological learning was identified. When participants were asked about this, they agreed that there was much technology to learn; some said they had received formal oTPD, but most said that they learned technology on their own or by the informal consultation method.

Unfortunately, there was no mention of the strong communities that teachers built in these settings to serve students with disabilities, and there was no mention whatsoever of social justice—both of which might be important for the professional development of teachers working with students with disabilities (Theoharis & Causton, 2014; Thomas, 2015). However, this is unsurprising since deconstructing disability has generally not been a priority for teacher preparation or development. Even so, it might be fitting to include such topics in oTPD since part of the promise of the digital age is to reevaluate deeply entrenched social beliefs about difference and to challenge power structures—to be *disruptive* (Horn & Staker, 2014).

This study was qualitative in nature and no generalizability is expressed or implied. However, the findings from teachers and administrators at multiple schools in the United States suggest that program evaluators ought to review the time configuration as well as the content of oTPD for teachers, and especially for diverse students such as those with disabilities. Such reviews should consider whether current oTPD opportunities reflect the school's values and commitment to sustain teachers and support their improvement through both formal and informal oTPD or other types of professional development.

Recommendations for Future Research

The findings of this study suggest that the research agenda set for oTPD by Dede, Ketelhut, Whitehouse, Breit, and McCloskey (2009) has yet to be realized. Part of the reason may be that online teachers, for the most part, do not receive comprehensive, structured opportunities for professional development. Moreover, there may be fewer opportunities for forming teacher learning communities in schools where teachers become accustomed to calling the administrator to learn about working with students with disabilities. Indeed, one of the recruitment issues in this study was that heavy teaching obligations denied many teachers the time to participate in this research. Therefore, it may also be true that teachers are extremely limited in their time for oTPD and for leveraging that oTPD for learning to provide accommodations and instructional support to students with disabilities.

While the ethos of online learning focuses on learner control, it seemed from this data that teachers were comfortable with contacting their administrators to learn the answers to their questions rather than participate in structured professional development, including micro-development opportunities that might be available through oTPD. While teachers seemed satisfied with this, one cannot help but wonder whether that type of development meets the charge for administrators who truly desire inclusive schools (Billingsley, & McLeskey, 2014). A truly inclusive school would have teachers that worked alongside administrators, who formed strong networks among themselves, and who actively collaborated with parents and other community resources. Perhaps a worthy goal for the immediate future is to use research in oTPD to determine how to help teachers and administrators engage with additional types of resources (assuming these resources exist or they are not difficult to generate).

In addition, future research could focus on reviving or reinterpreting Dede and his colleagues' (2008) recommended priorities of (a) identifying design features, (b) supporting improved practice, (c) documenting learning outcomes, and (d) justifying funding decisions for oTPD. Research into oTPD that is truly *disruptive* (Horn & Staker, 2014)—meaning that it challenges the status quo policies and procedures that have hampered innovation in traditional schools might lead to some effective practices for oTPD that are malleable and can be scaled. However, other practices that are genuinely innovative may need to be tailored to certain contexts. Thus, there seems that there is an on-going need to learn about systematic macro-development opportunities for all teachers, particularly those who work with students with disabilities, as well as micro-development opportunities where teachers make choices, but still grow networks. These tensions may be especially acute in large virtual schools with many students and many teachers in states without firm policies around IEP implementation and service delivery.

Conclusion

Federal statutes protect students with disabilities as a population who are supposed to be included in society to the greatest extent possible, a mandate that includes online learning. This study revealed the phenomenologically captured perceptions of oTPD opportunities that teachers of students with disabilities in online contexts must improve their practices. The findings also revealed that participating teachers and administrators had little opportunity to improve accommodation and instructional skill, but received some consultative assistance regarding the laws at stake in serving these students. Further, even as these teachers learned about laws, they did not learn about how to truly ensure social justice or engage with the spirit of the laws that protect students with disabilities as a vulnerable population. Future research should document ways to include a more robust structure for professional development, while also experimenting with the choice in oTPD offerings for teachers of students with disabilities.

References

Beach, P., & Willows, D. (2014). Investigating teachers' exploration of a professional development website: An innovative approach to understanding the factors that motivate teachers to use Internet-based resources/Investigation de l'exploration par les enseignants d'un site Web. *Canadian Journal of Learning and Technology/La revue canadienne de l'apprentissage et de la technologie*, *40*(3). Retrieved from http://www.cjlt.ca/index.php/cjlt/article/view/26278

Beach, P., & Willows, D. (2017). Understanding teachers' cognitive processes during online professional learning: A methodological comparison. *Online Learning*, *21*(1), 60-84.

Berliner, D. C. (2000). A personal response to those who bash teacher education. *Journal of Teacher Education*, *51*(5), 358-371.

Billingsley, B. S., & McLeskey, J. (2014). What are the roles of principals in inclusive schools? In J. McLeskey, N. L. Waldron, F. Spooner, & B. Algozzine (Eds.) *Handbook of Effective Inclusive Schools: Research and Practice* (pp. 67-79). New York, NY: Routledge.

Brown, J. L. (2012). Online learning: A comparison of web-based and land-based courses. *Quarterly Review of Distance Education*, *13*(1), 39-42.

Brownell, M. T., Sindelar, P. T., Kiely, M. T., & Danielson, L. C. (2010). Special education teacher quality and preparation: Exposing foundations, constructing a new model. *Exceptional Children*, *76*(3), 357-377.

Brunsting, N. C., Sreckovic, M. A., & Lane, K. L. (2014). Special education teacher burnout: A synthesis of research from 1979 to 2013. *Education and Treatment of Children*, *37*(4), 681-711.

Burdette, P. J., & Greer, D. L. (2014). Online learning and students with disabilities: Parent perspectives. *Journal of Interactive Online Learning*, *13*(2), 67-88.

Butler, D. L., Lauscher, H. N., Jarvis-Selinger, S., & Beckingham, B. (2004). Collaboration and self-regulation in teachers' professional development. *Teaching and Teacher Education*, *20*(5), 435-455.

Butler, R. (2007). Teachers' achievement goal orientations and associations with teachers' help seeking: Examination of a novel approach to teacher motivation. *Journal of Educational Psychology*, *99*(2), 241-252.

Charalambousa, K., & Ioannou, I. (2011). The attitudes and opinions of Cypriot primary teachers about the use of the Internet for their professional development and as an educational tool. *Learning, Media and Technology, 33*(1), 45-57.

Cochran-Smith, M., & Dudley-Marling, C. (2012). Diversity in teacher education and special education: The issues that divide. *Journal of Teacher Education*, *63*(4), 237-244.

Cochran-Smith, M., & Zeichner, K. M. (Eds.). (2009). *Studying teacher education: The report of the AERA panel on research and teacher education*. New York, NY: Routledge.

Cook, B. G., & Odom, S. L. (2013). Evidence-based practices and implementation science in special education. *Exceptional Children*, *79*(2), 135-144.

Darling-Hammond, L. (1998). Teacher learning that supports student learning. *Educational Leadership*, *5*(5), 91-100.

Dede, C., Ketelhut, D., Whitehouse, P., Breit, L., & McCloskey, E. M. (2009). A research agenda for online teacher professional development. *Journal of Teacher Education*, *60*(1), 8-19.

Deshler, D., Rice, M., Greer, D. (2014, April). *Which demographic variables predict final grades for high school students enrolled in online English/ELA courses? Results from a regression analysis.* Presentation at the annual meeting of the American Educational Research Association. Philadelphia, PA.

Feng, L., & Sass, T. R. (2013). What makes special-education teachers special? Teacher training and achievement of students with disabilities. *Economics of Education Review*, *36*, 122-134.

Freidhoff, J. R. (2015). *Michigan's K-12 virtual learning effectiveness report 2013-14*. Lansing, MI: Michigan Virtual University. Retrieved from http://media.mivu.org/institute/pdf/er_2014.pdf

Garrison, D. R. (2007). Online community of inquiry review: Social, cognitive, and teaching presence issues. *Journal of Asynchronous Learning Networks*, 11(1), 61–72.

Giangreco, M. F., Carter, E., Doyle, M. B., & Suter, J. C. (2010). Supporting students with disabilities in inclusive classrooms. *Confronting obstacles to inclusion: international responses to developing inclusive education. London: Routledge*, 247-264.

Giangreco, M. F., Edelman, S. W., Broer, S. M., & Doyle, M. B. (2001). Paraprofessional support of students with disabilities: Literature from the past decade. *Exceptional Children*, *68*(1), 45-63.

Greer, D., Rice, M., Dykman, B. (2014). Reviewing a decade (2004-2014) of research at the intersection of online learning coursework and disability (pp. 135-159). In R. Ferdig and K. Kennedy (Eds.) *Handbook of research on K-12 online and blended learning.* Pittsburgh, PA: ETC Press.

Halling, S. (2008). *Intimacy, transcendence, and psychology: Closeness and openness in everyday life*. New York, NY: Palgrave Macmillan.

Individuals with Disabilities Education Act (IDEA), 20 U.S.C. § 1400 (2004).

Jakubik, M. (2007). Exploring the knowledge landscape: four emerging views of knowledge. *Journal of knowledge management*, *11*(4), 6-19.

Kanuka, H., & Nocente, N. (2003). Exploring the effects of personality type on perceived satisfaction with web-based learning in continuing professional development. *Distance Education*, 24(2), 227-244.

Kao, C. P., Wu, Y. T., & Tsai, C. C. (2011). Elementary school teachers' motivation toward web-based professional development, and the relationship with Internet self-efficacy and belief about web-based learning. *Teaching and Teacher Education*, *27*(2), 406-415.

Marshall, C., & Rossman, G. B. (2014). *Designing qualitative research*. Thousand Oaks, CA: Sage.

Mayer, R. E. (2002). Multimedia learning. *Psychology of Learning and Motivation*, *41*, 85-139.

McConnell, T. J., Parker, J. M., Eberhardt, J., Koehler, M. J., & Lundeberg, M. A. (2013). Virtual professional learning communities: Teachers' perceptions of virtual versus face-to-face professional development. *Journal of Science Education and Technology*, *22*(3), 267-277.

Miles, M. B., Huberman, A. M., & Saldaña, J. (2013). *Qualitative data analysis: A methods sourcebook*. Thousand Oaks, CA: Sage.

Molnar, A., Miron, G., Huerta, L., King Rice, J., Cuban, L., Horvitz, B., & Rankin Shafer, S. (2013). *Virtual schools in the US 2013: Politics, performance, policy, and research evidence*. Boulder, CO: National Education Policy Center. Retrieved from http://files.eric.ed.gov/fulltext/ED558723.pdf

Orr, J. E. (1990). Sharing knowledge, celebrating identity: Community memory in a service culture. In D. Middleton & D. Edwards (Eds). *Collective remembering*, (168-189) London: Sage.

Ortiz, K., Rice, M., Deschaine, M., Lancaster, S., & Mellard, D. (2017). *Current policies to the provision of special education services in fully online statewide virtual schools.* Lansing, MI: Michigan Virtual University.

Pazey, B. L., & Cole, H. A. (2013). The role of special education training in the development of socially just leaders building an equity consciousness in educational leadership programs. *Educational Administration Quarterly*, *49*(2), 243-271.

Rice, M., & Carter, Jr., R. A. (2015). When we talk about compliance it's because we lived it: Online educators' experiences supporting students with disabilities. *Online Learning, 19*(5), 18-36.

Rice, M., & Dykman, B. (in press). The emerging research base for online learning and students

with disabilities. In R. Ferdig and K. Kennedy (Eds.) *Handbook of research on K-12 online and blended learning.* Pittsburgh, PA: ETC Press.

Roeser, R. W., Skinner, E., Beers, J., & Jennings, P. A. (2012). Mindfulness training and teachers' professional development: An emerging area of research and practice. *Child Development Perspectives*, *6*(2), 167-173.

Sánchez-Algarra, P., & Anguera, M. T. (2013). Qualitative/quantitative integration in the inductive observational study of interactive behaviour: impact of recording and coding among predominating perspectives. *Quality & Quantity*, *47*(2), 1237-1257.

Siciliano, M. D. (2016). It's the quality not the quantity of ties that matters: Social networks and self-efficacy beliefs. *American Educational Research Journal*, *53*(2), 227-262.

Soine, K. M., & Lumpe, A. (2014). Measuring characteristics of teacher professional development. *Teacher Development*, *18*(3), 303-333.

Smith, S. J., Basham, J. D., Rice, M., Carter, R. A., Jr. (2016). Preparing special education teachers for online learning: Findings from a survey of teacher educators. *Journal of Special Education Technology, 31*(3), 170-178.

Sugar, W., & van Tryon, P. J. S. (2014). Development of a virtual technology coach to support technology integration for K-12 educators. *TechTrends*, *58*(3), 54-62.

Theoharis, G., & Causton, J. (2014). Leading inclusive reform for students with disabilities: A school-and system-wide approach. *Theory Into Practice*, *53*(2), 82-97.

Thomas, J. (2015). Resource students use of Internet reading strategies in an online inquiry project. In M. Rice (Ed.). *Exploring pedagogies for diverse learners online* (pp. 25-65). Bingley, UK: Emerald Group Publishing.

van Manen, M. (1990). *Researching lived experience*. New York, NY: State University of New York Press.

Vu, P., Cao, V., Vu, L., & Cepero, J. (2014). Factors driving learner success in online professional development. *The International Review of Research in Open and Distributed Learning*, *15*(3). Retrieved from http://www.irrodl.org/index.php/irrodl/article/view/1714/2907

Watson, J., Murin, A., Vashaw, L., Gemin, B., & Rapp, C. (2011). Keeping Pace with K-12 Online Learning: An Annual Review of Policy and Practice, 2011. *Evergreen Education Group*.

Weschke, B., & Barclay, R. (2011). Online teacher education: Exploring the impact of a reading and literacy program on student learning. *Online Learning, 15*(2), 22-43.

Wilhelm, A. G., Chen, I. C., Smith, T. M., & Frank, K. A. (2016). Selecting expertise in context middle school mathematics teachers' selection of new sources of instructional advice. *American Educational Research Journal*, *53*(3), 456-491.

Willis, P. (2001). The "things themselves" in phenomenology. *Indo-Pacific Journal of Phenomenology*, *1*(1), 1-12.

Zigmond, N. (2003). Where should students with disabilities receive special education services? Is one place better than another? *The Journal of Special Education*, *37*(3), 193-199.

Best Practices Framework for Online Faculty Professional Development: A Delphi Study

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Abstract

Online learning is now a common practice in higher education. Because of the continued online enrollment growth, higher educational institutions must prepare faculty throughout their teaching career for learning theory, technical expertise, and pedagogical shifts for teaching in the online environment. This study presents best practices for professional development for faculty teaching online. In this study, the Delphi Method was used to gain consensus from a panel of experts on the essentiality of professional development items to help faculty prepare for teaching in the online environment. After four survey rounds to develop consensus, best practices were identified consisting of essential professional development and institutional/organizational strategies for supporting faculty teaching online. These results are significant for planning new or improving existing faculty development programs that enhance teaching and learning in the online classroom.

Keywords: online faculty development, online faculty training, teaching online

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Best Practices Framework for Online Faculty Professional Development: A Delphi Study

Technology has forever changed the higher education landscape through enriched learning environments; because of this, faculty need tools and resources to help successfully facilitate learning in online educational environments (Facer, 2011). Today, online education enrollment continues to grow even in the face of declining overall higher education enrollment (Allen & Seaman, 2016, 2017) with over 6 million students taking at least one online course in Fall 2015 (Allen & Seaman, 2017). In fact, one-third of all students in higher education are now enrolled in at least one online class and about half of those students complete all of their classes at a distance (Allen & Seaman, 2017).

Because of the continued growth of online education, faculty professional development has become a major focus (Herman, 2012), as faculty members often teach as they were taught, and many distance educators did not take online courses as students, which leaves them without a benchmark model for online teaching (Schmidt, Tschida, & Hodge, 2016). Given that faculty members are subject matter experts in the classroom, without professional development, they may not be creating the most effective learning environments for students (Meskill & Anthony, 2007). As institutions adopt online education to support institutional growth and student needs, it becomes essential to provide faculty with effective professional development opportunities that expose them to online methodologies (Vaill & Testori, 2012).

Higher educational leaders need to build and foster a common vision around the role of online teaching within an institution so that it can be integrated into the faculty and campus culture (Kaminskaya, 2006). Unfortunately, most professional development for faculty has been ineffective and wasteful more times than not because it has often been ad hoc, discontinuous, and unconnected to any plan for change (Reeves, 2012). In addition, many professional development opportunities for online faculty focus around technological training, but online instructors would also like the opportunity to learn about effective online pedagogical practices (Bailey & Card, 2009). Further, professional development opportunities are essential for faculty to learn from best practices and develop successful facilitation skills within an online environment (Moskal, Thompson, & Futch, 2015).

Based on a review of the literature of centers for teaching and learning, online faculty training, and faculty professional development, consistent standards have not been developed to help those responsible preparing faculty for the online environment such as centers for teaching and learning. Further, an abundance of technology tools and resources are available for the online modality, but best practices for faculty development and use of these tools and resources have not been created (Tabor, 2007). Using technology has become ubiquitous at most higher education institutions and faculty need professional development opportunities to help them understand when to use technology and to what degree to use technology in the online learning process (Ouellett, 2010). Because the availability of technologies continues to increase, so has the need for faculty development for using technology as a tool in the online learning environment (Picciano, 2006). With this in mind, higher education institutions need to prepare faculty throughout their teaching career for learning theory, technical expertise, and pedagogical shifts before and as they teach in the online environment (Shelton, Saltsman, Hostrom, & Pedersen, 2014). In addition to the training and teaching components, faculty need support and training in all aspects that interact with the online program (Shelton & Saltsman, 2005). Therefore, the purpose of this study was to identify best practices for providing professional development for faculty teaching online.

Review of Related Literature

Institutions need to create professional development opportunities that support faculty transitioning into online teaching to help ensure quality (Schmidt et al., 2013). Key professional development practices that enable faculty to develop their online role include visibility, intentionality, and active engagement (Jaggars, Edgecomb, & Stacey, 2013). Successful faculty development programs provide opportunities to build upon previous learning activities, collaborate with peers, and align with state and national standards (Birman, Desimone, Porter, & Garet, 2000). To date, research suggests development programs are most effective when they incorporate diverse teaching methods, experiential learning, effective peer and colleague relationships, provide feedback, and apply effective teaching and learning principles (Steinert et al., 2006). Ideally, teaching practices should help faculty identify, access, and use information in several contexts to assist student learning (Otto, 2014). Additionally, faculty development programs need to recognize faculty members' experiences as learners and teachers in the classroom to build upon those experiences and continue growing their knowledge (McQuiggan, 2011).

A critical component of successful online programs is the preparation of faculty to teach online (Baran & Correia, 2014; Kerrick, Miller, & Ziegler, 2015). In addition, faculty professional development should provide faculty with the skills needed to produce quality-learning experiences for their students (Wei, Darling-Hammond, Andree, Richardson, & Orphanos, 2009), as many faculty feel they can teach the same online as they do face-to-face (Hale, 2012). Moreover, faculty members are adult learners who should be continuously working through a process of critical reflection and action to transform meaning of structures related to online teaching (Baran, Correia, & Thompson, 2011). In addition, professional development opportunities can help faculty feel less isolated and disconnected from colleagues, build a community of learners, improve teaching, and help to build organizational capacity (Eib & Miller, 2006). However, most new online instructors begin teaching with little to no training or preparation specific to the online classroom (Alexiou-Ray & Bently, 2015; Fish & Wickersham, 2009). Additionally, online faculty often have little training in pedagogy for online instruction (Gabriel & Kaufield, 2008) and may not have an interest in learning more about pedagogy (Major, 2010). Additionally, faculty members may find it challenging to be placed in the student role and making mistakes in a place where one cannot lose face (Kress, Thering, Lalonde, Kim, & Cleeton, 2012). It is not uncommon for faculty to seem resistant to change or even dismiss the efforts of others who are engaged and demonstrating value in technological advancements (Kress et al., 2012).

Lane (2013) suggested that most professional development opportunities are too limited for faculty who are learning to teach online because they focus more on technology and not pedagogy (Lane, 2013). As online education has been growing, faculty involvement and acceptance of online education has been modest and limited change has occurred with online pedagogy (Natriello, 2005; Stewart, Bachman, & Johnson, 2010). In addition, an absence of faculty training in online pedagogy leads to low levels of faculty participation as well as poorly designed and executed online courses, which then may lead to lower student success and faculty satisfaction (University Leadership Council, 2010). However, support for professional development around online education is critical to allow faculty the opportunity for pedagogical problem solving and discovery (Kreber & Kanuka, 2006).

Purpose Statement and Research Questions

The purpose of this research was to identify best practices for higher education teaching and learning centers. This research study sought to bring consensus among directors of teaching and learning centers and directors of online learning to identify best practices of faculty development about online learning using the Delphi Method. While many schools use different faculty development practices, little is known about which faculty development practices are seen as the most effective and efficient (Austin & Sorcinelli, 2013). Before starting and providing resources for an online education at a teaching and learning center, it is important to understand which types of programs will be most effective and appropriate for their institutional contexts (Herman, 2012). Further, conducting research to assess the needs of faculty is an essential first step to develop an effective staff development plan (Engleberg, 1991). Thus, this research study provided a way to help understand learning needs and ways to invest in faculty development based on a needs assessment (Witkin, 1984). The following research question was analyzed for this study: What are best practices for offering professional development for higher education online faculty?

Methods

The Delphi Method, a procedure designed to have a panel of experts reach consensus on a particular topic without face-to-face interaction, was used to gather consensus from an expert panel. The method is cost-effective and collects and quantifies a large amount of data (Linstone & Turoff, 1975). Originating in the 1950s, the Delphi Method was created through a series of studies that the RAND Corporation conducted with the objective of developing a technique to obtain the most reliable consensus of a group of experts (Dalkey & Helmer, 1963). The Delphi Method incorporates qualitative data collection through expert opinions to achieve consensus while relying on quantitative techniques to rank the areas related to the issue (Pchenitchnaia, 2007). Linstone and Turoff (1995) identified four important phases of this method. Phase one begins with exploration of the research topic where each panel expert responds to provided prompts as well as contributes additional information on the topic being explored. Phase two is the process of gaining consensus among the panel experts. Phase three is where the reasoning behind disagreement is extracted and digested. Finally, the fourth phase ends when all previously gathered information has been analyzed and evaluations have been returned to panel experts for consideration.

Delphi Method. According to Rowe and Wright (1999), four key features characterize the Delphi Method:

1. Anonymity of participant allows free expression of opinions without influence of groupthink.
2. Iterative process where participants refine their views each round based on participant feedback.
3. Controlled feedback that allows for participants to clarify or change their views during each iterative round.
4. Data allows for quantitative analysis and interpretation.

The Delphi Method was selected to generate consensus from the expert panel and examine informed judgments on a topic spanning a wide range of disciplines (Delbecq, Van de Ven, & Gustafson, 1975). The research method was selected because there was incomplete knowledge around best practices for training and development of online faculty in teaching and learning centers. Further, the goal of the method was to improve the understanding around problems, opportunities, and solutions and identify best practices that can be used in teaching and learning centers to prepare faculty for the online classroom (Skulmoski, Hartman, & Krahn, 2007). The first-round survey used in this Delphi study was developed from a review of literature of professional development for online faculty members.

Expert panel. In a Delphi study, the participant sample consists of the respondents on a panel of experts on the topic needing consensus (Wilhelm, 2001). For this study, the expert panel consisted of Directors of Teaching and Learning Centers and Directors of Online Learning Departments that support online programs at their higher education institutions in the United

States. Directors of Online Learning Departments were included since many institutions offer professional development through these departments. Members of the Professional and Organization Development Network in Higher Education (POD) and members of the Online Learning Consortium (OLC) were identified as potential panel members. In addition, snowball sampling was used to identify additional Directors of Online Learning. Further, the panel criteria for selection included a minimum of five years' experience working in a teaching and learning center or online program in higher education or a role in supporting faculty at an institution that teaches online. Experience working with online faculty for at least five years supports the knowledge necessary to offer expert opinion.

Careful attention was given to select expert panel participants who had knowledge and strong experience in training online faculty (Baker, Lovell, & Harris, 2006). The potential panel experts were selected for this study because of their knowledge of online education or involvement with teaching and learning centers along with the desire to potentially benefit from the results of this study. Eighty prospective panel members were identified as meeting the criteria for this study and were solicited for study participation. Fifty-seven experts agreed to participate.

For this study, finding participants with a background in online education and teaching and learning centers was essential. The majority of panel experts (59.5%) had experience in both online education and teaching and learning centers and 38 % had experience in online education with only 2% having sole experience in teaching and learning centers. There was also a good distribution of institutional experience from the panel experts with 50% being at public universities followed by 29% of panel experts from private colleges or universities. The participant sample consisted of Directors of Teaching and Learning Centers from the Professional and Organizational Development Network (POD) and Directors of Online Programs from the Online Learning Consortium's Institute for Engaged Leadership in Online Education Alumni group. POD is the largest and oldest faculty development organization and the Online Learning Consortium is the leading organization dedicated to supporting quality online education. It is important to note that more than 57% of the expert panel had 15 or more years' experience in online education or teaching and learning centers as the strength of the Delphi Study is related to the expertise level of the panel members.

Table 1 provides the percentage participation of the members of the expert panel for each round. Among the original panel members, 72% completed all rounds of the Delphi survey process. As confirmed in the literature, it is difficult to keep a panel of experts fully engaged through the survey process. However, the participation rate for this study was above the 70% per round rate recommended by Hasson, Keeney, and Mckenna (2000). Given the large time commitment of panel experts, non-response rates can be an issue (Linstone & Turoff, 1975); therefore, precautions were taken to encourage full participation. The actions included clearly defining the time commitment, providing a financial incentive, and offering to share the research results with the experts. In order to encourage a high response rate, panel experts who completed all rounds of the Delphi research received a monetary honorarium of a $25 U.S. dollar Amazon gift card provided by the researcher.

Delphi Round	Experts Enlisted	Completed Survey	Response Rate
I	57	54	94.7%
II	54	42	77.9%
III	42	39	92.9%
IV	39	39	100%

Table 1. Percentage of Expert Panel Participation for Each Round

Delphi survey rounds and analysis. During each round of this study, panel experts responded to each survey item using a six-point balanced bipolar, Likert scale response (Likert, 1932). The panel experts were asked to evaluate the current and future essentiality of each suggested component of online faculty development elements where a score of -3 was Definitely Not Essential, -2 was Not Essential, -1 was Slightly Not Essential, 1 was Slightly Essential, 2 was Essential, 3 was Definitely Essential. There was also an option for the panel member to respond that they do not have the experience to provide an expert opinion on this item. Using a negative scale is common in Likert scale implementation and helps when analyzing data to indicate the strength of agreement or disagreement (Peabody, 1962).

The desired outcome in Delphi research is for creativity, synergy, and consensus to occur with the panel experts (Rotondi & Gustafson, 1996). The survey procedure comes to an end when consensus or stability of responses is achieved (Murry & Hammons, 1995). The Delphi panel experts were asked if they wanted to change or keep their rank for each survey item based on the group responses. In this study, if consensus on a variable was not reached after three survey rounds, it was concluded that consensus was not reached, and the item was removed.

After Institutional Review Board approval, recruitment began for potential panel participants of the opportunity to participate in this research study. An email was sent that explained the topic of research, gave information about the Delphi Method, estimated the time commitment for participation, and the included the request to participant. The Delphi process started with a survey of literature of professional development practices, which focused on the research question (Skulmoski et al., 2007). From the literature review, the first survey round questions provided the panel quality standards of teaching and learning and faculty support established from the Online Learning Consortium's *Quality Scorecard Handbook* (Shelton et al., 2014). The initial survey concluded with questions that were open-ended to allow participants to provide a broad range of responses that were then used to build the collective perspective of the research participants on the topic (Linstone & Turloff, 1975). The online questionnaire was electronically distributed to Delphi participants and was returned online for data analysis. Based on the round one data, quantitative analysis reviewed descriptive statistics and mean scores for consensus and qualitative coding was used to help categorize the new responses provided by the panel members to prepare for the second survey round.

For this research, the goal was to establish consensus among the expert panel (Linstone & Turoff, 1995). This study used descriptive statistics to measure the consensus level established with a mean score of 2.0, which equated to "Essential" out of the 3.0 maximum value response option used for measurement. After analyzing results of each round, any item that met consensus was removed from consideration in subsequent rounds. The survey items that had not met consensus were returned to the panel experts for further review along with the percentage of agreement among the prior round of responses.

The first-round survey provided from the literature 59 professional development considerations, 12 organizational/institutional best practices, and 12 online classroom contextual best practices for a total of 83 items for the panel to review. In the first survey round, the expert panel suggested an additional 29 professional development considerations, 22 organizational/institutional best practices, and 7 online classroom contextual best practices that were then added to the second survey (a total of 58 suggestions). A total 47 items met the consensus level and were removed from consideration (see Table 3 for complete round by round results).

Professional Development Opportunities
1. Creating faculty presence in the online classroom
2. Online feedback strategies
3. Developing and maintaining teaching presence online
4. Adaptation of teaching pedagogy for online
5. Strategies for connecting with online students
6. Online student engagement
7. Online assessment strategies
8. Using course objectives as the foundation for your online course
9. Planning and organizing an online classroom
10. Managing an online class
11. Designing and structuring an online course
12. Creating course content to align with learning objectives
13. Learning how to use the learning management system efficiently for items like: announcements, assessments, uploading files, discussion boards, learning modules, folders, and gradebook.
14. Online course discussions
15. Establishing a welcoming course environment
16. Creating accessible materials
17. Strategies for enhancing teacher and student relationships
18. Developing coherence between learning outcomes, course materials, and assessment
19. Adapting assignments for online
20. Copyright compliance and fair use
21. Grading student learning
22. FERPA guidelines
23. Guiding student learning
24. Active learning strategies
25. Student centered learning environments
26. Assisting students with disabilities online
27. Academic integrity
28. Characteristics of online students
29. Grading rubrics
30. Quality review standards
31. Guiding student learning
32. Knowing your online students
33. Using technology tools to enhance students learning of course objectives
34. Fostering online relationships
35. Creating classroom policies
36. Responding to student emails online and through email
37. Being flexible and adapting in the online classroom
38. Facilitating individual learning

Table 2. Round 1 Survey Items

39. Student motivational strategies
40. Facilitating group learning (collaboration)
41. Holding online office hours
42. Applying evidence based teaching in the online classroom
43. Integrating multimedia tools in the online classroom
44. Evaluating an online course
45. Pedagogical knowledge about technology integration
46. Introduction to instructional design
47. Faculty classroom/time management strategies
48. Creating innovating learning opportunities in the online classroom
49. Technology basics - Email and Microsoft Office products
50. Technology basics - Screen-casting tools
51. Retention strategies
52. Adult learning theories
53. Technology basics -Video creation tools
54. Teaching strategies for a generational diverse classroom
55. Technology basics -Audio tools (podcasting)
56. Strategies to support lifelong learning
57. Supporting military learners
58. Learning through social media and networking tools
59. Career focused learning

Organizational Development Opportunities

60. Support from instructional designers/technologists
61. Support from technology department on audio/visual resources
62. Polices on intellectual ownership
63. Higher education institution specific training for online
64. Meeting Institute-specific academic standards
65. Faculty mentoring
66. Support from library resources
67. Creating a strong school culture for online teaching
68. Institutional demographics of online students
69. Peer support programs
70. Participating in a community of practice in faculty content areas
71. Reward system for good online teaching

Contextual Development Opportunities

72. Faculty support for instructional design
73. Faculty support for technology
74. Strong orientation system for faculty that includes best practice resources and course design templates
75. Understanding how to use technology
76. Evaluating online classes: Student evaluation
77. Faculty support for selecting technology
78. Troubleshooting issues when they arise in the online environment
79. Evaluating online classes: Faculty evaluation
80. Evaluating online classes: Organizational evaluation
81. Faculty motivational strategies
82. Using goal setting in creating a faculty professional development plan
83. Strategies for supporting lifelong learning

Table 2 (cont.). Round 1 Survey Items

For the second survey, in addition to the 58 new suggestions, 36 items were returned that did not meet consensus for a re-vote. After the second survey round, a total of 14 items reached consensus. Following the same process from round one, the round three questionnaire was developed based on the prior responses. The third survey round resulted in seven items reaching consensus. The fourth survey round returned those items not reaching consensus, but all failed to achieve consensus. Each round of survey questions became more focused based on the data analysis and research questions. Table 3 provides an overall summary of each survey round.

	Professional Development Items with Consensus	Organizational/Institutional Items with Consensus	Online Classroom Contextual Items with Consensus	Total Items Achieving Consensus	Original Survey Items/Panel Suggestions
Round I	32	7	8	47	47/0
Round II	4	8	2	14	2/12
Round III	5	1	1	7	0/7
Round IV	0	0	0	0	0
	41	16	11	68	49/19

Table 3. Survey Round Data Collection Summary

Limitations

Research limitations are potential weaknesses in the study or things that are beyond researcher control (Creswell, 2014). For this study, the following limitations exist:

1. Potential research bias can influence the qualitative responses.
2. Researcher error in execution can occur in returning new responses to the panel suggested in prior rounds.
3. Because the Delphi Method requires several surveys, the expert panel may grow weary and not respond as carefully in the later rounds.

Results and Discussion

This four-survey-round Delphi study examined best practices for professional development identified by a panel of experts to meet online faculty needs and collected additional practices that the expert panel members believed to be relevant for preparing faculty to teach in the online classroom. The study received strong participation from the expert panel and the researcher believes that the strong participation rate can be attributed to the panel experts' interest in the results of the study to help them better understand and prepare faculty for teaching online at their institutions. The raw data yielded 41 best practices for professional development considerations, 16 organizational/institutional best practices, and 11 online classroom contextual best practices. For the professional development best practices, 33 were from the original survey and 8 were suggested by the expert panel. For the organizational/institutional best practices, eight were from the original survey round and eight were suggestions from the panel members. For the online classroom contextual best practices, eight were from the original survey and three were suggested by the panel members. However, it was determined that duplicate and similar items existed. After careful review, the duplicates were removed, resulting in a best practices framework for supporting online faculty with two categories: professional development considerations and institutional/organizational strategies. The group of online classroom contextual best practices were folded into the first two categories and clearly did not warrant a separate category. Table 4 provides best practices for professional development considerations and Table 5 provides best practices for institutional/organizational strategies for online faculty development.

After a final qualitative review process, the online faculty professional development topics considered essential were divided into four categories to structure the learning opportunities: faculty roles, online classroom design, learning processes, and legal issues. When thinking about faculty roles in the online classroom, key opportunities focus around faculty creating a presence in the online classroom, how to develop and maintain a teaching presence, strategies to manage an online classroom, and understanding faculty roles online. Additionally, the design of the online classroom is important and should include: how to plan, structure, and organize an online classroom, creating learning assessments appropriate for the learning environment, how to manage the online classroom, using the learning management system effectively in the learning process, and upholding quality standards online. Training for legal issues is increasingly becoming more necessary as the use of digital materials and intellectual property ownership can be misunderstood.

Although this study was focused on determining best practices for online faculty development, an impact still exists to the institution or organization. Best practices were identified that help to reinforce the importance of supports that should be provided to online faculty and programs. Three categories were identified through the review process: supportive campus climate, institution specific, and staffing support.

Online Faculty Professional Development Topics

Faculty Roles
• Creating faculty presence in the online classroom
• Developing a teaching presence
• Managing an online classroom
• Faculty strategies to connect with online students
• Understanding the role of the faculty member in the online classroom.
Classroom Design
• Planning, structuring, and organizing an online classroom
  o Utilizing course objectives as the foundation for developing an online course
  o Alignment and coherence of key course design elements (learning outcomes, assessments, and learning activities)
  o Creating appropriate learning assessments for online
    ▪ Adapting existing assessments/assignments for online
  o Developing effective online discussions
  o Faculty tools for discussion board management
  o Student-centered learning environment
  o Engagement strategies for students
  o Online feedback strategies
  o Importance of formative and summative feedback

Table 4. Best Practices Framework for Online Faculty Support: Faculty Professional Development

- Managing the online classroom
    - Utilizing the learning management system effectively
    - Establishing a welcoming course environment
    - Online communication strategies
    - Guiding student learning
    - Online discussion strategies
    - Fostering online relationships and knowing students
    - Assisting with online students with disabilities
    - Online grading strategies
- Upholding quality standards online
    - Course development standards and rubrics
    - Purposeful use of technology and tools online
    - Preparation to develop the course

Learning Processes

- Writing measurable course objectives
- Applying active learning strategies
- Adapting teaching pedagogy for the online classroom

Understanding Legal Issues in the Online Classroom

- Copyright compliance and fair use
- FERPA Guidelines
- ADA Compliance Guidelines
- Academic Integrity

Table 4 (cont.). Best Practices Framework for Online Faculty Support: Faculty Professional Development

Institutional/Organizational Strategies

Supportive Campus Climate for Online Learning

- Support from the institution for online education
- Institutional culture supportive of online education
- Adequate resources for online programs
- Clear organizational structure to support online programs
- Institution coordination of quality assurance standards
- Time allowance for course material development and training
- Comprehensive student support – tutoring, advising, counseling, writing, etc.

Institution Specific Expectations for Online Learning

- Faculty mentoring
- Adequate professional development opportunities for the online teaching environment
- Strong orientation system for faculty that includes best practice resources and course design templates.
- Policy
- Teaching guidelines for the online classroom
- Intellectual ownership of online classroom
- Online class evaluation process
- Student evaluation
- Faculty evaluation

Staffing Support

- Instructional designers/technologists to support
- Online course development

Table 5. Best Practices Framework for Online Faculty Support: Institutional/Organizational Strategies

- Accessible course material development
- Online course evaluation
- Ensuring faculty role in online classroom
- Technology staff to provide faculty technical support through on-demand resources, tutorials, or personalized assistance.
- Troubleshooting of technical issues.
- Support for selecting technology for use in the online classroom.
- Support for creating accessible class media.
- Audio/visual resource support.
- Library Staff Support for:
    - Finding resources for the online classroom.
    - Supporting faculty and students in the online classroom.

Table 5 (cont.). Best Practices Framework for Online Faculty Support: Institutional/Organizational Strategies

Conclusions

Institutions offer a variety of different professional development opportunities that typically focus on technology, pedagogy, and course content when preparing faculty to teach online (McQuiggan, 2007). Often faculty development models being provided are one size fits all models which might not meet the needs of faculty members preparing to teach online or who are currently teaching online (Rhode, Richter, & Miller, 2017). Higher education institutions can use the resulting best practices to develop programs that help support and prepare faculty for the online environment.

As the popularity of online classes continues to grow, it is important for institutions to support faculty in ways that are conducive to their needs, and to create professional development programs that are tailored to the needs of online faculty members with the goal of influencing the faculty's effectiveness (Williams, Layne, & Ice, 2014). Developing carefully thought-out and well-developed professional development programs may increase faculty loyalty and satisfaction (James & Binder, 2012) and are key to the continued success of higher education (Elliott, 2014). Teaching and learning centers or those responsible for providing professional development should become responsive and proactive entities on campus to enable success with online programs through providing ongoing and varied professional learning opportunities for those at different career stages (Stockley, McDonald, & Hoessler, 2015). The results of this Delphi study can be used help facilitate the development and design of professional development programs that meet the needs of online faculty members.

Rethinking approaches to faculty development around identified best practices can be a relevant and viable method to serve online faculty (Truong, Juillerat, & Gin, 2016). Understanding the needs of online faculty is the first step to planning effective professional development. Given that online faculty members can be geographically dispersed, there is a need to connect them to the faculty community and professional development can help with skill development and community building. Institutional leaders need to build and foster a common vision around the role of online teaching that is passed along to the faculty and campus culture (Kaminskaya, 2006).

Using this research, a strategic plan can be developed for professional development instead of a randomly grouped collection of activities to encourage ongoing online faculty development (Baran & Correia, 2014). Institutions should provide professional development that meets the perceived needs of online faculty, which can increase faculty's intrinsic motivation (Pink, 2011). The professional development should provide the tools faculty need to direct their classrooms, foster the urge to become better at teaching online, and demonstrate the need to improve student learning (Pink, 2011). Online faculty members need to feel that professional development is an ongoing part of their teaching responsibilities (Fabrice, 2010). When faculty members believe that there is strong organizational support around their needs, they tend to identify more with shared goals and become more involved in the process (Scott, Lemus, Knotts, & Oh, 2016). In addition, it is important for institutions to provide faculty with positive learner-centered experiences that help them connect to the larger organizational culture so they learn to navigate their classrooms and organizations with success (Scott et al., 2016).

Offering professional development that meets online faculty needs will require a collaborative effort among all stakeholders in higher education (Carpenter, Sweet, & Blythe, 2016). Using the essential elements of this research study, combined with the institutional knowledge around faculty and resources, can help personalize how these elements should be incorporated into professional development offerings. Additionally, findings from this study provide elements that could be used as a checklist to help certify faculty who are ready to serve as online instructional faculty and those who would be ready to serve as online course development faculty after successfully completing training.

Higher education organizations need to align goals of administration, faculty, and the institution to promote the success of online programs (Velez, 2015). In fact, Velez (2015) found institutions that create supportive environments between faculty and administration help to drive effectiveness within the organization. Developing faculty to teach online is a complex process that involves ongoing institutional commitment, time, and money (Barker, 2003). Each institution should work to create a culture for online learning that includes quality assurance standards, expectations for best practices, and training opportunities that prepare faculty for the online classroom. Additionally, having the organizational structure and support staff to design and work through important issues like ADA compliance, needs that are often different than the traditional face-to-face learning opportunities, support on using audio/visual resources, and library resources. Supporting online learning includes faculty support for instructional design, technology selection and usage, creating accessible materials, and evaluating courses and faculty instruction. To support continuous improvement, faculty need data about their online courses to help improve their teaching practice to help ensure that changes made in future course offerings are data driven (Reid, Sexton, & Orsi, 2015).

Recommendations for Future Research

This study identified best practices for providing professional development for online faculty members through a teaching and learning center. This research does not provide evidence-based standards; each best practice should be further explored to determine impact and effectiveness. In addition, further research should be done on the order and timing of when the practices are delivered to online faculty members to help provide the best learning experiences for online students. The majority of these best practices have been suggested for the beginning of a faculty member's online teaching career. Additional research should be done to understand the needs of more experienced online faculty to assist their continued professional development as the online learning landscape continues to evolve (Crawford-Ferre & Wiest, 2012).

References

Allen, I. E., & Seaman, J. (2016, February). *Online report card-tracking online education in the United States.* Babson Survey Research Group. Retrieved from http://onlinelearningsurvey.com/reports/onlinereportcard.pdf

Allen, I. E., & Seaman, J. (2017). *Digital learning compass: Distance education enrollment report 2017*. Babson Survey Research Group, e-Literate, and WCET. Retrieved from http://digitallearningcompass.org

Alexiou-Ray, J., & Bentley, C.C. (2015). Faculty professional development for quality online teaching. *Online Journal of Distance Learning Administration, 18*(4), 1-7. Retrieved from http://www.westga.edu/%7Edistance/ojdla/winter184/ray_bentley184.html

Austin, A. E., & Sorcinelli, M. D. (2013). The future of faculty development: Where are we going? *New Directions for Teaching & Learning*, *2013*(133), 85-97. doi:10.1002/tl.20048

Bailey, C. J., & Card, K. A. (2009). Effective pedagogical practices for online teaching: Perception of experienced instructors. *The Internet and Higher Education*, *12*(3), 152-155. doi:10.1016/j.iheduc.2009.08.002

Baker, J., Lovell, K., & Harris, N. (2006). How expert are the experts? An exploration of the concept of 'expert' within Delphi panel techniques. *Nurse Researcher, 14*(1), 59-70. doi:10.7748/nr2006.10.14.1.59.c6010

Baran, E., & Correia, A. (2014). A professional development framework for online teaching. *Techtrends: Linking Research and Practice to Improve Learning*, *58*(5), 95-101. doi:10.1007/s11528-014-0791-0

Baran, E., Correia, A. P., & Thompson, A. (2011). Transforming online teaching practice: Critical analysis of the literature on the roles and competencies of online teachers. *Distance Education*, *32*(3), 421-439. doi:10.1080/01587919.2011.610293

Barker, A. (2003). Faculty development for teaching online: Educational and technological issues. *The Journal of Continuing Education in Nursing*, *34*(6), 273-278.

Birman, B. F., Desimone, L., Porter, A. C., & Garet, M. S. (2000). Designing professional development that works. *Educational Leadership*, *57*(8), 28-33.

Carpenter, R., Sweet, C., & Blythe, H. (2016). The future of faculty development. *Journal of Faculty Development, 30*(2), 5-8.

Crawford-Ferre, H. G., & Wiest, L. R. (2012). Effective online instruction in higher education. *The Quarterly Review of Distance Education*, *13*(1), 11-14.

Creswell, J. W. (2014). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (5th ed.). Upper Saddle River, NJ: Pearson.

Dalkey, N., & Helmer, O. (1963). An experimental application of the Delphi Method to the use of experts. *Management Science*, *9*(3), 458-467. doi:10.1287/mnsc.9.3.458

Delbecq, A. L., Van de Ven, A. H., & Gustafson, D. H. (1975). *Group techniques for program planning: A guide to nominal group and Delphi processes.* Glenview, IL: Scott Foresman Company.

Eib, B., & Miller, P. (2006). Faculty development as community building. *International Review of Research in Open and Distance Learning*, *3*(2), 1-15. doi:10.19173/irrodl.v7i2.299

Elliott, R. (2014). Faculty development curriculum: What informs it. *The Journal of Faculty Development*, *28*(3), 35-46.

Engleberg, I. N. (1991). Needs assessment: The first step in staff development. *The Journal of Staff, Program, & Organization Development*, *9*(4), 15-22.

Fabrice, H. (2010). *Learning our lesson: Review of quality teaching in higher education.* Paris, France*:* OECD.

Facer, K. (2011). *Learning futures: Education, technology and social change*. New York, NY: Taylor & Francis.

Fish, W. W., & Wickersham, L. E. (2009). Best practices for online instructors: Reminders. *Quarterly Review of Distance Education*, *10*(3), 279-284.

Gabriel, M. A., & Kaufield, K. J. (2008). Reciprocal mentorship: An effective support for online instructors. *Mentoring and Tutoring: Partnership in Learning*, *16*(3), 311-327. doi:10.1080/13611260802233480

Hale, D. (2012). Online faculty development. In Maddix, M. A., Estep, J. R., & Lowe, M. E. (Eds.). *Best practices of online education: A guide for Christian higher education* (pp 121-128). Charlotte, NC: Information Age.

Hasson, F., Keeney, S., & McKenna, H. (2000). Research guidelines for the Delphi survey technique. *Journal of Advanced Nursing, 32*(4), 1008-1015. doi:10.1046/j.1365-2648.2000.t01-1-01567.x

Herman, J. H. (2012). Faculty development programs: The frequency and variety of professional development programs available to online instructors. *Journal of Asynchronous Learning Networks*, *16*(5), 87-106. doi:10.24059/olj.v16i5.282

Jaggars, S. S., Edgecombe, N., & Stacey, G. W. (2013). Creating an effective online instructor presence. *Community College Research Center, Columbia University*. Retrieved from: http://ccrc.tc.columbia.edu/media/k2/attachments/effective-online-instructor-presence.pdf

James, S. G., & Binder, D. A. (2012). The care and feeding of part-time faculty: A model to retain community college adjuncts. *National Forum of Educational Administration and Supervision Journal, 28*(3), 2011-2012.

Kaminskaya, E. (2006). *Teaching with technology: A case study of online faculty development at the University of Central Florida*. Retrieved from International Research and Exchanges Board, University of Central Florida: http://www.irex.net/sites/default/files/kaminskaya.pdf

Kerrick, S. A., Miller, K. H., & Ziegler, C. (2015). Using continuous quality improvement (CQI) to sustain success in faculty development for online teaching. *The Journal of Faculty Development*, *29*(1), 33-40.

Kreber, C., & Kanuka, H. (2006). The scholarship of teaching and learning and the online classroom. *Canadian Journal of University Continuing Education, 32*(2), 109-131.

Kress, H., Thering, A., Lalonde, C., Kim, S., & Cleeton, L. (2012). Faculty reflections on online course development and implementation for teacher education. *International Journal of Technology, Knowledge & Society*, *8*(1), 73-83. doi:10.18848/18323669/cgp/v08i01/56263

Lane, L. M. (2013). An open, online class to prepare faculty to teach online. *Journal of Educators Online*, *10*(1), 1-32. doi:10.9743/jeo.2013.1.1

Likert, R. (1932). A technique for the measurement of attitudes. *Archives of Psychology, 22*(140), 1–55.

Linstone, H. A., & Turnoff, M. (1975). *The Delphi Method: Techniques and applications.* Reading, MA: Addison-Wesley.

Major, C. H. (2010). Do virtual professors dream of electric students? University faculty experiences with online distance education. *Teacher College Record*, *112*(8), 2154-2208.

McQuiggan, C. A. (2011). *Preparing to teach online as transformative faculty development* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3471829)

Meskill, C., & Anthony, N. (2007). Learning to orchestrate online instructional conversations: A case of faculty development for foreign language educators 1. *Computer-Assisted Language Learning*, *20*(1), 5-19. doi:10.1080/09588220601118487

Moskal, P., Thompson, K., & Futch, L. (2015). Enrollment, engagement, and satisfaction in the BlendKit faculty development open, online course. *Online Learning*, *19*(4), 1-12. doi:10.24059/olj.v19i4.555

Murry, J. W., & Hammons, J. O. (1995). Delphi: A versatile methodology for conducting qualitative research. *The Review of Higher Education, 18*(4), 423-436.

Natriello, G. (2005). Modest changes, revolutionary possibilities: Distance learning and the future of education. *Teachers College Record*, *107*(8), 1885–1904. doi:10.1111/j.1467-9620.2005.00545.x

Otto, P. (2014). Librarians, libraries, and the scholarship of teaching and learning. *New Directions for Teaching & Learning*, *2014*(139), 77-93. doi:10.1002/tl.20106

Ouellett, M. (2010). Overview of faculty development: History and choices. In Gillespie, K. J. & Robertson, D. L. (2010). *A guide to faculty development* (pp. 9-23). San Francisco, CA: Jossey-Bass.

Pchenitchnaia, L. V. (2007). *Essential and model programs for teaching and learning centers as reported by directors in selected research extensive universities: A Delphi study* (Doctoral Dissertation). Available from ProQuest Dissertations and Theses database (UMI No. 3270379)

Peabody, D. (1962). Two components in bipolar scales: Direction and extremeness. *Psychological Review, 69*(2), 65-73.

Picciano, A. G. (2006). Blended learning: Implications for growth and access. *Journal of Asynchronous Learning Networks*, *10*(3), 95-102.

Pink, D. H. (2011). *Drive: The surprising truth about what motivates us*. New York, NY: Penguin.

Reeves, D. B. (2012). *Transforming professional development into student results*. Alexandra, VA: ASCD.

Reid, L. F., Sexton, J., & Orsi, R. (2015). Outcomes of a faculty development program promoting scholarly teaching and student engagement at a large research-intensive university. *The Journal of Faculty Development*, *29*(3), 23-36.

Rhode, J., Richter, S. & Miller, T. (2017). Designing personalized online teaching professional development through self-assessment. *TechTrends*, *61*(5), 444-451. doi:10.1007/s11528-017-0211-3

Rotondi, A., & Gustafson, D. (1996). Theoretical, methodological and practical issues arising out of the Delphi Method. In M. Adler & Ziglio, E. (Eds.), *Gazing into the oracle: The Delphi Method and its application to social policy and public health* (pp. 34-55). London: Jessica Kingsley Publishers.

Rowe, G., & Wright, G. (1999). The Delphi technique as a forecasting tool: Issues and analysis. *International Journal of Forecasting, 15*(4), 353-375. doi:10.1016/s0169-2070(99)00018-7

Schmidt, S. W., Tschida, C. M., & Hodge, E. M. (2016). How faculty learn to teach online: What administrators need to know. *Online Journal of Distance Learning Administration*, *19*(1), 1-10.

Scott, W., Lemus, D., Knotts, G., & Oh, J. (2016). Why learner-centered new faculty orientations matter: Organizational culture and faculty retention. *The Journal of Faculty Development*, *30*(1), 15-22.

Shelton, K., & Saltsman, G. (2005). *An administrator's guide to online education*. Greenwich, CT: Information Age.

Shelton, K., Saltsman, G., Holstrom, L., & Pedersen, K. (Eds.). (2014). *Quality Scorecard 2014 handbook: Criteria for excellence in the administration of online programs.* Newburyport, MA: Online Learning Consortium.

Skulmoski, G. J., Hartman, F. T., & Krahn, J. (2007). The Delphi Method for graduate research. *Journal of Information Technology Education*, *6*, 1-21. Retrieved from https://eric.ed.gov/?id=EJ807652

Steinert, Y., Mann, K., Centeno, A., Dolmans, D., Spencer, J., Gelula, M., & Prideaux, D. (2006). A systematic review of faculty development initiatives designed to improve teaching effectiveness in medical education: BEME Guide No. 8. *Medical Teacher*, *28*(6), 497-526.

Stewart, C., Bachman, C., & Johnson, R. (2010). Predictors of faculty acceptance of online education. *Journal of Online Learning and Teaching*, *6*(3), 597-616.

Stockley, D., McDonald, J., & Hoessler, C. (2015). Nudges, pulls, and serendipity: Multiple pathways to faculty development. *The Journal of Faculty Development. 29*(3), 61-68.

Tabor, S. W. (2007). Narrowing the distance. *Quarterly Review of Distance Education*, *8*(1), 47-57.

Truong, M. H., Juillerat, S., & Gin, D. H. C. (2016), Good, fast, cheap: How centers of teaching and learning can capitalize in today's resource-constrained context. *To Improve the Academy*, *35*(1), 180–195. doi:10.1002/tia2.20032

University Leadership Council. (2010). *Engaging faculty in online education: Rightsizing incentives and optimizing support*. Retrieved from https://www20.csueastbay.edu/oaa/files/student_success/EngFacOnlineEd.pdf

Vaill, A. L., & Testori, P. A. (2012). Orientation, mentoring and ongoing support: A three-tiered approach to online faculty development. *Journal of Asynchronous Learning Networks*, *16*(2), 111-119. doi:10.24059/olj.v16i2.256

Velez, E. (2015). Administration and faculty: How relationships create and solve the problems. *Journal of Applied Learning Technology*, *5*(4), 37-40.

Wei, R. C., Darling-Hammond, L., Andree, A., Richardson, N., & Orphanos, S. (2009). *Professional learning in the learning profession*. Dallas, TX: National Staff Development Council.

Wilhelm, W. J. (2001). Alchemy of the oracle: The Delphi technique. *Delta Pi Epsilon Journal, 43*(1), 6-26.

Williams, T., Layne, M., & Ice, P. (2014). Online faculty perceptions on effective faculty mentoring: A qualitative study. *Online Journal of Distance Learning Administration*, *17*(2), 1-19. Retrieved from http://www.westga.edu/~distance/ojdla/summer172/Williams_Layne_Ice172.html

Witkin, B. R. (1984). *Assessing needs in educational and social programs*. San Francisco, CA: Jossey-Bass.

Examining Distance Learners in Hybrid Synchronous Instruction: Successes and Challenges

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Abstract

This paper reports on a case study investigating distance learners participating in graduate-level hybrid synchronous instruction. This research helps inform the design of hybrid synchronous instruction in which face-to-face and distance learners engage in class sessions. Data were collected using electronic journals, individual interviews, and a focus group. The results of the data analysis provide evidence that in this case, hybrid synchronous instruction improved the study habits of distance learners. On the other hand, the case study results also revealed that there are challenging pedogogical aspects which the distance learners had to overcome during hybrid synchronous instruction. Among such challenges were the interactions, relationships, and communication exchanges between distance learners, their face-to-face counterparts, and the instructor.

Keywords: Hybrid instruction; synchronous instruction; distance learning; case study

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Examining Distance Learners in Hybrid Synchronous Instruction: Successes and Challenges

Higher education institutions need to explore innovative learning environments without necessarily increasing space on campus (Oyarzun & Martin, 2013). A novel learning environment that is now very popular in higher education is the implementation of asynchronous online instruction (Lee & Dashew, 2011; McGee & Reis, 2012). A strong utilitarian argument for asynchronous online instruction is that it provides the opportunity to teach new groups of students in places around the world (Popov, 2009). However, asynchronous online instruction can be lonely and disengaging for learners that enjoy social interactions, immediate feedback, and interactive class sessions (Cunningham, 2014; Lee & Dashew, 2011). A good middle ground that could help increase the number of students enrolled in a traditional class but not require additional physical classroom space is the implementation of hybrid synchronous instruction (Bonakdarian, Whittaker, & Yang, 2010; Butz, Stupnisky, Peterson, & Majerus, 2014; Niemiec & Otte, 2009; Stewart, Harlow, & DeBacco, 2011). This type of instruction does not present the challenges of asynchronous online education, and can be of great benefit for many contemporary students seeking to advance their education but are bound by work, family, or geography.

Hybrid synchronous instruction is also referred to as blended synchronous learning (Hastie, Hung, Chen, & Kinshuk, 2010), synchronous online teaching (Park & Bonk, 2007), or synchronous hybrid delivery (Butz et al., 2014). This type of delivery is important because it is anticipated that universities will have inadequate physical facilities to meet the demands of an increasing student population. There has been a surge in the number of students graduating high school and enrolling in college; in 2022 that number is estimated to be 3.4 million (White, Ramirez, Smith, & Plonowski, 2010). In addition, college enrollment rose 23 percent between 1995 and 2005 (White et al., 2010). This trend is expected to continue over the next ten years, leaving universities with a lack of brick and mortar space to meet the needs of instruction. The aim of this paper is to understand the effectiveness and efficiency of hybrid synchronous instruction from the perspective of distance learners engaged in graduate-level coursework.

Review of Related Literature

Universities need to prepare to deliver courses in alternative ways to ensure the continuity of instruction for adult learners and non-traditional students (Bower, Dalgarno, Kennedy, Lee, & Kenney, 2015; Butz et al., 2014; Stewart et al., 2011). Many non-traditional students, as well as working adults seeking to improve their professional opportunities, recognize the need for additional education to accomplish their goals (Bonakdarian et al., 2010; McGee & Reis, 2012). A number of these potential students often find themselves under time constraints to pursue this endeavor. Therefore, such students opt for online classes as they offer greater flexibility in terms of both scheduling and location (Butz et al., 2014). The traditional notion of the on-campus university experience is changing, with many students choosing to participate wholly or partially away from their institutions' campuses.

Sadly, most programs that are moved to an online asynchronous format predominantly suffer from a loss of social interactions, which results in students' feelings of isolation (Chakraborty & Victor, 2004; Oyarzun & Martin, 2013). The learners miss the benefits that come from the more traditional face-to-face environment, such as closer contact and engagement with the instructor and fellow students and the immediate feedback that can result from this setting (Bonakdarian et al., 2010; Chakraborty & Victor, 2004; Stewart et al., 2011). Additionally, in some cases, these asynchronous methods may not provide effective support for learning in cases where students need to engage in real-time conversations, share audio/visual content, or where a sense of presence and community are important elements of the learning episode (Bower, Kenney, Dalgarno, Lee, & Kennedy, 2013; Stewart et al., 2011).

In this context, hybrid synchronous instruction could potentially allow students to retain many of the benefits of online instruction while simultaneously gaining some of the advantages of face-to-face classes, resulting in effective, efficient, and engaging learning (Bell, Sawaya, & Cain, 2014; Bonakdarian et al., 2010; Bower et al., 2015; Stewart et al., 2011). Researchers believe that this approach holds much promise as an alternative that offers the "best of both worlds" for students unable to attend traditional face-to-face classes but who are also reluctant to commit to the purely online classroom format (Bonakdarian et al., 2010). Learning design using media-rich real-time communication tools such as video conferencing and/or web conferencing have become increasingly popular (Bell et al., 2014; Bower et al., 2013). These technologies can be used to facilitate efficient discussion, content exchange, education international collaborations, and identity representation (Hastie et al., 2010; Popov, 2009).

Prior Research

Although there has been a significant number of implementation cases (Bell et al., 2014; Bower et al., 2013; Butz et al., 2014; Chakraborty & Victor, 2004; Oyarzun & Martin, 2013; Park & Bonk, 2007; Popov, 2009; Roseth, Akcaoglu, & Zellner, 2013; Stewart et al., 2011; Szeto, 2015), only a small number of studies have investigated the learning experience of the distance students enrolled in a hybrid synchronous course. White et al. (2010) examined the feasibility of delivering a course on-campus and in real-time, simultaneously transmitting it to students who were remotely accessing the same course. The results of the investigation showed that all students taking the course at a distance indicated that it was a good learning experience. Participants reported that the presentation slides were effective, the web conferencing tool was easy to use, the technical support received was sufficient, and the ability to review the videos after class was appreciated. The participants did report and comment on some technology problems experienced during the live sessions and how these may have prevented them from fully engaging in classroom discussion or activities due to the discontinuation of the live stream. Nevertheless, overall, participants indicated that it felt as if they were in the classroom when all the technology was working correctly.

Similarly, Bonakdarian et al. (2010) pilot-tested and evaluated the implementation of a hybrid synchronous course following the e^3-learning framework, which specified that e-learning should provide an effective, efficient, and engaging environment. The results of the implementation confirmed the assumption that indeed the hybrid synchronous course provided a more efficient and engaging learning environment for the students, when compared to a purely face-to-face or online course. The online students overwhelmingly appreciated the synchronous, instructor-led interactions, and live demonstrations. However, the students indicated that the video feed of the classroom and interactions with other students were ineffective (primarily due to the technology issues).

A study conducted by Cunningham (2014) asked distance learners and on-campus learners who had participated in a hybrid synchronous classroom to anonymously evaluate the experience of having physical and virtual participants sharing a physical space. Eleven students shared their experience. The results indicate that the distance learners did not feel welcomed by the on-campus learners. Additionally, on-campus learners felt some resentment of the time and effort taken to assist the distance learners when technical issues occurred. There was also some frustration caused by the lack of perception of social cues by the distance learners, due to the limitations in their mode of participation, as both groups of learners mentioned the challenges with sound quality. Overall, both groups of learners reported seeing the other group as separate from themselves.

Another study that focused on the learning experience of distance learners was conducted by Rogers, Graham, Rasmussen, Campbell, and Ure (2003). As part of a case study, Rogers et al. (2003) surveyed and conducted semi-structured interviews with seven distance learners participating in hybrid synchronous instruction. The results of the survey and the interviews revealed that the distance learners were very grateful for the ability to participate in class and receive a graduate degree, even though they could not physically travel to campus. One of the main issues mentioned was the social interaction with the on-campus learners and the instructors. Several distance learners mentioned that there were some negative aspects due to technology limitations, for example, the lag time or delay of voice messages to the physical classroom. The distance learners also mentioned positive aspects related to the social interaction during hybrid synchronous instruction. For example, they enjoyed the ability to see each other using video and to converse using the chat features of the video conferencing software.

Overall, due to its newness, research on hybrid synchronous instruction focusing on the distance learners' experience has not been fully explored. As a result, the efficacy and efficiency of hybrid synchronous instruction needs further investigation to satisfactorily demonstrate how this mode of instruction impacts distance learners, what pedagogical strategies are best suited for these learners, and what the best ways are to provide support for them.

Purpose Statement and Research Question

This case study investigates and describes the learning experience of distance learners participating in graduate-level education classes through hybrid synchronous instruction. The purpose of this research is to understand the effectiveness and efficiency of hybrid synchronous instruction from the perspective of the distance learners. This research helps inform the instructional design of hybrid synchronous instruction in which face-to-face and distance learners engage during synchronous class sessions. This investigation was designed to render valuable data for instructors and institutions that are currently engaged or are considering engaging in hybrid synchronous instruction. The research question addressed in this investigation was the following: What are the challenges and successes of distance learners engaged in hybrid synchronous instruction?

Operationalized Variables

Face-to-Face Learners: Students in the traditional educational environment in which classes take place at a specific time and place in the university campus.

Distance Learners: Students located in other cities and/or states within the country, taking classes at a distance in the hybrid mode of instruction, where they join class meetings using video conferencing technology.

Methods

Research Paradigm

The approach used for this qualitative investigation was a case study; in other words, a strategy of inquiry in which the researcher goes in-depth to explore a program, event, activity, process, or one or more individuals—elements of a bounded system (J. W. Creswell, 2009). Case studies are distinguished from other qualitative traditions because cases are researched in depth and the data are delineated by time period, activity, and place (Patton, 2015; Plummer, 2001). In case study investigations, researchers collect detailed information using a variety of data collection procedures over a sustained period of time (J. W. Creswell, 2009). Plummer (2001) described case studies as establishing "collective memories and imagined communities; and they tell of the concerns of their time and place."

Case studies have long been used in the social sciences as a way to carefully document life stories and events (Patton, 2015; Yin, 2014). Case studies have emerged from the tradition of biographical writing within the fields of psychology, sociology, anthropology, political science, and history. They are particularly useful in counseling and education since practitioners are interested both in unique dimensions of a case (often a client or student), as well as their more generalized application to other individuals.

In this investigation, the case refers to the narratives of three individuals engaged in hybrid synchronous instruction while completing graduate level coursework. The case study method was used because it helped explain in an extensive and in-depth manner the challenges and successes of these distance learners engaged in a specific instructional model at a particular institution. Yin (2014) indicated that the distinctive need for case study research arises out of the desire to understand complex social phenomena. Therefore, a case study allows investigators to focus on a "case" and retain a holistic and real-world perspective.

The Setting

The participants of this investigation were enrolled in a master's degree program in a mid-sized private university. The university is located in the southeastern United States. Students enrolled in this program are of varied ages, backgrounds, and technical abilities. The program is primarily offered face-to-face but three students in the program were allowed to complete the remainder of the program as "distance learners" (see the "Participants" section). At the time of the implementation of these hybrid synchronous courses, no other programs had attempted to use technology to deliver synchronous online instruction.

The faculty evaluated various videoconferencing technologies and the best solution for the program was the adoption of Google Hangouts, along with the use of the Blackboard LMS, which offered asynchronous affordances for virtual classroom participation. Students were already familiar with the Google tools, since most students in the program have a Google+ account. The Google Hangouts video conferencing tool contained features such as real-time live application sharing, which captured the audio of the classroom dialogue and the instructor's lecture, as well as interactive capabilities for the distance learners, which provided them with access to students' comments and questions posed during class. Some of the interactive features included synchronous chat, the ability to ask questions in real-time via live audio, and the "step out" function, allowing the participant to leave the online classroom.

The program courses were all offered in the evening and were three hours in duration. On average, each course in the program had fifteen students enrolled per semester. Most courses were taught in a blended format, in which the class met every other week. The classrooms used for each of the courses attended by distance learners varied. Regrettably, the program did not have a designated classroom outfitted with web conferencing technology. However, all classrooms used by the faculty had a computer station with a computer that could be projected on to a screen.

Students in the courses offered in the program were not required to bring their laptops to the class meetings. Nonetheless, if they chose to bring their laptops to the classroom, they had access to wireless Internet and electric outlets to charge their laptops. During class meetings, students primarily attended face-to-face. In some rare instance, due to illness, work, or transportation issues, students attended the class meetings using video conferencing. Students have expressed positive feelings about their ability to choose.

Since courses were developed for a face-to-face class, the professors were able to implement the same instructional strategies which would have been used if the classes were taught completely face-to-face. Because all instructors in the program were already comfortable with distance education tools and had experience teaching both face-to-face and distance education courses, the challenge to learn how to manage the new technologies did not pose a threat to instruction. In fact, the experience with distance education pedagogical tools assisted the professors in understanding how a hybrid synchronous course should be taught in this context. For the most part, the students at a distance were able to see the lecture slides that were used in the classroom. In some instances, the instructor would share the video image of the real-time class periods.

Participants

The participants in this case study investigation were three graduate students. These graduate students were specifically selected because they had started the master's program in a face-to-face format, but due to different circumstances, had to relocate to cities within the country (away from their academic institution). The participants, all of whom have received pseudonyms for anonymity, were all 18 years of age or older. Two of the students attended the program part-time, with a maximum of two courses per semester. One of the students was a full-time student, with a course load of three or four courses per semester.

Participants were enrolled in different courses in the graduate program. Before the students were allowed to participate at a distance, each instructor would contact the students and inform them how their participation in the course would occur throughout the semester. These included student requirements for training, computer hardware and software, attendance requirement, and specifications of how the in-class interactions/activities would be handled. It was important for the instructors to ensure that learning environments both face-to-face and online would remain equitable and as similar as possible.

Ryan: The Corporate Dad. One of the participants was an employee in a large corporation as well as a dedicated father to a young infant. Ryan started the program attending face-to-face classes on campus, but after a year in the program, he was offered a job in a different city (within the state) and accepted the offer to provide a better living standard to his family. Ryan attended the program at a distance for the remaining four semesters.

Katie: The Student and Mom. Another participant in this case study investigation was a full-time student in the program that had to relocate out of state because her husband was transferred due to his job. After attending the program at a distance for two semesters, Katie became a mom. She attended the program at a distance for the remaining four semesters.

Robin: The Full-Time Distance Student. The last participant in the case study was a full-time student while attending the program on campus. After attending the program face-to-face for two semesters, Robin got engaged and relocated to her hometown. She attended the program at a distance for the remaining two semesters.

All of the partipants received an email invitation to take part in this research study from the principal investigator. The email provided the purpose of the research project, the risks and benefits of their participation, the IRB approval letter, and a PDF copy of the consent form. The participants were asked to reply "Yes, I agree to participate in this investigation" or "No, I am not interested in participating in this investigation."

Data Sources

Data were collected during the last academic year in which the three graduate students were enrolled in the program. The researchers used various forms of data collection at different stages, including a one-hour individual interview via video conference with each of the distance learners at the end of the fall semester, a one-hour focus group session when all distance learners joined a video conference at the end of the spring semester, and voluntary electronic journal entries via Google Forms that could be completed throughout the academic year. The same protocol was used for both the individual interviews and the focus group (see Appendix A).

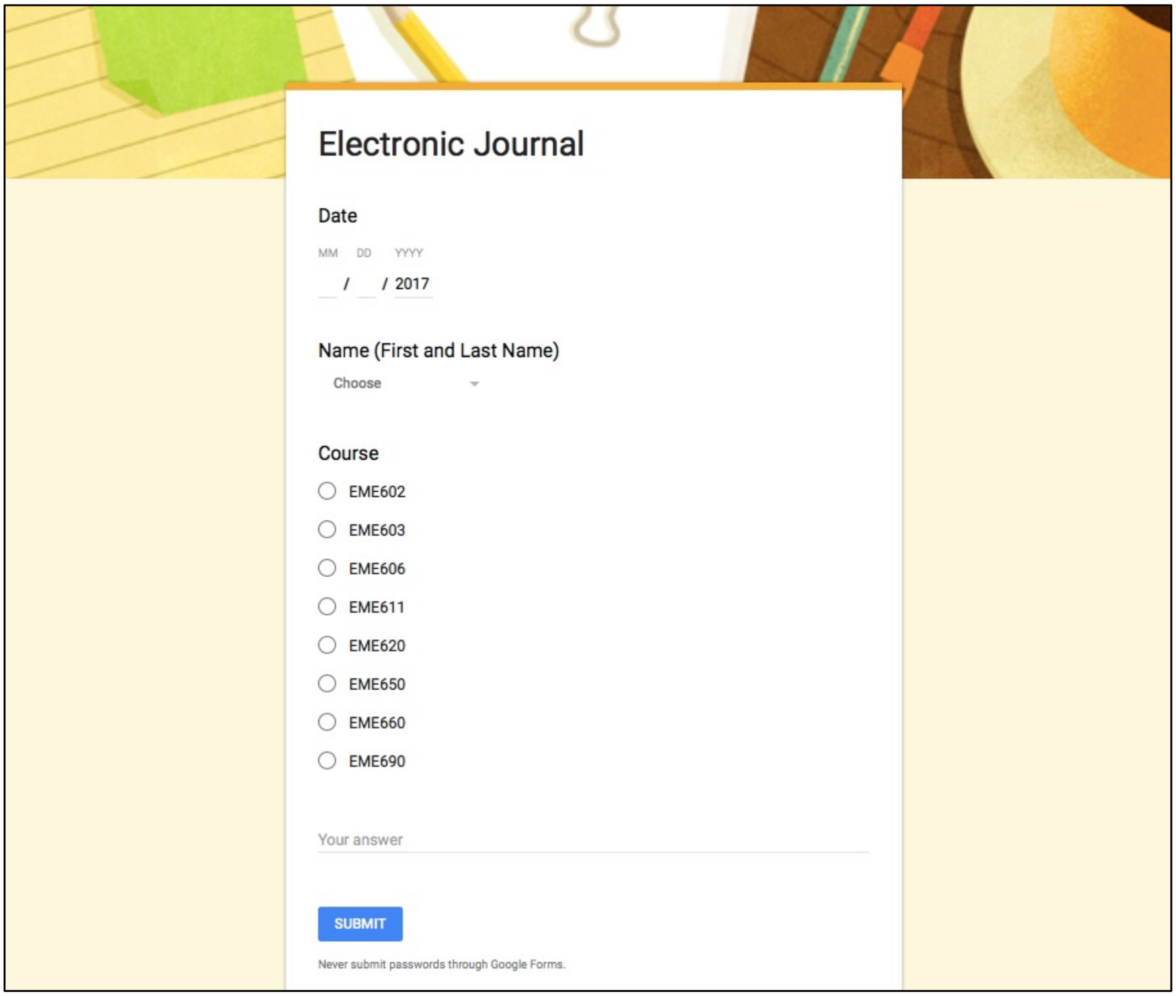

Figure 1. Electronic journal form.

The link to the electronic journal was sent to the participants via email. In the electronic journal, participants shared the date of the entry, their name, and their statements on feelings or experiences (see Fig. 1). Eleven journal entries were completed by the participants. These electronic journal entries were completed at will, whenever participants wanted to comment on their learning experiences throughout the academic year.

A total of 7,270 words were analyzed. As recommended by J. W. Creswell (2009), an interim analysis was conducted, with an ongoing and iterative process until the case was fully explored. Each electronic journal entry, as well as transcripts from the individual interviews and the focus group were copied verbatim into an MS Word document. The next step was the reduction of the data (J. W. Creswell, 2009; Plummer, 2001). For this procedure, all journal entries, interviews, and focus group transcripts were coded. During the coding process, keywords and phrases were pulled from the data to develop initial codes (Yin, 2014). The researchers used Yin (2014) case study analysis recommendation in which code lists from both of the researchers were then compared against each other for possible similarities or discrepancies. Keywords and phrases were grouped into eighteen coding categories.

Following the reduction of the data, the horizontalization process (J. W. Creswell, 2009; Patton, 2015) occurred, with the purpose of spreading out the data and organizing it into meaningful clusters, in which irrelevant, repetitive, or overlapping data were eliminated. Ten main themes were identified from the horizontalization process. A spreadsheet was created to enter textual and structural descriptions for each of the main themes. To ensure the validity of this qualitative investigation and as advocated by J. Creswell (2009) and Patton (2015), data and investigator triangulations were part of the research process, since multiple data sources and investigators were used in the collection, analysis, and interpretation of the data.

Results

Ten themes emerged from the data collected. They will be described in turn.

Connecting with Other Distance Learners

One of the main themes that emerged in the data was related to the connections among other distance learners in the program. Participants expressed that they enjoyed the experience of being distance learners more when there were other classmates that were also at a distance. Having several distance learners in the same class allowed them to work in projects together and to connect with classmates that understood the challenges of being online. The participants found that if they worked together with other distance learners taking the same class, they were more active in the discussion of the class topics.

Having other distance learners in the same class also increased the social connection with other classmates, in addition to the intellectual interchange. As one participant (Ryan) mentioned, “There weren’t any kind of social hurdles you had to cross over because you weren’t in the room with them.” Another participant (Katie) explained, “Having others at a distance with me, helped and created a sense of community. I had close connections with those because we bonded over the distance.”

Study Habits

Participants mentioned that being distance learners encouraged them to improve their study habits. They mentioned spending more time reading the course materials and ensuring they comprehended the content before and after class. In some instances, this was primarily due to the fact that the audio from the class was not clear and thus prevented them from hearing the class discussion. In other instances, the participants felt that being proactive and reading the materials before class was important because it would allow them to ask questions during class time instead of having to email the instructors with a question. Overall, the participants felt that they were more accountable for their own learning and that they had to prove themselves to the instructors. For example, one participant (Ryan) explained, “I felt that every instructor had to see how good of a student I was and how well I could perform; so, I felt extra pressure to be in the top 10% of the class.”

Several participants mentioned practicing better organization and time management skills to improve their study habits as well as being proactive to seek additional help (from classmates or instructor) when needed. One participant mentioned that being a distance learner encouraged her to improve her navigation skills in the learning management system so that she could access the asynchronous material available.

Relationships and Communication with Classmates

The next theme that emerged during the data analysis was a central component of the distance learners’ experience in the hybrid synchronous classroom: the relationships and communication between distance learners and their face-to-face classmates. One participant (Ryan) mentioned that he has managed to maintain the relationships that had started in the classroom when he was a face-to-face learner. Ryan explained:

> It was nice to have this connection because no one else in my personal network is in the instructional design field. Therefore, it is difficult for me to engage in discourse related to instructional design outside my peers in the classroom.

Another participant (Robin) mentioned that she had a strong intellectual and social connection with a face-to-face classmate and that had helped her tremendously as she transitioned to distance learning: “We [her close face-to-face classmate and her] talk every single semester and I am still good friends with her outside the classroom. I rely significantly on her because she is in all of my classes.”

A point made by participants was that aside from those relationships created before they became distance learners, there was not much communication with their face-to-face classmates, unless they were working collaboratively on a team project. According to Katie, “It is almost like there is no discussion between the online people (the distance learners) and the students in the classroom.” Ryan, on the other hand, commented, “The team for my project wanted to communicate synchronously, but they wanted to do it via video web. It actually ended being a benefit to us, we (the team) all ended up working remotely and being distance learners.” Robin acknowledged that she communicated with her face-to-face classmates primarily during the in-class group assignments: “We had lots of group projects in class and group discussions, so for every single class I was with a different group via the iPad or in someone’s computer screen via Google Hangouts.

Hybrid Synchronous Instruction Technology

Another central element that had an impact in the learning experience of the participants was the hybrid synchronous instruction classroom technology (hardware and software), in particular the Internet connection. According to Robin, “There were times I’d get kicked off the Internet connection and then I would miss class. I would have to contact someone in the class (a face-to-face learner) to inform them I was not online and was missing class.” Katie mentioned a similar issue with the Internet connection:

> Our university does not have the most up-to-date technology; therefore, there would be no Internet signal and I could not do any audio sharing. In some instances, I

would have to call the classroom phone and the instructor would put me on speakerphone.

Another technology concern for the distance learners in the hybrid synchronous classroom was the quality of the audio to and from the face-to-face classroom. Ryan mentioned in his interview that is was difficult to understand the classroom discussion. He specified that "[Y]ou could always hear the professor very well but when it comes to the students responding, you'd usually hear this muffle in the background." Similarly, Robin stated that it was difficult to listen to the classroom discussion during the Google Hangouts sessions. Robin added that she would "call the instructor's phone and be on speakerphone to get a better classroom audio." Katie said the following about her experience with technology in the hybrid synchronous classroom: "I could mainly hear the instructor. The video and audio would freeze constantly. I would always have to re-learn what was lectured in the classroom after class and on my own."

Another issue indicated by the participants as part of their hybrid synchronous learning experience was the lack of technology that could help them see the notes and markings made by the instructor on the classroom whiteboards. Katie stated, "I cannot see the drawings the professors make in the board to demonstrate different points."

Inequality in the Classroom

Feelings of inequality were very common throughout the learning experience of these distance learners taking classes in the hybrid synchronous classroom. In some occasions, when working in group projects, the distance learners felt they were not treated equally by their group members, and that their opinion was not valued as much. For example, during the focus group, Ryan and Katie explained that there were occasions when their face-to-face group members would assign them the work to do for a project without asking for their preferences.

Another element of the learning experience that made the distance learners feel unequal compared to their face-to-face classmates was the layout of the software that was used for video sharing. During the class time, the instructors would primarily share their presentation slides with the class and the distance learners; therefore, the students in the two different formats (distance and face-to-face) could not see each other. This, in turn, made the distance learners feel as if they were "out of sight, out of mind."

Robin felt that her sense of inequality was primarily due to the fact that she was missing many of the social cues from her classmates, which are important during classroom discussion. She felt self-conscious when participating in class discussion. In her opinion, "When I participate through the classroom speakers, I feel that my voice just projects and everybody just stops or thinks it is funny. I want to be considered an equal participant in class."

As previously discussed, the distance learners also felt that they missed the ability to network and create relationships with their face-to-face classmates, which created a sense of inequality in the classroom. According to Katie, "It seems like everyone has a relationship with one another because they talk before, during, or after class. I miss the sense of being a part of the class or making friendships/connections."

Relationship and Communication with Instructors

An additional component of the experience of the distance learners in the hybrid synchronous classroom, and a theme from the data collected, was their relationship and communication with their instructor. Although initially the students felt like they were a burden to the instructor(s), the distance learners realized that their instructors were glad to help them with questions, concerns, or any additional information. Additionally, the distance learners stated that they were also more proactive about emailing the instructors, if needed, and the instructors (for the most part) would communicate with the distance learners in a timely manner. Robin mentioned that she preferred scheduling individual meetings with the instructor(s) via phone or Google Hangouts because she felt email could, at times, lead to misinterpretation.

In some instances, the distance learners resented the fact that technology issues would frequently cause them to miss important information that the instructor would pass on to students before, during, or at the end of a class session.

Participating in Class

One of the main themes that emerged in the data analysis was related to class participation. According to the distance learners, there were two important issues with class participation in the hybrid synchronous classroom. The first was the difficulty obtaining non-verbal cues from both the face-to-face learners and the distance learners. Such non-verbal cues help provide information on when to participate in class discussion. Since the distance learners did not have a video feed of the classroom and could not see their classmates, it was difficult for them to know when to participate in the discussion. Robin explained that she felt awkward interrupting her classmates when she tried to join the class discussion (and was unable to see the non-verbal cues). Ryan mentioned that not knowing when to cue in was one of the biggest challenges for him, because he was not visually aware of what was happening in the classroom. On the other hand, Ryan also stated that the lack of non-verbal cues (from his classmates) allowed him to give more truthful responses. According to Ryan: “You can be a lot more honest when you are at a distance.”

The second issue mentioned significantly by the distance learners when it came to participating in the hybrid synchronous classroom was the difficulty hearing the audio. As mentioned in a previous theme (hybrid synchronous instruction technology), it was challenging for the distance learners to hear the class discussion and as Ryan explained: “It made it difficult to know what to contribute, when to contribute, and who was listening.” It was also challenging for the distance learners to participate in the class discussion because the audio connection would drop during the transmission. Consequently, as the distance learners would share a comment with the class, the transmission would stop and the comment would be incomplete. This was extremely frustrating for the distance learners.

Class Materials and Educational Tools

Another theme that surfaced during the data analysis was the accessibility of class materials and the increased use of educational technology tools by the distance learners to enhance their learning experience. All three participants mentioned that the class materials were easily accessible to them because instructors would make materials available online either using the learning management system provided by the university or some other online platform (such as a Google+ Community). Ryan, Robin, and Katie also mentioned that due to their distance learning experience, they started to use more educational technology tools for content creation and storage (e.g. Dropbox and Google Drive), and screen sharing software and video conferencing tools (such as Google Hangouts, Skype, Adobe Connect). These educational technology tools helped them work in team projects synchronously/asynchronously, organize files and documents, create/share content with others, and communicate with face-to-face classmates while being at a distance.

Suggestions

A significant portion of the data collected from the interviews, the focus group, and the electronic journal entries included suggestions that the participants provided for the improvement of the hybrid synchronous classroom at this specific institution. One of the main suggestions was related to the implementation of hardware that can help with the audio issues, such as the use of USB microphones in the classroom. Other suggestions involved using hardware and software to offer an equal environment for all students in the hybrid synchronous classroom. For example, Ryan recommended that the hybrid synchronous classroom should have computers (desktops or laptops) with access to a virtual classroom environment like Adobe Connect, where face-to-face and distance learners would be able to communicate during the class session.

Other suggestions were related to the wireless Internet connection. Robin explained that it is important for the institution to ensure a good wireless connection for the distance learners. One last suggestion to improve the hybrid synchronous classroom was the implementation of a SmartBoard that would allow the distance learners to see the drawings, markings, and/or notes made by the instructor in the whiteboard.

Effectiveness of Program

The most important element from the learning experience for the distance learners was the effectiveness of the program (using the hybrid synchronous instruction format) and their level of confidence on the knowledge acquired. All participants stated that they believed that the program had prepared them for their career as instructional designers. Robin announced that she was already working as an instructional designer, having received a job offer at the beginning of her last semester in the program. Robin shared, "I currently work as an instructional designer, so I have benefitted from the program already." With regards to the program, Ryan commented, "It was nice to finally learn about learning, and not to learn about learning from a teaching perspective, but more from a design perspective." Lastly, Katie mentioned that the program had provided her with "direction for a tangible career as an instructional designer."

Additionally, two of the participants expressed that they feel confident about the instructional design knowledge acquired during their studies in the program. Ryan mentioned that progressing through the program part-time really helped him gain a good understanding of all the principles and the different theories and their application. Katie expressed that progressing through the program as a distance learner was where she found her strength. She added that she used her distance learning experience in the hybrid synchronous classroom and turned it into an advantage for her and her studies: "I feel like I have a better grasp on the relationship between technology and learning."

Discussion

The themes which emerged from the data collected during the case study demonstrate that during hybrid synchronous instruction, from the distance learners' perspective, the following elements were a significant part of the overall learning experience:

A. Need for Stronger Connection with Classmates: The three distance learners expressed enjoyment when working together with other classmates, particularly with others at a distance. Instances in which participants had the chance to work with other learners in the same situation made them feel more integrated to that community of practice. Additionally, the strongest bond between the distance learners and face-to-face learners occurred in situations when they had met face-to-face, which allowed them to maintain that connection throughout the remainder of the program. New connections were not established between distance and face-to-face learners, which aided in the feeling of inequality in classroom activities.

B. Improvement in Study Habits: The technical issues that often prevented the distance learners from hearing the instructor or participating in all class discussions contributed to a higher accountability of the three participants, some of whom felt the need to prove themselves to the instructors. Such attitude and desire to increase their understanding on the subject transformed their study habits from passive to more proactive, which improved their time management and organizational skills. Learning at a distance allowed for the use of educational technology tools to be greatly improved during the program, especially when it came to interacting with other classmates and cooperating in an online environment.

C. Challenges in Classroom Participation: Even though all distance learners in this case study made every effort to contribute to class discussions, technical issues many times prevented them from doing so. Not knowing when to cue in, and a feeling of embarrassment and discomfort to ask for repetition due to having missed key information created the greatest differences between the distance learners' and the face-to-face learners' experience in the hybrid synchronous classroom.

D. Level of Confidence in their Knowledge: All distance learners demonstrated having a higher level of confidence at the end of the program, in particular due to the challenges they faced, which allowed them to become better professionals in the field of instructional design and technology. The hybrid synchronous instruction format of the courses also allowed distance learners to immediately put theory into practice, which in some cases does not happen in the face-to-face setting.

Implications for Practice

There are several benefits that come from the integration of distance and face-to-face learners in a hybrid synchronous classroom. It enables access to students who are geographically isolated or cannot physically attend classes due to life demands (Bower et al., 2013; Chakraborty & Victor, 2004; Hastie et al., 2010). It also reduces the cost of additional on-campus infrastructure and brick-and-mortar classrooms. Furthermore, it provides an alternative for those students who do not want to enroll in a fully online program (Bell et al., 2014). Today, there are also a wide variety of tools used to facilitate hybrid synchronous instruction (Bell et al., 2014; Bower et al., 2013); video conferencing software, screen sharing software, and synchronous document editing software are just a few of them (Chakraborty & Victor, 2004).

The results of this case study reveal that certain challenges can prevent the distance learners from having the same learning experience as their face-to-face counterparts in the hybrid synchronous classroom. These challenges require careful consideration by instructors, administrators, and institutions who desire to adopt hybrid synchronous instruction. Understanding that there are certain interactions, relationships, and communication exchanges that do not occur as naturally when students are not sharing the same physical space, instructors and instructional designers need to create learning experiences that facilitate opportunities for exchanges which enhance interactions, relationships, and communication between distance learners and face-to-face learners in the same hybrid synchronous instructional environment.

The challenges faced by the distance learners in the case study demonstrate the need for adequate infrastructure (microphones, speakers, and adequate wireless Internet) to help establish the interactions, communication, and sense of equality between all learners in the hybrid synchronous classroom. We also learned that it is key for instructors to be pro-active in their instruction, to maintain open communication channels with all students, to make materials available in advance, and to ensure that activities during hybrid synchronous sessions allow all students to be part of the class. Last, the analysis of the case study indicates that it is important for distance learners in hybrid synchronous environments to stay motivated and accountable throughout the instruction. It will help them maintain adequate study habits and increase the overall effectiveness of the instruction.

Conclusion

This case study contributes to the literature regarding the effectiveness and efficiency of hybrid synchronous instruction. It provides helpful data regarding the experience of distance learners in this setting to inform instructors/instructional designers who wish to implement synchronous online instruction. Sharing this case study with the larger community of researchers on online and distance learning could encourage others to further explore this promising instructional format, as the results reinforce that hybrid synchronous instruction holds much promise as an alternative to the two more traditional formats, fully online or face-to-face.

References

Bell, J., Sawaya, S., & Cain, W. (2014). Synchromodal classes: designing for shared learning experiences between face to face and online students. *International Journal of Designs for Learning, 5*(1).

Bonakdarian, E., Whittaker, T., & Yang, Y. (2010). Mixing it up: more experiments in hybrid learning. *Journal of Computing Sciences in College, 25*(4), 97-103.

Bower, M., Dalgarno, B., Kennedy, G. E., Lee, M. J. W., & Kenney, J. (2015). Design and implementation factors in blended synchronous learning environments: Outcomes from a cross-case analysis. *Computers & Education, 86*, 1-17. doi: http://dx.doi.org/10.1016/j.compedu.2015.03.006

Bower, M., Kenney, J., Dalgarno, B., Lee, M. J. W., & Kennedy, G. E. (2013, 2013). *Blended synchronous learning : patterns and principles for simultaneously engaging co-located and distributed learners.* Paper presented at the Electric Dreams: Australasian Society for Computers in Learning in Tertiary Education, Sydney, Australia.

Butz, N. T., Stupnisky, R. H., Peterson, E. S., & Majerus, M. M. (2014). Motivation in synchronous hybrid graduate business programs: A self-determination approach to contrasting online and on-campus students. [Article]. *MERLOT Journal of Online Learning & Teaching, 10*(2), 211-227.

Chakraborty, M., & Victor, S. (2004). Do's and don'ts of simultaneous instruction to on-campus and distance students via videoconferencing. *Journal of Library Administration, 41*(1-2), 97-112. doi: 10.1300/J111v41n01_09

Creswell, J. W. (2009). *Research design Qualitative, Quantitative, and Mixed Methods Approaches* (Third Edition ed.). Los Angeles, CA: Sage.

Cunningham, U. (2014). Teaching the disembodied: Othering and activity systems in a blended synchronous learning situation. *The International Review of Research in Open and Distance Learning, 15*(6).

Hastie, M., Hung, I. C., Chen, N. S., & Kinshuk. (2010). A blended synchronous learning model for educational international collaboration. *Innovations in Education and Teaching International, 47*(1), 9-24. doi: 10.1080/14703290903525812

Lee, R., & Dashew, B. (2011). Designed learner interactions in blended course delivery. *Journal of Asynchronous Learning Networks, 15*(1), 68-76.

McGee, P., & Reis, A. (2012). Blended course design: A synthesis of best practices. *Journal of Asynchronous Learning Networks, 16*(4), 7-22.

Niemiec, M., & Otte, G. (2009). An administrator's guide to the whys and hows of blended learning. *Journal of Asynchronous Learning Networks, 13*(1), 19-30.

Oyarzun, B., & Martin, F. (2013). A case study on multi-modal course delivery and social learning opportunities. *Bulleting of the IEEE Technical Committee on Learning Technology, 15*(1), 25-28.

Park, Y., & Bonk, C. J. (2007). Is online life a breeze? A case study for promoting synchronous learning in a blended graduate course. *MERLOT Journal of Online Learning and Teaching, 3*(3).

Patton, M. Q. (2015). *Qualitative Research and Evaluation Methods* (Fourth Edition ed.). Thousand Oaks, CA: SAGE Publications.

Plummer, K. (2001). The call of life stories in ethnographic research. In P. Atkinson, A. Coffey, S. Delamont, J. Lofland & L. Lofland (Eds.), *Handbook of Ethnography*: SAGE Publications.

Popov, O. (2009). Teachers' and students' experiences of simultaneous teaching in an international distance and on-campus master's programme in engineering. *The International Review of Research in Open and Distance Learning, 10*(3).

Rogers, P. C., Graham, C. R., Rasmussen, R., Campbell, J. O., & Ure, D. M. (2003). CASE 2 Blending face-to-face and distance learners in a synchronous class: Instructor and learner experiences. [Article]. *Quarterly Review of Distance Education, 4*(3), 245-251.

Roseth, C., Akcaoglu, M., & Zellner, A. (2013). Blending synchronous face-to-face and computer-supported cooperative learning in a hybrid doctoral seminar. *TechTrends, 57*(3), 54-59. doi: 10.1007/s11528-013-0663-z

Stewart, A. R., Harlow, D. B., & DeBacco, K. (2011). Students' experience of synchronous learning in distributed environments. *Distance Education, 32*(3), 357-381. doi: 10.1080/01587919.2011.610289

Szeto, E. (2015). Community of Inquiry as an instructional approach: What effects of teaching, social and cognitive presences are there in blended synchronous learning and teaching? *Computers & Education, 81*, 191-201. doi: http://dx.doi.org/10.1016/j.compedu.2014.10.015

White, C. P., Ramirez, R., Smith, J. G., & Plonowski, L. (2010). Simultaneous delivery of a face-to-face course to on-campus and remote off-campus students. *TechTrends, 54*(4), 34-40. doi: 10.1007/s11528-010-0418-z

Yin, R. (2014). *Case Study Research: Design and Methods (Aplied Social Research Methods)*. Thousand Oaks, CA: SAGE Publications.

Appendix A

Individual Interview and Focus Group Protocol

The purpose of this individual interview [focus group] is to discuss your experiences as distance learners in a predominantly face-to-face classroom. Thank you for agreeing to speak with me today. This focus group will last approximately 45 minutes and will consist of several questions.

As we discussed previously, this conversation will be digitally recorded. Do you still provide your consent to have this interview recorded?

This study is part of research investigation and the information you provide will be held in complete confidentiality. No information you present to me will be linked back to you in any way. If at any time during the interview you feel uncomfortable, you have the right to stop the interview and withdraw from the study. Do you have any questions?

Thank you again for your participation, are you ready to begin?

1. What was your experience with in-classroom collaborative assignments as a distance learner in a predominantly face-to-face classroom?
2. What was your experience with access to class materials as a distance learner in a predominantly face-to-face classroom?
3. What was your experience with participation during class discussion as a distance learner in a predominantly face-to-face classroom?
4. Where there any educational technology tools that assisted you during your class sessions as a distance learner?
5. What challenges did you face during your distance learning experience related to technology issues (internet, audio, presentations)? How did you overcome these challenges?
6. Do you have any additional comments?

Hybrid Learning in Higher Education: The Potential of Teaching and Learning with Robot-Mediated Communication

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Abstract

Blended learning, which combines online and face-to-face pedagogy, is a fast-growing mode of instruction as universities strive for equitable and alternative pathways to course enrollment, retention, and educational attainment. However, challenges to successfully implementing blended instruction are that *social presence*, or students' ability to project their personal characteristics into the learning space, is reduced with potential negative effects on student engagement, persistence, and academic achievement. Instructors are experimenting with robot-mediated communication (RMC) to address these challenges. Results from a study of RMC at a large public university suggest that it offers advantages over traditionally used video-conferencing, including affordances for fostering students' embodiment in the classroom, their feelings of belonging and trust, and their ability to contribute ideas in authentic ways.

Keywords: Blended (hybrid) learning, online learning, social presence, robots, embodiment

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**Hybrid Learning in Higher Education:
The Potential of Teaching and Learning with Robot-Mediated Communication**

A synthesis of a decade of research (1996-2008) on online learning suggests that *blended* or *hybrid* learning, which combines face-to-face and online learning, is the most promising approach for K-12 and higher education (Means et al., 2010). Today, advances in technologies make possible new models for hybrid education. One such model features hybrid learners' synchronous *online* attendance of face-to-face courses with other students *physically present* on-campus, in the classroom (Roseth, Akcaoglu, & Zellner, 2013). This model has the potential to enrich students' learning and make teaching and resource allocation more efficient, but poses several challenges. One is that students' ability to establish *social presence*—defined as learners' ability to project their personal characteristics into the learning environment—may be particularly challenging to establish in synchronous hybrid learning models. Social presence has been shown to be critical to course satisfaction, students' engagement, development of a community of inquiry and student learning outcomes. Low social presence leads to diminished learning outcomes. This study examines whether incorporating mobile social robotic systems (i.e., Double and Kubi robots) enhances *social presence* and *embodiment* within a synchronous hybrid course. Such research not only advances the knowledge base on the emerging field of social robotic telepresence but also provides needed insights about designs for new models of hybrid education. Next, we present our theoretical framework and review of relevant literature followed by our methods, presentation of results, discussion, and conclusion.

Review of Related Literature

Online learning is a fast-growing component of the field of education. However, research on the effectiveness of online learning approaches compared to traditional face-to-face instruction has shown mixed results (Means, Toyama, Murphy, Bakia, & Jones, 2010). Today, many scholars agree that *blended* or *hybrid* learning, which combines face-to-face and online learning, is the most promising approach for increasing access to higher education and students' learning outcomes (Means et al., 2010). In fact, the number of universities utilizing blended courses is growing rapidly. Some estimate that between 80 and 90 percent of college and university courses will someday be hybrid (Young, 2002) and suggest that the amount of blended learning classrooms has increased 30 percent annually from 2001 to 2011 (Horn & Staker, 2011).

In blended learning, portions of the course content are delivered online, typically through asynchronous instruction, supplementing face-to-face instruction in traditional classrooms. One model includes hybrid students attending face-to-face courses with students in brick-and-mortar classrooms. This synchronous hybrid education (in which online students learn through a technology-mediated "face-to-face" learning environment) promises enriched learning opportunities for the class as a whole by bringing together student perspectives from different educational backgrounds and contexts that may otherwise have remained separate (Bell, Sawaya, & Cain, 2014).

On the other hand, implementing synchronous hybrid learning poses challenges for students and instructors. One challenge is that social presence—an important aspect of a successful learning experience (Chickering & Gamson, 1987)—is often more difficult for online students to form. Online students, especially, often complain about feeling disconnected from their instructor in the learning environment (Smith & Taveras, 2005) or as interrupting interactions happening in the physical space of the classroom (Bell, Cain, Peterson, & Cheng, 2016). Establishing *social presence,* or the ability of students to project their personal characteristics into the community of inquiry, thereby presenting themselves to other participants as "real people" (Garrison, Anderson, & Archer, 2000, pp. 89) has proven to be very important for student satisfaction (Gunawardena & Zittle, 1997), the development of a community of learners (Rourke, Anderson, Garrison, & Archer, 2001), and students' learning (Richardson & Swan, 2003). Richardson and Swan (2003) found that not only do students perceive learning benefits when *they* themselves are recognized as being "real" or "authentic," but also that students perceived learning benefits from being in the presence of others, acknowledging this presence as "an essential part" of the learning experience (p. 78-79). Richardson and Swan (2003) also reported that social presence could be developed or "cultured," aligning with what Garrison has proposed with his Community of Inquiry model (Akyol & Garrison, 2008).

In a recent publication in *Online Learning*, Whiteside (2015) proposed a framework for social presence that suggested that class community and emotional connection are critical components of this construct. Other theoretical frameworks for social presence (Biocca, Harms, & Burgoon, 2003) describe it as comprised of 1) co-presence, 2) psychological involvement, and 3) behavioral engagement. Co-presence involves students being aware of each other and feeling like they are in the same place. Psychological involvement exists when students are engaged in student-student and instructor-student interactions and there is mutual understanding. Behavioral engagement can involve "eye contact, nonverbal mirroring, turn taking, and so forth" (Biocca et al., 2003, p. 465). Some researchers have argued that social presence is a necessary precondition for learning to occur, especially collaborative and social learning (So & Brush, 2008); others have argued that social presence is a by-product of an effective collaborative learning environment (Bower, Delgarno, Kennedy, Lee, & Kenney, 2015). Taken together, these ideas suggest that high social presence is facilitated in learning environments where all students feel included, seen, heard, respected and "valued as people, not merely an image on a display or a body in a seat" (Bell et al, 2016, p. 20). Attending to social presence is important because (both online and offline) students' abilities to establish relationships with faculty and with other students have a direct and significant effect on their level of scholarly engagement and learning outcomes (Kuh, Cruce, Shoup, Kinzie, & Gonyea, 2008).

Looking for ways to increase social presence within synchronous hybrid learning models, researchers today have begun to examine a new mobile technology: *social robotic telepresence systems* (SRTS) and their ability to foster social interaction between individuals (Kristoffersson, Coradeschi, & Loutfi, 2013). SRTSs facilitate social interactions through an LCD screen, a web camera, microphone, and speakers—with the added functionalities of moving/steering the system to various locations—allowing communication between remote and local parties. SRTSs, such as the Double and Kubi robots, can be moved around by a remote user who is not situated at the robot site. (See Figure 1 for examples).

Figure 1. Social robotics telepresence systems used in hybrid doctoral education.

SRTSs offer users the unique potential for *embodied* communication which facilitates social presence. Embodiment may be experienced as the feeling of being within, having control over, and/or owning a given body (Kilteni, Groten, Slater, 2012), as the incorporation of an apparatus into body schema (Haans & Isslestein, 2012), or as close connection between the virtual and physical body (Biocca, 2014). Embodiment contributes to social presence by facilitating the sense of being co-present (Biocca, Harms, & Burgoon, 2003). This may occur when interaction partners are embodied physically (e.g., in robots; Lee, Jung, Kim, & Kim, 2006) or virtually (e.g., in avatars; Bente, Rüggenberg, Krämer, & Eschenburg, 2008). Further, embodied social presence has been found to enhance cognitive engagement and performance in shared activities (Mennecke, Triplett, Hassall, Conde, & Heer, 2011), making it a particularly important topic in the examination of SRTSs within education settings. Buxton and colleagues have designed collaborative work spaces for remote workers, aiming to support the physical, social, and cognitive presence of workers through physical and virtual proximity (Sellen, Buxton, Arnott, 1992). Such systems may also become especially important in facilitating productive collaborations and a sense of "being there" for remote workers in today's hybrid work environments, including academia, as telecommuting has risen 79 percent between 2005 and 2012 and telecommuters, working alongside their face-to-face colleagues, constitute 30 percent of the U.S. workforce (Tugend, 2014). Moreover, we might expect this percentage to increase in the wake of studies that find today's employees have a strong desire for flexibility in where and when they work and report far higher engagement in their work when they have more choice (Schwartz & Porath, 2014).

Currently, we are aware of only a handful of studies that have examined robot-mediated communication within higher education learning environments (Bell et al., 2016; Cain, Bell, & Cheng, 2016; Tanaka, Nakanishi, & Ishibguro, 2014). For instance, Tanaka et al. (2014) found social presence is facilitated through robot-mediated communication, specifically systems that "transmit bodily motions" (p. 109). Bell and colleagues (2016) studied the psychological, social, and emotional dimensions of effective online learning, especially for hybrid classes. In multiple iterations of the course, the researchers experimented with social robotic telepresence technologies and pedagogical imperatives, guided by student feedback. They found that one design solution to a pedagogical or technological problem often led to another, unintended issue. For example, the decision to position the video display at the front of the class led to "the realization that this approach tended to constrain the attentional capacities of the instructor" (p. 23); she could look at the face-to-face students in front of her, or turn around to address the online students. The authors noted how it was "surprisingly difficult" to consider the complex interplay of technologies, pedagogies, and psychological needs of face-to-face and online students (p. 23). While recent research has investigated the general principles of robot-mediated communication, this study investigated how the use of robot-mediated communication in higher education supported the learning environment.

Methods

Building on this gap in the educational research literature concerned with blended or hybrid learning environments mentioned above, we inquired: What is the nature of students' embodiment, social presence, and their classroom experience in robot-mediated learning?

Data Sources

We examined this question in an educational technology doctoral course at a large, public university in the Midwest US. The course included twelve online students enrolled in their first year of a hybrid doctoral program and one face-to-face student enrolled in her first year of an on-campus doctoral program. We obtained access to this group of students because the second author of this paper was also the course instructor. Students were introduced to the study by the first author, who was not at all involved in the course, and data analysis began at the end of the semester after the course was over. Eleven out of twelve possible students consented to participate in this study.

Data Collection

Because our goal was to interpret and understand the nature of students' experiences with robot-mediated communication (compared to traditionally used video-conferencing), we collected data from a survey, focus groups, and students' written reflections. With each data source, we focused on students' 1) perceptions of social presence, 2) embodiment, and 3) transactional distance in terms of frequency of interaction, quality of interaction, sense of closeness/connectedness, and attention distribution. Ten of twelve online students and the one face-to-face student took a post-semester survey. Sample survey questions asked: "What impact did the use of robots (Kubi and Double) have on your ability to pay attention to the instructor" and "How would you rate the quality of the following interactions (face-to-face; in-person instructor to hybrid student; in-person student to hybrid; hybrid to hybrid)?"

Three focus groups of 3-4 students (n=11) (Krueger & Casey, 2014) were conducted at the end of the semester. Sample focus group questions included: "Whether you have used the robots or not, what do you see as the advantages of robots for whole class discussion? Disadvantages?" and "What do you feel are the major differences between using Zoom versus using robots to conduct a whole class discussion? Which do you prefer and why?" We also asked focus group questions that helped illuminate trends we were seeing in survey results, such as "In the survey, people largely agreed that they were able to express their ideas in the whole class discussion more than when they used Zoom for whole class discussion. Why do you think that might be?" and "In the survey, people largely agreed that they were able to build on the ideas that others expressed in the whole class discussion more than when they used Zoom for whole class discussion. Why do you think that might be?"

In addition, students reflected in writing near the beginning of the course, but after they had experienced the use of Zoom video-conferencing and robot-mediated communication to facilitate class discussions, and at the end of the course. We asked them to reflect on their experiences when they were in Zoom or robot form, or physically present (as in the case of one student), and when *others* were in these forms. Sample reflection questions included:

- How did the [insert robot or Zoom] help you to take part in whole group discussion, if at all?
- Specifically, what features or affordances, if any, did the [insert robot or Zoom] offer you that enhanced your ability to take part in the whole group discussion?
- Did using the [insert robot or Zoom] help you to interact with others (peers and/or instructor) in the whole group discussion? Please explain.
- Did using the [insert robot or Zoom] help your ability to collaborate in the whole group discussion? Please explain.
- Did using [insert robot or Zoom] help your ability to be present in the whole group discussion? Please explain.
- Were there any aspects to using the [insert robot or Zoom] in whole group discussion that you found challenged your ability to [insert interact, collaborate, be present] with your class (peers and/or instructors)?

In this paper, we draw from the focus group and beginning and end-of-semester written reflection data to describe themes that emerged in answer to our research question.

Focus groups lasted forty-five minutes and were recorded and subsequently transcribed. Responses were then compiled and grouped by mediated form (RMC, Zoom, physically present). We engaged in thematic analysis (Glesne, 2016) and initially categorized the focus group data descriptively in terms of the reported advantages and disadvantages of each mediated form and their differences and preferences as expressed by students, related to social presence, embodiment, and transactional distance (Saldana, 2016). We also grouped students' responses to each of our focus group questions about the survey results and looked for themes in these responses. In addition to our a priori, etic categories related to our three focal topics, we allowed emic categorizations or codes to emerge based on what participants were telling us.

Reflection data were organized into a matrix with each row corresponding to each question asked and the columns corresponding to students' beginning and end-of-course responses (Miles & Huberman, 2013). Similar to our thematic analysis of the focus group data, we again looked for themes around our focal topic: the nature of students' experiences (i.e., social presence, embodiment, additional aspects of the classroom experience) with robot-mediated communication in light of traditionally used Zoom video-conferencing and physical presence. Next, we present a brief overview of the course's aims and the pedagogical strategies used related to the robot-mediated communication in order to orient the reader to what implementing these technologies in this doctoral course actually looked like and the rationale behind our approach.

Course Aims and Pedagogy

In experimenting with robot technologies, the second author, also the course instructor, aimed to see if they helped increase students' experience of *social presence*, or social connection, and their sense of "being there" with their peers and instructor in the synchronous whole group class discussions compared to their experiences when video-conferencing software (e.g., Zoom) was used. Moreover, we were interested in all students' experiences—both the physically present student in our on-campus doctoral program and the online students in our hybrid doctoral program—and their sense of the interactions during synchronous class discussions. Facilitating effective discussions where all students are participating is essential to meeting course objectives; the course is framed on the assumption that participating in discussion brings with it several research-based benefits. These benefits include helping students explore a diversity of perspectives; increasing students' awareness of and tolerance for ambiguity or complexity; helping students recognize and investigate their assumptions; encouraging attentive, respectful listening; helping students become connected to a topic; affirming students as co-creators of knowledge; developing habits of collaborative learning; helping students develop skills of synthesis and integration; leading to transformation; and helping students connect their interests to the field (Brookfield & Preskill, 2005).

Previously, in teaching this class, the instructor had used Zoom video-conferencing technology and wall-mounted displays to show all the online students' faces at once. Those physically present on campus in the class, seated around a table, looked up at the screen, not really knowing where to look (into the camera lens, at the student's face on screen) to best speak to online colleagues via Zoom. Similarly, the online students using Zoom viewed those sitting in the classroom from up on high and at a distance. We sought a technology that would help reduce that transactional distance and increase our senses of being there, together, engaged in discussion.

In partnership with our colleagues in the College of Education's Design Studio we sought to investigate and collect data on the relationship between students' social presence, embodiment, and their classroom experience in robot-mediated communication compared to videoconferencing communication in order to improve the overall quality of the synchronous class discussion.

Prior to the synchronous class meetings, online students and the face-to-face student corresponded in an online threaded discussion forum every other week. These discussions, focused around guided reading questions, took place asynchronously in the course website's discussion forum one week before our synchronous whole group class discussion. For the weeks that the class met synchronously, the face-to-face student, the instructor, and teaching assistant (who also provided technical support) attended class in a classroom on campus while the online students attended class using either traditional Zoom video-conferencing software or robot-mediated communication (i.e., Kubi or Double robots). During weeks in which the class met synchronously via Zoom, the online students logged into Zoom (www.msu.zoom.us) on their own computers and appeared as ten faces on a large screen that hung at the back of the classroom. The instructor, the on-campus students, and the teaching assistant sat in a semi-circle and faced this screen in order to facilitate a whole group class discussion.

During weeks where the class met synchronously using robot-mediated communication, the instructor, teaching assistant, and on-campus students again met in the classroom on campus while each online student logged into one of the ten robot devices positioned around the room. Such systems concentrate primarily on enabling social interactions via a video conferencing system with the added functionalities of a moving "head-screen" and steering the system to various locations. One such technology called a Kubi, pictured in the photo below (Figure 1) pairs an iPad with a desk-mounted swivel that is controlled by the online students remotely, so they can join in-class discussions like they were sitting at the table. Students using the Kubi have closer proximity to their face-to-face counterparts than when using wall-mounted displays. (As mentioned earlier, in prior iterations of this course, we used wall-mounted displays and Zoom video-conferencing technology to show all the students at once). Now, with the Kubi, students can be seen through a personal portal that they can control. The students (pictured in Figure 1) were two online students, tilting and panning their "head-screens" with the Kubi devices as they took part in class discussions. Kubis were positioned around a table in the classroom as if the online students were actually sitting with their on-campus peer and instructor.

In addition to the Kubi, the other robot technology used in this proseminar was called a Double, pictured in the photo (Figure 1). This technology takes the concept of autonomous telepresence a step further by letting users control a rolling motorized iPad mount that can be maneuvered around the room and steered from remote locations. A Bluetooth speaker paired to the iPad allows students to hear the student on the Double and his contributions to the class discussions. The Double robots were positioned around the room. Students who logged into the Double robot "drove" their mobile robot device to a position at the classroom table using arrows on their keyboard to steer the device remotely. Thus, SRTs like the Kubi and Double offer users the unique potential for *embodied* communication which has been shown to contribute to social presence. Drawing from the aforementioned literature, we expected that these robot technologies (Kubis and Doubles), with their added functionality for social interaction, would increase students' social presence and embodiment and reduce feelings of transactional distance in the synchronous, whole class discussion compared to when Zoom video-conferencing was used. To see in more detail what integrating this robot technology looks like in action and what students have to say about it, please see the short video https://youtu.be/oiW81rAIJCE

Results

This section reports findings from our analysis of focus group transcripts and students' written reflections. We use pseudonyms instead of students' actual names. In answer to our research question: What is the nature of students' embodiment, social presence, and classroom experience in robot-mediated learning? two major themes emerged: in many ways students experienced a sense of embodiment and social presence through robot-mediated communication, but these were not without challenges compared to traditional video-conferencing.

Embodiment in Hybrid Classrooms

Focus group data suggested that all ten of the online students who participated in our study and experienced the class through RMC mentioned a general theme of physical presence or *embodiment*: a sense of being able to control a given body or see, hear, and be in a particular space. For instance, Lisa mentioned "embodied experience," and Chris said he felt like he had a "physical presence" in the classroom. For some students, the feeling of control in RMC—e.g., "being able to move the screen up"—afforded a "sense of freedom" that made the students "feel more physically and virtually present in the class." This experience was "more similar to being in the classroom [than video conferencing]." Some students noted that embodiment in RMC made it easier "to specify who [students were] addressing" and "to observe the nonverbals" of others. This created an awareness that "people can see what you're looking at," which one student noted "helps me pay attention." This was especially apparent during interactions with the professor, who was "clearly looking at you" and "addressing you directly" during RMC, which made one student "scared to death [she would] get caught dozing." Similarly, one student recalled a day when his robot's "head was broken." Unable to turn his robot's head-screen as he would normally do, he "felt disrespectful because [he] wasn't turning toward the speaker." The visual affordances of using the robots to see others facilitated learners' embodied experience. Stephanie, for instance, talked about being able "to see who you [other students] were." Moreover, three of the ten online students interviewed discussed the affordance of being able to move; Kevin said that the robot allowed him to get a "lay of the land," and Cai mentioned that "you can move" which she said felt "natural." Hannah mentioned that since the robots "could go," and "proximity is important," the robots helped her to "stay focused." The ability to control social interactions—e.g., "choose the proximity with the other" through moving the robot around the room—seemed to facilitate embodiment.

In their written reflections, students noted that robot-mediated communication helped them to communicate, interact, and participate with their peers, the instructor, and in small groups. Eleven of the twelve hybrid students noted that the affordance of having a "physical presence" in the room via the robots made them feel like they were in "an actual classroom." Hannah noted that positioning the robots at eye-level led them to feel part of a "group instead of outsiders looking in on a class" as is typical of the Zoom set-up. Here, it is important to reiterate that students in the class used two different kinds of robots: a stationary Kubi robot (left, in Figure 1), and a mobile Double robot (right, in Figure 1). Typically, Kubis were placed on a table-top, so that student learners in robot form were more or less at eye-level and could move their head-screen side to side and up and down. Though mobile, Double robots were often positioned in their charging stations around the perimeter of the room so they could roll up to the table when in active mode. In both forms, students mentioned that they appreciated being able to communicate with people in the room.

This sense of connection between classmates in robot form was enabled by students being able to see, hear, and interact with each other—generally, being able to perceive the others. Significantly, students reported that the ability to move the Kubi robot to look at who was speaking supported increased communication and a sense of physical presence. One student noted that the ability to "control movement" (i.e., to direct the robot to look at a classmate or instructor by turning the robot's "head") "simulated an authentic experience." Another student noted that the "Double's capacity for movement gave me the sense of being in the classroom." A student's comment that "it's nice to have them [the robots] move around" (e.g., especially before class) was representative of the students' feelings about robot-mediated mobility.

One student mentioned that the Kubi robot helped her "as a distance learner to feel closer" to the students and faculty, especially when compared to video-mediated communication. Students reported that robot-mediated communication helped them develop embodiment with those people physically present (i.e., face-to-face student and the instructor), with one reporting that it "definitely helped me to interact" and another noting that the robot helped to facilitate "a more direct interface" with individuals.

In this study, the number of learners physically present in the classroom was limited to the instructor, the face-to-face student, and a teaching assistant who also served as the "technology navigator," assisting with technological issues. The face-to-face student, Abby, reported that she enjoyed "seeing them 'closer' to me than online," which she believed helped facilitate greater participation in class discussions. One reason Abby might have felt "closer" to the students in robot form, according to her written reflection, was due to their position in the classroom. Abby reported that the Kubi robots were positioned at eye-level, which was "similar to an actual classroom discussion." Thus, for Abby, having classmates in robot form was an advantage over video-mediated communication (i.e., videoconferencing software). Further, when the Kubi robots were positioned at "eye level," Abby noted that the mediated experience was similar to a traditional, face-to-face setting.

On the other hand, hybrid students described how robot-mediated communication, while an improvement over video-mediated communication, had some limitations. For example, students reported challenges perceiving other online students when they were in robot form, due to a narrow field of vision or being unable to hear or see students whose robots were positioned farther away from their own robot. In a written reflection, one hybrid student described the experience of this visual challenge as "each participant going through the class in their own individual tunnel." For this student, the narrow field of vision was perceived holistically as an embodied problem—that is, the inability to see a complete field of vision was felt by the whole body, and contributed to a sense of isolation.

Similarly, in focus groups, students reported obstacles to embodiment via RMC; five of the ten online students in our study mentioned "audio" or "hearing" as a challenge to using the robots. Stephanie explained, "It was much more difficult to hear and to see my peers." Lisa said, "The biggest one for me was volume," while Chris noted, "The audio was one disadvantage," noting that the audio was acceptable depending on his proximity to the other robot-speakers, but became "faint" the farther away he was positioned from robot-peers. Online students did not report any challenges in hearing their on-campus peer or their instructor or their teaching assistant when they were in robot form, and the on-campus student reported no challenges in seeing or hearing her online peers in robot form. Furthermore, three-quarters of the online students reported that the "visual" experience was challenging when using the robots for seeing other students in robot form.

For instance, Michael commented, “It was really hard to see them [other robot-mediated peers]. It was hard to see their face.” Cai reported, “Sometimes you’re not clear. You know, the picture.” Kevin said, “I couldn’t see as well, especially if they [the robot-mediated peer] were turned.” Abby explained, “I couldn’t see everybody either and some people, yeah, would just keep their iPad facing one person so then you wouldn’t really interact with them during the whole class discussion.”

Two people mentioned the challenge of moving the robot or getting it in the ideal position. Chris explained, “The robot [the Double] was kinda slow and clunky to move.” Hannah said, “Being close enough without being awkward and then not being so far away that you have problems like seeing and hearing and things like that.” In their written reflections, students elaborated on the challenges associated with mobility in robot form, with some students commenting that a robot’s mobile form could also diminish students’ embodiment. Some students called the robots a distraction, with one reporting that he was “so focused on figuring out technology…that I was less focused” on course content. Another student reported that “navigating to optimal location precluded participating in discussion,” while another critiqued the Double robot’s tendency to “hover back and forth” while supposedly stationary. A fourth student described how the Double’s capacity for movement led to concerns about violating classroom behavioral norms: “I didn’t want to be rolling around and disrupting others.” For some hybrid students, then, while the Double robot presented the affordance of mobility, in classroom practice this affordance was less useful, as it was confusing or distracting.

Social Presence in Hybrid Classrooms

Social presence—the ability of students to project their personal characteristics into the community of inquiry and feel co-located, seen, heard, and valued as “real” people—was experienced to varying degrees by the students in our study. Online students generally agreed that RMC facilitated their participation in the classroom community of inquiry and encouraged students to contribute ideas. The only face-to-face student, Abby, for instance, mentioned that this experience allowed her to feel a sense of “belonging” as a result of using the robots. Another student noted: “Using the robots helped me feel like I was there.” One student remarked, “It felt like we were having a legitimate conversation” in RMC, which helped reinforce and support her own contributions. Another student felt that RMC encouraged her to “focus on what people are saying” and make connections to course content. Students mentioned that RMC helped them contribute ideas and develop a rich discussion, noting that the conversation was “germane” and “authentic.” Aligned with Rae, Takayama, and Mutlu (2013), who found that people using a telepresence robot (like the one used in this study) were trusted more than those using a simple tablet, this study found that many students who used an SRTs (i.e., Kubi or Double) reported an increased sense of connection through RMC. For example, one student in the class reported that the use of the robots in class supported “our trust and our willingness to be open.”

In their written reflections, students commented on how the robots’ ability to support increased communication, interaction, and social presence in the class “felt natural,” as one commented, “Seeing them [other students] closer provided a more comfortable atmosphere,” while a second student noted that using the robots “felt more connected” than in a traditional class. Likewise, another student mentioned how “Being able to see them [peers] allowed me to stay focused on class discussion.” Overall, hybrid students noted how robot-mediated communication supported interaction and the co-construction of ideas, with one student noting how robots “helped facilitate discussion and bounce ideas collaboratively off one another.” Thus, hybrid students recognized the capacity of robots to support class discussion. Likewise, Abby, the face-to-face student, felt that the use of robot-mediated communication provided a "comfortable" environment for all students to participate and be physically present. Abby described how the physical layout of the classroom, in this case positioning the robots in a semi-circle, allowed her to connect with her classmates: "I could turn to my right or left and interact with a specific person...It helped create bonds." For the physically present student, the use of robots seems to facilitate the social presence of those students in robot form by first giving them the capacity for embodiment, and then facilitating connection, interaction, and collaboration.

At the same time, students recognized the relationship between the use of robots in a classroom and the pedagogical organization of the class. For example, students reported that "sitting in a circle" with the robots allows students to "look at each other," which seemed an appropriate pedagogical strategy for a discussion-based seminar. These findings demonstrate that for many students, the use of the robots for teaching and learning felt "natural" and helped them facilitate "legitimate conversation" but this was also a function of their arrangement in the classroom. For these students, RMC supported the development of rich discussion and co-constructed idea contribution.

On the other hand, several students observed that the robot-mediated audio was most effective when used to speak directly with those physically present (e.g., the instructor or face-to-face student), and less so with their hybrid colleagues, especially those colleagues in robot form positioned farther away from their own robot form. One student described how the technical challenges presented by robot-mediated communication (i.e., lag-time between students; difficulty hearing or seeing other students) required the instructor to act as a "coordinator" who "pieced together other points" from students.

While many students appreciated the value of mobility via robot-mediated form in their written reflections (e.g., moving around the classroom, moving their head-screens, etc.), students also noted the challenges of teaching and learning in embodied, robotic form. For example, one student described how "fun" it was to use the Double (i.e., the rolling "mobile") robot, calling it an "added novelty," but he also wondered if he would choose it for himself. Along the same lines, one student noted that getting the attention of other classmates ("being perceived by them") was a challenge. For some students, the use of robots in class was somewhat of a distraction—with one noting that their embodied presence led them to lose focus ("My focus kept on going in and out").

Discussion

The purpose of this study was to investigate the nature of students' sense of embodiment and social presence when using robot-mediated communication in hybrid doctoral education and to explore the experience of teaching and learning in a robot-mediated classroom. In this study, we found that a majority of online students in a hybrid graduate course felt that the use of robots facilitated communication, interaction, and set the stage for possible collaboration and co-construction of ideas. Students described how the use of robots enabled them to see, hear, and interact with those people physically present in the classroom (i.e., the instructor, teaching assistant, and face-to-face student) and their online peers, to varying degrees. This research found that the use of robots afforded a sense of physical presence for hybrid students; in a sense, the robots were online students' eyes and ears in the class, facilitating students' sense of actually "being" there.

Results from this study indicate that the use of social robotics telepresence systems can enable hybrid students' sense of embodiment in a synchro-modal class, which may support their social presence, or sense of connection and belonging. This finding seems aligned with existing research in the field. The relationship between embodiment and social presence has been suggested in a number of different lines of research, including in Human-Computer Interaction (Tanaka et al., 2014), Design (Bell et al., 2016), Education (Bower et al., 2015; Whiteside, 2015), and others. So and Brush (2008) found a positive relationship between social presence and collaborative learning in a hybrid graduate course—that is, graduate students who felt connected to their peers reported a greater degree of motivation and investment in learning with (and from) their peers. In a study of seven different blended synchronous courses, Bower et al. (2015) proposed a number of critical components that support student learning, including technological, logistical, and pedagogical aspects. The authors also reported on design strategies that supported effective teaching and learning, including designing for active learning, matching technology to curricular requirements, distributing attention between face-to-face and online students, and establishing a learning community.

Bower et al. (2015) suggested that if these aspects were present in the hybrid course, class community and "co-presence" (i.e., a critical element of social presence) would occur as a result. For example, the authors reported that almost three-quarters of face-to-face students felt "co-present" with remote students, and that 60 percent of online students reported feeling "co-present" with face-to-face students. However, they also noted that the degree of co-presence "varied widely...depended on technology performance and human factors" (p. 13).

Similar to Bower et al. (2015), our study found that the benefits of robot-mediated communication are not evenly distributed among students enrolled in a hybrid course. Online students participating in robot-mediated communication appreciated the capacity to use robots to interact with those people physically present (i.e., the instructor and the face-to-face student) and described these interactions as contributing to their learning experience in the classroom. Without robot-mediated communication, online students reported that they felt disembodied; that is, their presence in the classroom was mediated through video, which felt superficial as if they were looking down (i.e., as if "on high") on the rest of the class. With robot-mediated communication, however, online students felt they had a presence in class, and could interact with those physically on campus. They could turn to face and address their interlocutor with the Kubi, or even move across the room to discuss with the Double robot.

This research aligns with findings from Cain et al. (2016), who reported that the use of social robotics telepresence systems in a hybrid course presented meaningful successes and noticeable challenges. For instance, the use of robots enabled online students to feel a sense of embodiment, or as Cain wrote, "providing a new and effective mode for online students to get individuated presence in a synchronous hybrid environment" (p. 173). The current study found that the use of mobile robots (e.g., Double robots) enabled hybrid students a greater degree of mobility, which in turn seemed to suggest increased possibilities for students to express autonomy in who they choose to learn from (and with).

However, collaboration with fellow online students via robot proved more challenging, as technical challenges made it difficult to see or hear peers. For instance, the limited range of vision meant that a robot could be seen by others, but often could not see others; it was almost as if students were wearing blinders. Similarly, the microphone on the robots picked up an excessive amount of background noise, making both proximal and distant conversations challenging to hear

(Cain et al., 2016). The current study aligns with this earlier research that found that while social robotics telepresence systems can facilitate greater interaction and communication, these systems can also highlight "tensions" in current social and cultural practices.

This research draws attention to the ways that experienced teachers may reimagine pedagogical approaches in light of technological advances and possibilities (Mishra & Koehler, 2006). For Bell and colleagues (2016; 2014; 2013), integrating cutting-edge technology into current pedagogical practices was made more successful by following a number of critical design principles. First, technology is dynamic, and the function, flow, and format of current technological systems is likely to evolve, challenging teachers, researchers, students, and instructional designers to accept more temporary solutions to enduring sociotechnical problems.

Second, Bell and colleagues found that a faculty member's "risk tolerance" goes a long way toward handling the numerous technological challenges that are bound to arise, even when faculty and instructors are impeccably prepared. Third, the authors encouraged teachers, researchers, instructional designers, and others to continue to collect and interpret data from technology-mediated courses; this strategy aims to create a feedback loop where student data informs future iterations of technology, pedagogy, and course groupings.

The collection and interpretation of student data may urge educators to consider how technology can support pedagogical experimentation and innovation. In a written reflection, one hybrid student advocated for "making use of the mobility of Doubles for learning," which suggests that hybrid teaching with embodied robots requires significant shifts from traditional, face-to-face teaching methods. In this case, instructors are advised to recognize the affordances of emerging technologies, such as mobilities, and consider the ways that student mobility might reorganize teaching and learning. Almost a decade ago, responding to global changes in networked society, and the resulting changes in daily life as a result, Leander, Philips, and Taylor (2010) wrote of the ways that considering learning as mobilities may spur essential new questions for the field of education: "How do people (on the move) build qualitatively distinct relations with different learning 'environments'?" (2010, p. 331). We can take Leander's question metaphorically to inquire about the possibilities that student mobilities via robot-mediated forms may have on challenging current models of hybrid (blended) or online education. How might robot-mediated classes suggest new visions for the dimensions, scope, and feeling of hybrid education? What happens when learner mobility is imagined as a feature (rather than an outlier) of learning? How might graduate education be different if classes are organized around dynamic movement rather than static sitting? These are just some of the questions our study raises that point the way toward future research in hybrid education with social robotic telepresence systems.

Limitations

Ours was a small-scale qualitative study to explore the nature of students' embodiment, social presence, and their classroom experience in robot-mediated learning. A strength of our methods was that they provide detailed descriptions of students' perceptions in a range of mediated forms (RMC, video-conferencing, physically present). A weakness, however, is that we did not capture observational data which could have been used to confirm or disconfirm what students were telling us. Moreover, we collected data from only one group of students in a graduate seminar where class discussion is a key pedagogical strategy. Collecting data related to our research questions from a variety of students (e.g., undergraduates) in hybrid learning contexts (e.g., larger classes with a more balanced mix of online-to-on campus students and that use different pedagogical strategies such as lecture) would strengthen the research base.

As faculty, instructional designers, and others involved in online learning consider this approach in similar educational contexts, we would like to point out a few limitations to using robot-mediated communication in small seminar courses. First, the audio quality of the Double technology is not as good as is that of the Kubis. This is especially an issue when online students on the Kubis cannot hear the student on the Double who is on the other side of the table. Second, the Kubis and Doubles are limited in their ability to zoom in and zoom out, which is an issue when the robots are situated too close to each other. Third, the on-campus student in this study felt that the class discussion was improved when her peers were in robot form, but that her interaction with the instructor suffered since facilitating a discussion with the robots took more time and attention from the instructor than did her merely looking up at a Zoom video-conferencing screen. Fourth, this approach works well in small seminars where interactive discussion is a key part of the pedagogical strategy, and there are roughly equal numbers of online and on campus students. Students and instructors must also be willing to try out new technology, knowing there can be technological and pedagogical issues along the way. This approach may be suited to larger classes where there are small numbers of online students; however, if lecture is the primary pedagogical strategy, Zoom video-conferencing will likely be preferred due to its screen-sharing capability, which facilitates slide-sharing during lectures and instructor control.

Conclusion

As colleges and universities continue to find ways to increase their enrollments such as offering expanded and alternative pathways to education for all students, especially nontraditional or under-represented students, hybrid or blended learning programs are a promising solution. This first-of-its kind study of robot-mediated blended learning suggests that RMC can offers several advantages over traditionally used videoconferencing systems for fostering social presence and embodiment in doctoral education. Additional design studies are needed to examine the interaction of hybrid pedagogy and robot technology over a longer period than a one-semester course, with additional groups of students (e.g., undergraduates), and connected to student learning outcomes.

References

Akyol, Z., & Garrison, D. R. (2008). The development of a community of inquiry over time in an online course: Understanding the progression and integration of social, cognitive and teaching presence. *Journal of Asynchronous Learning Networks*, *12*, 3-22.

Bell, J., Sawaya, S., & Cain, W. (2014). Synchromodal classes: Designing for shared learning experiences between face-to-face and online students. *International Journal of Designs for learning*, *5*(1).

Bell, J., Cain, W., Peterson, A., & Cheng, C. (2016). From 2D to Kubi to Doubles: Designs for student telepresence in synchronous hybrid classrooms. *International Journal of Designs for Learning*, *7*(3).

Bente, G., Rüggenberg, S., Krämer, N. C., & Eschenburg, F. (2008). Avatar-mediated networking: Increasing social presence and interpersonal trust in net-based Collaborations. *Human Communication Research*, *34*(2), 287-318.

Biocca, F. (2014). Connected to My Avatar. In *Social Computing and Social Media* (pp. 421-429). Springer International Publishing.

Biocca, F., Harms, C., & Burgoon, J. K. (2003). Toward a more robust theory and measure of social presence: Review and suggested criteria. *Presence: Teleoperators and Virtual Environments*, *12*(5), 456-480.

Bower, M., Dalgarno, B., Kennedy, G. E., Lee, M. J., & Kenney, J. (2015). Design and implementation factors in blended synchronous learning environments: Outcomes from a cross-case analysis. *Computers & Education*, *86*, 1-17.

Brookfield, S. D. & Preskill, S. (2005). *Discussion as a way of teaching: Tools and techniques for democratic classrooms* (2nd ed). New York: Wiley.

Cain, W., Bell, J., & Cheng, C. (2016, July). Implementing Robotic Telepresence in a Synchronous Hybrid Course. In *Advanced Learning Technologies (ICALT), 2016 IEEE 16th International Conference on* (pp. 171-175). IEEE.

Chickering, A. W., & Gamson, Z. (1987). Seven principles for good practice in undergraduate education. *AAHE Bulletin, 40*(7), 3-7.

Garrison, D. R., Anderson, T., & Archer, W. (2000) Critical inquiry in a text-based environment: Computer conferencing in higher education. *The Internet and Higher Education, 2*(2-3), 87-105.

Glesne, C. (2016). In *Becoming qualitative researchers* (5th ed.). New York, NY: Pearson.

Gunawardena, C. N. (1995). Social presence theory and implications for interaction and collaborative learning in computer conferences. *International Journal of Educational Telecommunications, 1*(2/3), 147-166.

Gunawardena, C. N., & Zittle, F. J. (1997). Social presence as a predictor of satisfaction within a computer-mediated conferencing environment. *The American Journal of Distance Education, 11*(3), 8-26.

Haans, A., & IJsselsteijn, W. A. (2012). Embodiment and telepresence: Toward a comprehensive theoretical framework. *Interacting with Computers, 24*(4), 211-218.

Horn, M.B. & Staker, H. (2011). *The rise of K-12 blended learning.* New York, NY: Innosight Institute.

Kilteni, K., Groten, R., & Slater, M. (2012). The sense of embodiment in virtual reality. *Presence: Teleoperators and Virtual Environments*, *21*(4), 373-387.

Kristoffersson, A., Coradeschi, S., & Loutfi, A. (2013). A review of mobile robotic telepresence. *Advances in Human-Computer Interaction*, *2013*, 3.

Krueger, R. A., & Casey, M. A. (2014). *Focus groups: A practical guide for applied research* (5th ed.). Thousand Oaks, CA: Sage.

Kuh, G.D. (2002). *The National Survey of Student Engagement: Conceptual Framework and Overview of Psychometric Properties.* Center for Postsecondary Research, Indiana University, Bloomington. Retrieved from http://nsse.iub.edu/pdf/psychometric_framework_2002.pdf

Kuh, G.D., Cruce T.M., Shoup R., Kinzie J. & Gonyea R.M. (2008). Unmasking the effects of student engagement on first-year college grades and persistence. *Journal of Higher Education 79*, 540–563.

Leander, K. M., Phillips, N. C., & Taylor, K. H. (2010). The changing social spaces of learning: Mapping new mobilities. *Review of Research in Education*, *34*(1), 329-394.

Lee, K. M., Jung, Y., Kim, J., & Kim, S. R. (2006). Are physically embodied social agents better than disembodied social agents?: The effects of physical embodiment, tactile interaction, and people's loneliness in human–robot interaction. *International Journal of Human-Computer Studies*, *64*(10), 962-973.

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones., K. (2010) *Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies.* U.S. Department of Education.

Mennecke, B. E., Triplett, J. L., Hassall, L. M., Conde, Z. J., & Heer, R. (2011). An examination of a theory of embodied social presence in virtual worlds. *Decision Sciences*, *42*(2), 413- 450.

Miles, M. B., & Huberman, A. M. (2013). *Qualitative data analysis: An expanded sourcebook* (3rd ed.). Thousand Oaks, CA: Sage.

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: framework for teacher knowledge. *Teachers College Record*, *108*(6), 1017.

Rae, I., Takayama, L., & Mutlu, B. (2013, March). The influence of height in robot-mediated communication. In *Proceedings of the 8th ACM/IEEE international conference on Human-robot interaction* (pp. 1-8). IEEE Press.

Richardson, J. C., & Swan, K. (2003). Examining social presence in online courses in relation to students' perceived learning and satisfaction. *Journal of Asynchronous Learning Networks, 7*(1), 68-88.

Roseth, C., Akcaoglu, M. & Zellner, A. (2013). Blending synchronous face-to-face and computer supported cooperative learning in a hybrid doctoral seminar. *Techtrends, 57* (3), 54-59.

Rourke, L., Anderson, T., Garrison, D. R., & Archer, W. (2001). Assessing social presence in asynchronous text-based computer conferencing. *Journal of Distance Education, 14*(2). Retrieved from http://cade.athabascau.ca/vol14.2/rourke_et_al.html

Rovai, A. P. (2002). Building a sense of community at a distance. *International Review of Research in Open and Distance Learning, 3*(1). Retrieved from http://www.irrodl.org/index.php/irrodl/article/view/79/153

Saldaña, J. (2016). *The coding manual for qualitative researchers* (3rd ed.). Thousand Oaks, CA: Sage.

Schwartz, T., & Porath, C. (2014). The power of meeting your employees' needs. *Harvard Business Review*, *26*(6), 442-457.

Sellen, A., Buxton, B., & Arnott, J. (1992, June). Using spatial cues to improve videoconferencing. In *Proceedings of the SIGCHI conference on Human factors in computing systems* (pp. 651-652). ACM.

Smith, G. G., & Taveras, M. (2005, January). The missing instructor: Does e-learning promote absenteeism? *eLearn Magazine*, 1. Retrieved from http://www.elearnmag.org/subpage.cfm?section=tutorials&article=18-1

So, H.-Y., & Brush, T. (2008). Students perceptions of collaborative learning, social presence, and satisfaction in blended learning environment: Relationships and critical factors. *Computers & Education*, 51(1), 318-336.

Swan, K., Shea, P., Richardson, J., Ice, P., Garrison, D. R., Cleveland-Innes, M., & Arbaugh, J. B. (2008). Validating a measurement tool of presence in online communities of inquiry. E-Mentor, 2(24), 1-12. http://online.purdue.edu/sites/purdue/files/Validating-a-Measurement-Tool-of-Presence-in-Online-Communities-of-Inquiry.pdf

Tallent-Runnels, M. K., Thomas, J. A., Lan, W. Y., Cooper, S., Ahern, T. C., Shaw, S. M., & Liu, X. (2006). Teaching courses online: A review of the research. *Review of Educational Research. 76(1),* 93-135.

Tanaka, K., Nakanishi, H., & Ishiguro, H. (2014, September). Comparing video, avatar, and robot mediated communication: pros and cons of embodiment. In *International Conference on Collaboration Technologies* (pp. 96-110). Springer.

Tugend, A. (2014, March 7). It's unclearly defined, but telecommuting is fast on the rise. *The New York Times.* Retrieved from http://www.nytimes.com

Whiteside, A. L. (2015). Introducing the social presence model to explore online and blended learning experiences. *Online Learning*, *19*(2).

Young, J.R. (2002). "Hybrid" teaching seeks to end the divide between traditional and online instruction. *Chronicle of Higher Education, 48*(28), A33-34.

Live Synchronous Web Meetings in Asynchronous Online Courses: Reconceptualizing Virtual Office Hours

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Abstract

Most online courses rely solely on asynchronous text-based online communication. This type of communication can foster anytime, anywhere reflection, critical thinking, and deep learning. However, it can also frustrate participants because of the lack of spontaneity and visual cues and the time it takes for conversations to develop and feedback to be shared, as well as the self-directedness and discipline it requires of participants to regularly check in and monitor discussions over time. Synchronous forms of online communication can address some of these constraints. However, online educators often avoid using synchronous forms of communication in their courses, because of its own constraints. In this paper, we describe how we integrated live synchronous web meetings into asynchronous online courses, collected student feedback, and made iterative changes and refinements based on student feedback over time. We conclude with implications for practice.

Keywords: Synchronous communication, asynchronous communication, live meetings, Web conferencing, office hours, social presence, instructional design

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Live Synchronous Web Meetings in Asynchronous Online Courses: Reconceptualizing Virtual Office Hours

Online learning comes in many forms (Lowenthal, Wilson, & Parrish 2009; Moore, Dickson-Deane, & Galyen, 2011). The most popular is the type offered in schools and universities that relies predominantly, if not solely, on asynchronous text-based communication (Bowman, 2010; Johnson, 2006; Shea & Bidjerano, 2009). Asynchronous text-based communication technology enables students to work at their own pace within a designated timeframe (e.g., one week) as they meet course deadlines (Huang & Hsiao, 2012; Murphy, Rodríguez-Manzanares, Barbour, 2011). Despite the widespread use of this type of communication in online courses, there are challenges with relying only on asynchronous text-based communication (Dunlap, Bose, Lowenthal, York, Atkinson, & Murtagh, 2016; Fadde & Vu, 2014). Perhaps one of the most notable challenges is the lack of visual cues and the time it takes for conversations to develop with asynchronous text-based communication (Fadde & Vu, 2014; Huang & Hsiao, 2012). Live synchronous video-based communication—whether one-on-one (e.g., Skype and FaceTime) or many-to-many (e.g., Adobe Connect, Zoom, and Google Hangouts)—can address many of the challenges of asynchronous text-based communication. For instance, synchronous video-based communication happens in real time and therefore can be more expedient and help establish others as being “real” and “there” (Fadde & Vu, 2014; Martin & Parker, 2014; Martin, Parker, & Deale, 2012). However, despite the benefits of synchronous video-based communication, many faculty avoid using this form of communication in online courses (see Huang & Hsiao, 2012; Martin & Parker, 2014; Palloff & Pratt, 2007). Some of the commonly cited reasons faculty avoid using synchronous video-based communication include (a) the belief that students enroll in online courses to avoid having to be in class at a specific time, (b) fear of technological and bandwidth issues, (c) scheduling / time zone issues, and (d) the belief that it encourages teacher-centered practices (Anderson, 2003; Huang & Hsiao, 2012; Palloff & Pratt, 2007). While each of these reasons are legitimate concerns, we questioned whether the benefits of synchronous video-based communication could outweigh the possible drawbacks. While there is some literature on how to use synchronous text-based communication (e.g., chatting or instant messaging) in online courses, there is surprisingly very little literature on how to use synchronous video-based communication (i.e., web conferencing) in online courses—and almost none on how to use it specifically for virtual office hours (Hrastinski, Keller, & Carlsson, 2010). Given this gap in the literature, we decided to investigate effective ways to integrate live synchronous video-based communication (i.e., web conferencing) into predominantly asynchronous online courses. In the following paper, we describe how we used live, synchronous, video-based communication for virtual office hours in asynchronous online courses, collected student feedback, and made iterative changes and refinements based on student feedback over time. We conclude with implications for practice.

Background

This study took place in a fully online graduate program in educational technology at a metropolitan research university. Students in this program live across the United States; a small percentage even live outside of the United States. The instructor (the first author) taught each of the courses involved in this study. Over the past 13 years, the instructor had experimented with different ways to hold office hours with his online students. For instance, as web conferencing technology improved during the mid-2000s, the instructor began hosting “live” (i.e., in real-time) synchronous virtual office hours each week (in Adobe Connect) in asynchronous online courses.

While he was aware of general recommendations found in the literature about holding live virtual office hours (cf. Boettcher & Conrad, 2016; Finkelstein, 2006; Ko & Rossen, 2017), there were three main reasons at that time motivating the instructor’s use of live virtual office hours. First, he was teaching a multimedia/coding course and he wanted to have a set time that students could come get help in real time. He believed, like others, that the desktop-sharing feature in particular, available in many virtual classrooms/web conference tools, could help him answer student questions and provide just-in-time direct instruction in an efficient and timely manner (cf.

Martin & Parker, 2014). Second, he was aware of research suggesting that students often feel isolated and alone in online courses (Bolliger & Inan, 2012; Ludwig-Hardman & Dunlap, 2003) and the importance of frequent student-teacher interaction to enhance students' motivation to engage, learn, and persist in online courses (Bernard, Abrami, Borokhovski, Wade, Tamim, Surkes, & Bethel, 2009; Chickering & Gamson, 1987). He was also specifically interested in ways to increase instructor social presence using video (Borup, West, & Graham, 2012; Richardson & Lowenthal, 2017). Third, as an adjunct instructor with a full-time day job, he was concerned about the amount of time he spent teaching online each week. He hoped that using live, video-based office hours would increase his efficiency and lower his workload by decreasing the volume of asynchronous back-and-forth exchanges with multiple students via discussion forums, email, and text messaging (cf. Dunlap, 2005).

Despite the purported benefits, for years the instructor had mixed success with live, video-based, virtual office hours. He scheduled virtual office hours every Saturday at 10am during the semester. But he repeatedly found that only about 10% of students would attend the first virtual office hour and after that the number would decrease each week until the point where one lone student (or sometimes no students) would show up. He questioned whether logging in each week for live virtual hours was a good use of his time. After a couple of years, he stopped using live virtual office hours and instead simply held office hours as needed by appointment only—a practice he found adopted by many of his colleagues having similar no-show challenges with virtual office hours.

A few years later, though, he found himself teaching at a new institution and revisiting the utility of video-based, live virtual office hours. He knew that while only a few students showed up in the past, live virtual office hours were still important and valuable to those who did show up. Further, his background in instructional design and computer-mediated communication reminded him that it is not the technology that matters but rather how technology is effectively used in online courses that makes the difference. So, with two colleagues who were also dissatisfied with their use of virtual office hours, he decided to explore ways to best engage students in synchronous video-based interactions via virtual office hours.

Methods

Technology-based instructional interventions often fail when educators or developers expect technology alone to fix educational problems. Research has consistently shown that technology is not a panacea (Cuban, 2009; Oppenheimer, 1997); pedagogy, and specifically how instruction is designed and implemented, is what makes a difference in student outcomes (Clark, 1983, 1994). Further, the instructional strategies educators and designers plan to use, do not always work as expected when implemented in a classroom with students. Given this, over the years, a growing body of educational researchers have argued that there is a need for more developmental or design-based research (Amiel & Reeves, 2008; Anderson & Shattuck, 2012; Brown, 1992; Collins, 1992).

While there are different approaches, design-based research usually involves a team of researchers using educational theory to develop an instructional intervention; the instructional intervention is then implemented in an authentic setting and studied for how well it works. The researchers then make changes to the instructional intervention based on what they learn from their design experiment; they then continue to test the instructional intervention in authentic settings, conduct additional design experiments, and make iterative improvements to the intervention over time. Design-based research, therefore, focuses on connecting research, theory, and practice by using iterative theory-driven development to investigate how and why an instructional intervention works in authentic educational settings (Amiel & Reeves, 2008; Anderson & Shattuck, 2012).

Given the potential affordances of synchronous communication technology, we set forth to investigate "how" to successfully use live synchronous video-based communication (i.e., web conferencing) in predominantly asynchronous online courses. While we were not focused on how an instructional intervention can improve student outcomes in a specific authentic setting, we were interested in using a design-based research approach to create design knowledge (cf. Boling, 2010; Howard, Boling, Rowland, & Smith, 2012) about how to use live synchronous web meetings in asynchronous online courses. Future research will need to be conducted to investigate how synchronous communication can be used to improve student outcomes.

Students in three different courses, each taught by the same instructor, took part in this study. Students were surveyed after the semester's final live meeting about their experiences and perceptions of attending live meetings. The survey was intentionally kept short, with students responding to a few Likert-style questions and three open-ended questions. The survey included questions like, "To what degree do you agree with the following statement, "Attending Happy Hours was a good use of my time" and "In your own words, why did you attend the Happy Hours?" The quantitative data from the survey was downloaded and descriptive statistics calculated for each question. The comments to the three open-ended questions were coded in NVivo 11 (QSR International, 2016). A descriptive coding process was used to catalog comments by topic and then group similar statements into main categories (Saldana, 2016).

Six students were then randomly selected from the pool of students who completed the survey to participate in follow-up semi-structured interviews as part of the first round of design experiments. During the interviews, participants were asked questions such as "What do you think of the live sessions? Do you like them? Do you find they are worth your time? How could live sessions be made more valuable to you?" The interviews were conducted by a graduate assistant. The interviews were recorded, transcribed, and then independently coded using an open-coding technique. Finally, end-of-course student evaluations were also used to triangulate the findings and further explore student perceptions of the instructor's use of live virtual office hours. The same surveys and end-of-course evaluations were then used to collect student feedback and perceptions after the second phase of design experiments.

Office Hours Redesigned

In the following section, we describe how the instructor iteratively redesigned his use of live, video-based, virtual office hours over a two-year period.

1st Redesign

The first thing the instructor did when he decided to start using live, video-based virtual office hours again was to rebrand his virtual office hours. Office hours implies something optional, something not important, something only for struggling students (Huang & Hsiao, 2012). Research has shown that students usually do not attend office hours (in any format) and that when given the choice, they prefer to simply email questions directly to their instructor (Kitsantas & Chow, 2007; Li, Finley, Pitts, & Guo, 2011). This is in part because of flexibility but also the stress involved in asking questions, especially in front of other students (cf. Li et al., 2011). Inspired by his colleague, Krishna Pakala, the instructor renamed his virtual office hours as "Happy Hour." This was an attempt to portray virtual office hours as a more informal, social environment where students might feel more at ease to ask questions as they arise (and learn vicariously through others' questions and answers), commiserate with peers, and get to know each other better.

Office hours are traditionally offered each week. However, the instructor questioned whether this was needed in the courses he taught. Thus, rather than offering live virtual office hours each week, he strategically chose four key times throughout the semester to offer the four live virtual hours, each lasting 60 minutes. The first live session was offered three weeks into each course and the remaining three were scheduled three weeks apart. The hope was that this would be frequent enough to help students with major questions but not too frequent that it became a burden (for him or the students). He was fully aware though that four was not a magic number; between 3 to 6 meetings could be equally effective, depending on the course and context. Research, though, suggests that instructors should have more than two live synchronous sessions in order to have students feel comfortable with the technology (McBrien, Jones, & Cheng, 2009).

Following suggestions in the literature (cf. Barclay, 2010), the live virtual office hours remained optional. However, the instructor chose to emphasize them more than he had emphasized office hours in the past. For instance, the date and times of each Happy Hour were set at the start of the semester and listed on the syllabus. The instructor had students living all over the United States as well as a number of students out of the country. Therefore, rather than trying to find a time that worked for all students, he opted for a time that worked for him and most of his students (many of which had full-time jobs)—which happened to be Wednesday evenings. He alternated times to enable students from both the east and west coast time zones to attend (e.g., the 1st and 3rd Happy Hour would be scheduled at 5:30pm and the 2nd and 4th happy hour would be scheduled at 6:30pm). He also posted information about each live session in the corresponding module of the learning management system. Then on the day of the live meeting, following Martin et al.'s (2012) recommendation, a reminder was posted in the course announcements. Finally, as suggested in the literature, the live meeting was recorded and the recording was posted online so those who could not attend were able to watch at their convenience (Barclay, 2012; Martin et al., 2012) as well as ask follow-up questions as needed.

2nd Redesign

The following year, the instructor made additional changes to his use of live, video-based virtual office hours based on feedback he received from students—which came from a survey, select interviews, and end-of-course evaluations (which will be discussed in more detail in the following section)—as well as his own experience offering live meetings (see Table 1 for a summary of these changes). First, based on student feedback, a Google Calendar invite was created for each meeting and students were invited to attend the meeting through the Google Calendar application (this university used the G Suite for Education core services). This provided students one more way to be reminded of the live virtual office hours. Second, based on student suggestions, he decided to allow students to earn points for attending the live meetings. While he could have added the points simply as extra credit, he decided instead to add the points as a part of the course participation points. Thus, this gave students the ability to choose whether they earn all their participation points for the course by taking part only in the asynchronous course discussions or earn some points by attending the live meetings. Thus, attendance was still optional but students could earn points for attending. Third, a mini instructional lesson was added to each Happy Hour session because students reported that they wanted some type of instruction if they were going to attend a live meeting; that is, the live meetings should not simply be a question-and-answer forum (like traditional office hours). Students also mentioned that there should be a way to ask questions that could be addressed during Happy Hour in case they were unable to attend; in response, when the instructor would post an announcement reminding students to attend a live meeting later that day, he asked students who could not attend to post any questions they had so that he could address them during the live meeting.

Based on this feedback, each future live meeting would start by addressing student questions; then there would be an instructional lesson, which was either a pre-planned lesson based on the content of the given module or a lesson based on students' past work (e.g., common errors the instructor noticed while grading student work).

Initial Design	**1st Redesign**	**2nd Redesign**
● Live Virtual Office Hours ● Weekly (Saturday mornings at 10am) ● Attendance was optional ● Unstructured	● Rebranded as "Happy Hours" ● Offered 4 times a semester on Wednesdays (times varied) ● Dates & times listed on syllabus ● Remind students about "Happy Hour" ● Attendance is optional ● Unstructured ● Recorded ● Added Happy Hours within corresponding modules	● Rebranded as "Happy Hours" ● Offered 4 times a semester on Wednesdays (times varied) ● Dates & times listed on syllabus ● Remind students about "Happy Hour" ● Attendance is optional ● Unstructured ● Recorded ● Added Happy Hours within corresponding modules ● Added Happy Hours to Google calendar & invite students ● Enable students to earn points for attending ● Add instructional lesson ● Solicit questions from students who can't attend

Table 1. Design Changes of Live Virtual Office Hours

Results

As previously mentioned, our purpose was to find more effective ways to use live, video-based virtual meetings in predominantly asynchronous courses. More specifically, we wanted to find ways to improve student attendance, satisfaction, and overall perceptions of live, video-based virtual meetings. In the following section, we briefly describe the findings.

We were initially interested in getting more students to attend the optional live meetings and therefore make it feel like the live sessions were a good use of the instructor's and his students' time. While previously only about 10% of students attended one virtual office hour (i.e., 2 out of

23 students), now about 50% of the students in each course are attending at least one Happy Hour semester after semester (i.e., 11-13 out of 23 students) and about 25% (i.e., 6-7 out of 23 students) attend every Happy Hour in a given semester (Table 2). Thus, while every student is not able to, or chooses not to, attend a live session, the design changes appear to be associated with an overall increase in attendance. Further, the analytics of the archived recordings of the live meetings (which are uploaded as unlisted videos on YouTube the following week of each live session) revealed that each recoded live session has an average of 8 "views," thus in ways increasing "attendance" even more through post-session review by students not in live attendance.

Course	**Enrollment**	**# of Students Attending a Happy Hour**	**Average Attendance**	**#Attending All**
Internet for Educators	74	41 (55%)	2.56	9 (22%)
Online Course Design	35	18 (51%)	1.94	5 (28%)
Doctoral Studies Orientation	16	9 (56%)	3.11	3 (33%)

Table 2. Happy Hour Attendance

We were also interested in why students attended the live meetings and whether they enjoyed them (Table 3). Students reported that they attended the live meetings to learn the course material (*M*=3.88 on a 5-point scale), learn course requirements (*M*=3.76), and to get questions answered (*M*=3.85). But the number one reason students said they attended the live sessions was to get to know their instructor better (i.e., the instructor's social presence; *M*=4.38). Finally, students reported that attending the live sessions was a good use of their time (*M*=4.43). Further, a few students, each semester, would mention the live sessions (i.e., Happy Hour) when asked in the end-of-course evaluations, "Which aspects of this course were most valuable to your overall learning experience?" The following are a few examples of what some students said in the instructor's end-of-course student evaluations:

- "I loved the happy hours and the video feedback he would give"
- "The instructional videos and forum feedback as well as the Happy hour connection were all important to making course more than just a long tutorial."
- "...videos, happy hours and personal tutoring made this course the only online course I have ever had where I really felt a connection to the professor personally and to the other students."
- "I enjoyed the "Happy Hours" as this helped me feel more connected to my peers and the instructor."
- "The "happy hour" online webchats were also very useful and fostered a sense of community in the class."
- "...enjoyed the happy hours as a way to connect with other learners in the cohort. Appreciated the informal approach to it to ease new students and alleviate their fears of belonging."

- "I appreciated the Happy Hour... question/answer sessions, casual and frank preparation for the doctorate program, and general support and cheerleading."

To what degree do you agree with this statement,	**[Strongly Disagree**				**------Strongly Agree]**	**M**	**SD**
I attended Happy Hours to learn course material / content	2	6	15	19	25	3.88	1.11
I attended Happy Hours to learn more about course requirements	3	10	11	20	24	3.76	1.21
I attended Happy Hours to get my questions answered	3	6	17	14	28	3.85	1.19
I attended Happy Hours to get to know my instructor better	1	1	7	21	38	4.38	.85
I attended Happy Hours to get to know my fellow students better	2	5	15	19	27	3.94	1.09
Attending Happy Hours was a good use of my time	0	2	3	27	36	4.43	0.72

Table 3. Student Perceptions of Happy Hours (i.e., Synchronous Live Meetings)

We also wanted to learn more about why students attended and how the use of live virtual office hours could be improved through each iteration. Via the survey, we asked students the following open-ended questions:

Q1: In your own words, why did you attend the Happy Hours?

Q2: What would you change about Happy Hours if you could?

Q3: Final comments.

The main categories of coded comments are listed in Table 4 along with a percentage breakdown of comments coded under each category. Many of the categories span across multiple questions due to similarities in responses. For example, participants discussed Personal Interaction topics in response to all three questions (Q1, Q2, Q3). In Table 4, each category is described and then is followed by a summary of where coded comments appeared in response to the three open-ended questions.

Personal Interaction: These comments emphasize interaction with instructor and/or peers in the live setting.

Satisfied or Appreciative: These comments referred to satisfaction with aspects of the live sessions or general appreciation for the availability of live sessions.

Useful Information: Comments regarding the value or usefulness of the live sessions.

Timing: Comments pertaining to the timing of the live sessions and schedule conflicts.

Incentives: Comments related to incentives such as points given for attending.

Technology: Comments about the technologies used for the live session.

Advanced Preparation: These comments emphasize student requests for discussion topics prior to the live session.

Content and Focus: These comments are on how focused and on track (or not) the sessions were:

Q1	Q2	Q3	Main Categories for Coded Comments	Percentage of Coded Comments*
x	x	x	Personal Interaction	26
x	x	x	Satisfied or Appreciative	24
x			Useful Information	15
x	x	x	Timing	14
x	x	x	Incentives	8
x	x	x	Technology	5
	x	x	Advanced Preparation	5
	x		Content and Focus	2

*Note. There was a total of 252 coded statements. Percentages of coded comments were rounded to the nearest whole number, which accounts for the total at slightly less than 100.

Table 4. Coding by Question and Category

Below is a sample of student responses within each of the eight coding categories:

Personal Interaction: Comments about interaction with instructor and/or peers in the live setting.

- “It was a great way to connect with the instructor and other students. There's a difference between being a participant ‘live’ and just listening to the recording.”
- “Since we are in an online course, I liked the opportunity to see my instructor and classmates ‘live.’ This is why I attended the first Happy Hour.”

- “I attended the Happy Hour sessions for two reasons. First, it's difficult to connect with people in an online program, it was nice to be able to see people and hear their voices in real-time for a change.”

Satisfied or Appreciative: Comments about satisfaction with aspects of the live sessions or general appreciation for the availability of live sessions.

- “I was satisfied with the Happy Hours opportunity in terms of its content and structure. It was casual and not formalized so that it was a comfortable environment for people who have not met each other.”
- “I appreciate that Patrick took time to hold the Happy Hour conferences. It was very helpful to be able to ask questions and it was great to get to know some of my classmates.”
- “I really enjoyed attending Happy Hours. I think this is a great idea to get answers and see where everyone else is in the course. All courses should have Happy Hours.”

Useful Information: Comments about the value or usefulness of the live sessions.

- “To gain additional insights in the assignments and activities. It was very helpful to hear Patrick's viewpoints on finer issues. Also, I always learn from what other people are doing/know.”
- “I wanted to be kept in the loop and receive any additional information the instructor thought was helpful for the course.”
- “I attended to make sure that I was on task with my assignments. I also needed clarification on coding and web design when the course began. The happy hour sessions were extremely valuable to me when I started the course.”

Timing: Comments about the timing of the live sessions and schedule conflicts.

- “I was only able to attend the first one because they were all on Wednesdays and that is the day that my school has after school meetings. By the time I got out and home to log in, the Happy Hour was over.”
- “I would change up the day of the week and or the time of the day that they are scheduled. That way more people could attend all of them.”
- “As an east coast student with a toddler child at home, having the session at 7-8pm EST was very difficult for getting my child ready for bed—I would be happy to have it later for my own personal schedule.”

Incentives: Comments about incentives such as points given for attending.

- “The reason I said that I wouldn't attend without the points was because I wouldn't have gone to start without the points. Knowing what I know now, I feel they were worth going with or without credit, but I wouldn't have gone to the first one to find that out without the tempting participation points.”
- “I wish there was another way to make up the missed participant points for those who can't attend happy hours live. I know the points probably don't mean that much in the overall picture but I feel like I've failed for something out of my control.”

- "If points weren't given for attending, I might not have attended at first or as regularly and I would've missed out. The points motivated me to go to the first one and then I looked forward to the next ones."

Technology: Comments about the technologies used for the live session.

- "I teach online, so I was curious about seeing another platform other than Blackboard and thought it would be good to have a live experience with this class since I hadn't done that with any others during the program."
- "I want to check it out as this was my first time in an online course. I also wanted to try the online meeting technology which I have never used before."
- "This was my first time participating in a web conference at Boise State. I was nervous about having to be seen on camera which fortunately did not happen. I would like to use a similar software to have teachers engage with independent studies that can't attend school every day. I wish adobe connect software wasn't so expensive."

Advanced Preparation: Comments about student requests for discussion topics prior to the live session.

- "It might be helpful to have students submit questions prior to the happy hour so that you could tailor the hour to those attending. It would be nice if there was a way to encourage students to come up with questions before happy hour so there were more questions being asked.
- It would be good to have participants ask about their primary concerns/ questions on a form (such as this) before everyone attended."

Content and Focus: Comments about how focused and on track (or not) the sessions were:

- "I think the Happy Hours got sidetracked by questions about comps and dissertations. All of which are years away. I wish they were more focused on the course. Maybe dedicate one late in the course for folks that had questions."
- "I feel like we threw a lot of random questions at you during HH, which made it difficult for there to really be a flowing discussion. I'm sure this was partially because we are all new the program and there are simply a lot of questions that we have about coursework, formats, etc."

Students comments were invaluable as they helped clarify survey results and provided specific insight into how to better design virtual office hours in online courses.

Discussion

Most online courses today rely predominantly on asynchronous, text-based communication. This is not surprising when one considers the independent, correspondence- study tradition of distance learning from which online learning evolved. While we understand the benefits of asynchronous, text-based online communication, we also believe—based on the literature (Fadde & Vu, 2014; Finkelstein, 2006; Huang & Hsiao, 2012; Martin & Parker, 2014; Ng, 2007; Power, 2008) and our experiences—that there are inherent affordances of communicating in real time, "face-to-face," using synchronous video communication technology.

However, over the years we have struggled to effectively use live, video-based synchronous communication in our online courses.

In this study, we set out to investigate how to use live, video-based synchronous technology during office hours in three different predominantly asynchronous online graduate courses. Whether online or face-to-face, most students do not attend office hours. Thus, our first goal was to get students to attend office hours in the first place. While we were aware that simply requiring students to attend would likely increase attendance, we wanted to keep office hours as an optional activity. Over the two-year period, we found that as we emphasized the importance of the live virtual office hours more, reminded students of when the meetings were (i.e., by listing it as an activity in the course, sending calendar invitations, and reminders the day of the meetings), added an instructional component, and enabled students to earn points for attendance, overall attendance increased. While some students chose not to attend, more than half of each class attended or watched the archived recording of the meeting. Additional research, though, is needed to see if similar strategies could increase attendance in other subject areas.

In addition to increasing the overall attendance of office hours, we also wanted students to feel like attending was a good use of their time and to better understand what they liked or did not like about attending live, video-based office hours. The results suggest that students who attended the live, video-based office hours liked them, found them helpful, and even wished that other instructors used them in their courses. However, students also reported that they sometimes struggled getting the technology to work and sometimes could not attend the live meetings due of prior commitments. Additional research is needed to better understand why some students never attended a live meeting as well as the relationship between participation in live meetings, student retention, and student learning.

Design Recommendations

Incorporating synchronous learning opportunities and events into online courses is an important design decision. We do not believe that synchronous live meetings are appropriate for all courses, all instructors, or all students. But we do believe that they can add value to predominantly asynchronous online courses, when used intentionally, with thought and care. This study illuminates several design recommendations derived from the analysis of the collected data—some of which align with previous work (e.g., Barclay, 2010 and Martin et al., 2012), but many that do not.

Based on our experience, the following recommendations are offered to support the effective use of live office hours:

Orientation to live sessions

1. Refer to virtual office hours using a more inviting title. For example, for more informal live sessions, select a name like Happy Hours, Coffee Breaks, Afternoon Tea, Bat Cave, and Around the Campfire. For more formal live sessions, consider titles such as Consultations, Design Studio, Conference Room, Headquarters, and Open Space.
2. Inform students at the start of the semester when synchronous sessions are scheduled.
3. Inform students of the agenda for each live session in advance.
4. Remind students of approaching live sessions in daily/weekly communications, such as via the announcements feature of a learning management system.

5. Provide low-stakes opportunities for students to troubleshoot and get acquainted with the synchronous format and associated tools. For example, during the first few weeks of a course, have each student—or small groups of students—visit with you in Adobe Connect for the sole purpose of checking out tool functionality, and to hear and see each other laugh.
6. Share a short recording of a live session with students new to live sessions so they can get a sense of how they work and what to expect in advance of participating in a live session.

Scheduling

7. Consider students' time zones when scheduling live sessions. Use a tool like Doodle, for example, to determine best times to meet.
8. Schedule live sessions strategically; they do not need to be scheduled weekly. For example, schedule live sessions prior to the due dates of major deliverables or in advance of exams.
9. Vary the day of the week and time of day. Consider scheduling two live sessions per week on different days and at different times of day.

Relevance

10. Be transparent with students as to your reasons for including live sessions in your online courses.
11. Ask students to share questions in advance of live sessions so sessions may be tailored to meet specific goals, needs, and interests.
12. Make live sessions relevant in terms of content and activity. Make sure the live sessions add value to the students' learning experience in an online course. For example, include a brief direct-instruction component, demonstration, or guest speaker in each live session.
13. Provide a comparable learning experience for those unable to attend a live session. For example, give those students specific questions/prompts to respond to while watching the recording.

Incentives and assessment

14. Add incentives for attendance (e.g., require it or allow students to earn points), but provide options—equitable in terms of learning experience—for those who have schedule conflicts.
15. Involve students in learning activities during synchronous sessions that support their work on projects, papers, and so on. For example, provide a lab demonstration that will help students complete their own experiments in the lab.

Interaction

16. Start each live session with a brief ice-breaker and/or get-to-know-you activity to help establish connections between and among instructor and students, and to get warmed up with the technology before launching into more coursework-oriented activities.
17. Provide both informal and structured time and opportunity for students to interact with each other.
18. Have students contribute to or determine "rules of engagement" for interacting with each other during live sessions.

19. Model the type and level of interaction that supports student engagement during live sessions.
20. Get students involved in the live meetings. For example, have them collaborate on a response to a problem of practice or peer review each other's work.
21. Ask for questions from students who are unable to attend, and respond to the questions during the live session.

Conclusions

Prior to this research study, the instructor and co-authors were dissatisfied with the reach and effectiveness of virtual office hours in their online courses. They knew there was great potential value even if only for the few students who did participate in virtual office hours, however they consistently questioned whether or not the time spent planning, promoting, and facilitating live sessions was a good use of a finite resource—their time and energy. They were curious about considerations like: *Do live, video-based, virtual office hours have to be offered each week? Do they have to be offered at the same time each week? Should students be required to attend virtual office hours?* This study helped them think through their instructional decisions and associated instructional strategies and develop a set of design recommendations to guide their practice and the practice of others.

As synchronous video-based communication technologies continue to improve and become more reliable and easy to use, instructors are likely to take advantage of the instructional potential of live sessions. Ideally, online courses would include both asynchronous and synchronous learning opportunities based on the instructional goals of the course, taking advantage of the affordances of both formats. In fact, on-campus courses may learn associated best practices from online courses; the "flipped classroom" approach is an example of how on-campus courses can be structured to best take advantage of synchronous learning opportunities (i.e., those occurring in a classroom, lab, or the like) and asynchronous learning opportunities (i.e., homework). Using a design-based research approach to create new knowledge about how to use live synchronous web meetings in asynchronous online courses, we have identified a set of design recommendations that match instructional goals and strategies based on currently available synchronous tools and technologies. These design recommendations inform our online and on-campus teaching practices, and have provided us with an ongoing line of inquiry to pursue as we explore additional ways in which synchronous video-based web tools and technologies may be used to support student learning.

References

Ambrose, S. A., Bridges, M. W., DiPietro, M., Lovett, M. C., & Norman, M. K. (2010). *How learning works*. San Francisco, CA: Jossey Bass.

Amiel, T., & Reeves, T. C. (2008). Design-based research and educational technology: Rethinking technology and the research agenda. *Educational Technology & Society, 11* (4), 29-40.

Anderson, T. (2003). Getting the mix right again: An updated and theoretical rationale for interaction. *The International Review of Research in Open and Distributed Learning*, *4*(2). Retrieved from http://www.irrodl.org/index.php/irrodl/article/view/149/230

Anderson, T., & Shattuck, J. (2012). Design-based research: A decade of progress in education research? *Educational Researcher*, *41*(1), 16-25.

Astin, A. W. (1993). *What matters in college? Four critical years revisited*. San Francisco, CA: Jossey Bass.

Barclay, K. (2010). Humanizing learning-at-distance: Best practice guidelines for synchronous instructors. In *Web-Based Education: Concepts, Methodologies, Tools and Applications* (pp. 1232-1238). Hershey, PA: IGI Global.

Bernard, R. M., Abrami, P. C., Borokhovski, E., Wade, C. A., Tamim, R. M., Surkes, M. A., & Bethel, E. C. (2009). A meta-analysis of three types of interaction treatments in distance education. *Review of Educational research*, *79*(3), 1243-1289.

Boettcher, J. V., & Conrad, R. M. (2016). *The online teaching survival guide: Simple and practical pedagogical tips (2nd ed.).* San Francisco, CA: Jossey-Bass.

Boling, E. (2010). The need for design cases: Disseminating design knowledge. *International Journal of Designs for Learning*, *1*(1), 1-8.

Bolliger, D. U., & Inan, F. A. (2012). Development and validation of the online student connectedness survey (OSCS). *The International Review of Research in Open and Distributed Learning*, *13*(3), 41-65. Retrieved from http://www.irrodl.org/index.php/irrodl/article/view/1171/2206

Borup, J., West, R. E., & Graham, C. R. (2012). Improving online social presence through asynchronous video. *Internet and Higher Education,15*(3), 195-203.

Bowman, L. (2010). *Online learning: A user-friendly approach for high school and college students.* Lanham, MD: Rowman & Littlefield Education.

Brown, A. L. (1992). Design experiments: Theoretical and methodological challenges in creating complex interventions. *Journal of the Learning Sciences, 2*, 141–178.

Clark, R. E. (1983). Reconsidering research on learning from media. *Review of educational research*, *53*(4), 445-459.

Clark, R. E. (1994). Media will never influence learning. *Educational technology research and development*, *42*(2), 21-29.

Collins, A. (1992). Toward a design science of education. In *New directions in educational technology* (pp. 15-22). Springer, Berlin, Heidelberg.

Cuban, L. (2009). *Oversold and underused*. Harvard University Press.

Chickering, A., & Gamson, Z. (1987, March). Seven principles for good practice in undergraduate education. *AAHE Bulletin*, 3-7.

Dunlap, J. (2005). Workload reduction in online courses: Getting some shuteye. *Performance Improvement, 44*(5), 18-25.

Dunlap, J., Bose, D., Lowenthal, P. R., York, C. S., Atkinson, M., & Murtagh, J. (2016). What sunshine is to flowers: A literature review on the use of emoticons to support online learning. In S. Y. Tettegah & M. Gartmeier (Eds.), *Emotions, design, learning and technology* (pp. 163-182). San Diego, CA: Elsevier.

Fadde, P. J., & Vu, P. (2014). Blended online learning: Benefits, challenges, and misconceptions. In P. R. Lowenthal, C. S. York, & J. C. Richardson (Eds.), *Online learning: Common misconceptions, benefits, and challenges* (pp. 38-48). Hauppauge, YU. Nova Publishers.

Finkelstein, J. E. (2006). *Learning in real time: Synchronous teaching and learning online*. San Francisco, CA: Jossey-Bass.

Gunawardena, C. N. (1995). Social presence theory and implications for interaction and collaborative learning in computer conferences. *International Journal of Educational Telecommunications, 1*(2/3), 147-166.

Gunawardena, C. N., & Zittle, F.J. (1997). Social presence as a predictor of satisfaction within a computer-mediated conferencing environment. *American Journal of Distance Education, 11*(3), 8-26.

Howard, C. D., Boling, E., Rowland, G., & Smith, K. M. (2012). Instructional design cases and why we need them. *Educational Technology*, *52*(3), 34-39.

Hrastinski, S., Keller, C., & Carlsson, S. A. (2010). Design exemplars for synchronous e-learning: A design theory approach. *Computers & Education*, *55*(2), 652-662.

Hsiao, E. L. (2012). Synchronous and asynchronous communication in an online environment: Faculty experiences and perceptions. *Quarterly Review of Distance Education*, *13*(1), 15-30.

Ice, P., Curtis, R., Phillips, P., & Wells, J. (2007). Using asynchronous audio feedback to enhance teaching presence and students' sense of community. *Journal of Asynchronous Learning Networks, 11*(2), 3-25.

Kitsantas, A., & Chow, A. (2007). College students' perceived threat and preference for seeking help in traditional, distributed, and distance learning environments. *Computers & Education, 48*(3), 383-395.

Ko, S., & Rossen, S. (2017). *Teaching online: A practical guide* (4th ed.). New York, NY: Taylor & Francis.

Li, L., Finley, J., Pitts, J., & Guo, R. (2011). Which is a better choice for student-faculty interaction: synchronous or asynchronous communication? *Journal of Technology Research, 2*, 1-12.

Lowenthal, P. R. (2010). The evolution and influence of social presence theory on online learning. In T. T. Kidd (Ed.), *Online education and adult learning: New frontiers for teaching practices* (pp. 124-139). Hershey, PA: IGI Global.

Ludwig-Hardman, S., & Dunlap, J. C. (2003). Learner support services for online students: scaffolding for success. *The International Review of Research in Open and Distributed Learning*, *4*(1).

Martin, F., & Parker, M. A. (2014). Use of synchronous virtual classrooms: Why, who, and how? *Journal of Online Learning and Teaching*, *10*(2), 192-210.

Martin, F., Parker, M. A., & Deale, D. F. (2012). Examining interactivity in synchronous virtual classrooms. *The International Review of Research in Open and Distributed Learning*, *13*(3), 228-261. Retrieved from http://www.irrodl.org/index.php/irrodl/article/view/1174/2253

McBrien, J. L., Cheng, R., & Jones, P. (2009). Virtual spaces: Employing a synchronous online classroom to facilitate student engagement in online learning. *The International Review of Research in Open and Distributed Learning, 10*(3). Retrieved from http://www.irrodl.org/index.php/irrodl/article/view/605/1264

Moore, J. L., Dickson-Deane, C., & Galyen, K. (2011). E-Learning, online learning, and distance learning environments: Are they the same? *Internet and Higher Education, 14*(2), 129-135.

Murphy, E., Rodríguez-Manzanares, M. A., & Barbour, M. (2011). Asynchronous and synchronous online teaching: Perspectives of Canadian high school distance education teachers. *British Journal of Educational Technology*, *42*(4), 583-591.

Ng, K. C. (2007). Replacing face-to-face tutorials by synchronous online technologies: Challenges and pedagogical implications. *The International Review of Research in Open and Distributed Learning*, *8*(1). Retrieved from http://www.irrodl.org/index.php/irrodl/article/view/335/764

Oppenheimer, T. (1997). The computer delusion. *The Atlantic Monthly*, *280*(1), 45-62.

Palloff, R. M., & Pratt, K. (2007). *Building online learning communities: Effective strategies for the virtual classroom* (2nd ed.). San Francisco, CA: Jossey-Bass.

Power, M. (2008). The emergence of a blended online learning environment. *Journal of Online Learning and Teaching*, *4*(4), 503-514.

Reeves, T. C., Herrington, J., & Oliver, R. (2005). Design research: A socially responsible approach to instructional technology research in higher education. *Journal of Computing in Higher Education, 16*(2), 96–115.

Richardson, J. C., & Lowenthal, P. (2017). Instructor social presence: Learners' needs and a neglected component of the community of inquiry framework. In A. Whiteside, A. Garrett Dikkers, & K. Swan, (Eds), *Social presence in online learning: Multiple perspectives on practice and research* (pp. 86-98). Sterling, VA: Stylus.

Saldana, J. (2016). *The coding manual for qualitative researchers* (3rd ed.). Thousand Oaks, CA: Sage.

Shea, P., & Bidjerano, T. (2009). Community of Inquiry as a theoretical framework to foster "epistemic engagement" and "cognitive presence" in online education. *Computers & Education*, *52*(3), 543-553.

QSR International. (2016). NVivo 11 for Windows [Computer software]. Retrieved from http://www.qsrinternational.com/product/nvivo11-for-windows

Wherefore Art Thou MOOC?: Defining Massive Open Online Courses

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Abstract

Although MOOCs are a much-discussed topic in higher education, conversations about MOOCs do not often include details regarding the nuanced nature of these courses. What do people mean when they use the term MOOC? In the current work, we delve into the variations of MOOCs, and we put a typology we previously created into practice. Our goal with this work is not only to provide an extended categorization for MOOCs but also to apply those categories to MOOCs that are currently advertised or already available.

Keywords: MOOC, MOOC typology, defining MOOCs

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Wherefore Art Thou MOOC?: Defining Massive Open Online Courses

Massive open online courses (MOOCs) are relatively new online instructional platforms for providing free instruction to anyone who can access them. The first MOOCs were offered in the late 2000s by Canadian professors teaching an online course from their campus; later, several for-profits formed for offering MOOCs, including groups such as Coursera and Udacity, as did nonprofits, such as edX. MOOCs have become fairly commonplace in higher education over the last decade. Indeed, close to 4,000 MOOCs were planned for 2016 (Wexler, 2015). Moreover, according to the MOOC Course Report, 1500 free courses were planned for May 2017, including 102 newly-developed MOOCs (Shah, 2017).

MOOCs vary widely in form, but they are said to have several defining features. As noted in Major and Blackmon (2016, p. 12-14), MOOCs are:

- **Massive**. Theoretically, MOOCs are massive courses, sometimes boasting participant numbers in the thousands, largely due to their often-unrestricted access (see Carver & Harrison, 2013). However, there are also courses with much lower numbers of participants, and those courses are referred to as MOOCs as well, possibly due to the potential they hold for a larger number of participants. At times, smaller courses have been referred to as SMOOCs, for small to medium online courses. Despite the use of terms like SMOOC, the term MOOC seems to function as an overarching term no matter the size of the course.

- **Open.** The "open" aspect of MOOCs can refer to the idea that MOOCs are often free, accessible to anyone (at least in terms of enrollment), and do not require a formal admissions process. Open can also refer to MOOCs' open access roots, with some instructors allowing course materials to be refashioned, in keeping with the spirit of open access. Some MOOCs, however, are both open and closed, offering course credit for some students while allowing others to continue with the course without credit.
- **Online.** MOOCs are offered online. However, some instructors have students complete MOOC coursework in face-to-face settings. Despite that variation, there are still the online elements, so the purpose of the "O" for online remains quite clear.
- **Courses.** Although MOOCs may or may not offer credit or have a start or end date, they are still courses. They are created around specific content and typically offer a syllabus or some other layout of the material and the order of readings and events. MOOCs also typically have assignments and some form of evaluation or assessment.

Despite several common features, there are differences in how MOOCs are implemented.

Given the potential variation in form, it is not surprising that speculations about the future of MOOCs have ranged from assertions that they are a disruptive force to questions about whether they are essentially "over." Perhaps part of the disagreement over their future stems from the fact that educators and researchers really haven't developed a firm description of what a MOOC is and what it isn't. Researchers and educators need to understand the potential variations for these courses in order to fully understand their potential for higher education.

Purpose

The purpose of this article is to report the results of an examination of MOOCs through a specific lens: an instructional typology developed for classifying MOOCs (Major & Blackmon, 2016). For this work, we examined courses advertised as MOOCs and classified them according to the essential features and elements noted on their public course materials. The goal of this work was to provide an extended categorization for MOOCs. In this way, we tested the practical utility of a MOOC typology. Clearly delineating the various forms of MOOCs, we sought to chart some of these popular courses. Our findings will be beneficial to those who teach and deliver MOOCs (and their variations) as well as to individuals who may want to take these courses.

Review of Related Literature

MOOCs are a relatively recent instructional phenomenon, and as such, the research has only just begun. At this point, it is fragmented and difficult to fully classify. However, we see three key areas of MOOC research: pedagogical, technological, and organizational.

Pedagogical. The majority of the research studies focused on MOOCs are about pedagogy, even though there is no one way to teach a MOOC, and many MOOCS do not have direct comparisons in traditional courses. There are, however, several experimental research studies dealing with the evaluation of pedagogical strategies (Anderson & Ponti, 2014; Guo, Kim, &

Rubin, 2014) as well as student motivation (Milligan, Littlejohn, & Margaryan 2013) and student engagement (Castaño, Maiz & Garay, 2015a/b; Cheng, 2014; Sangrá, González-Sanmamed, & Anderson, 2015; Veletsianos, 2013). In addition, some of this research focuses on e-assessment, peer-assessment, and self-assessment (Gallego, Gámiz & Gutiérrez, 2015).

Technological. Research on the technological aspects of MOOCs often focuses on data mining and learning analytics. Newer areas of inquiry focus on technological solutions to learning issues, including human-computer interactions and technological adaptations with student progress (Vargas, 2014). Other research focuses on new tools, including video annotations that allow for interactions with multimedia and between students (Monedero, Cebrián & Desenne, 2015).

Organizational. Dillenbourg, Fox, Kirchner, Mitchell and Wirsing (2014) suggested that integrating MOOCs in university education is one of the main challenges that MOOC providers face. It is not surprising that much of the research on organizational aspects of MOOCs focuses on how campuses use MOOCs to support learning. Some researchers investigated the use of MOOCs in learning modules on traditional campuses (e.g., Bruff, Fisher, McEwen & Smith, 2013; Fidalgo, Sein-Echaluce, Borrás & García Peñalvo, 2014). Other researchers have examined the use of MOOCs as reference material in flipped classrooms (e.g., Firmin, Schiorring, Whitmer, & Willett, 2014). These studies suggest that instructors are using MOOCs in blended and flipped classrooms (Castaño et al., 2015b; Delgado Kloos et al., 2015; Israel, 2015).

Even though these three areas are emerging as a pattern of inquiry in MOOC literature, we don't know much about the different kinds of MOOCs researchers are examining. Having a system of classification would allow researchers going forward to ask more nuanced questions about pedagogical, technological, and organizational aspects and study interactions between different features and elements of MOOCs in these key areas. The current study applies the authors' typology (Major & Blackmon, 2016) to various MOOCs. Because the application of the typology is based on publicly available content that potential MOOC participants would have prior to enrolling in a MOOC, and not on the MOOC experience, the authors did not enroll in each MOOC and did not include information on the inner workings of these courses.

Conceptual Framework

We are not the first to attempt to develop a taxonomy for MOOCs, and we sought out and examined many earlier MOOC classifications. For example, Moessinger (2013) categorized MOOCs according to who offered them: an organization (which, in this case, we mean an entity that is not a higher education institution) or an institution, including institutions that may or may not use an established MOOC platform.

Clark (2013) classified MOOCs in terms of their pedagogical functions. For example, he noted eight categories for MOOCs (Major & Blackmon, 2016, p. 18-19):

- **synchMOOCs**. These MOOCs typically have a set start date, as well as set deadlines for assessments and course assignments. The courses also have fixed end dates and are usually connected to the academic calendar. The general sense is that synchronous MOOCs are constructed in a way that will aid student motivation, the development of a cohort, and maximize instructor availability.
- **asynchMOOCs**. Asynchronous MOOCs are often more fluid, with little to no fixed dates and times for assignments and other elements of the course. While the format may be too

free-flowing for some, others may find that the format works better for those who need more flexibility for various reasons: e.g. residing in a different time zone than that of the institution offering the course, work obligations, etc.

- **transferMOOCs**. These MOOCs move existing courses to a MOOC platform. Clark noted that courses offered by Coursera qualify as transferMOOCs. These MOOCs are similar to more traditional classes and may rely on the name of an institution to draw participants.
- **adaptiveMOOCs**. These courses rely on algorithms for personalization of the course experience, and they use analytics to improve and adjust the course for future offerings. They also use prerequisites to provide users with unique, personalized experiences. The courses often have a linear structure.
- **madeMOOCs**. These courses take a more innovative approach and can be viewed as more vocational because of their emphasis on building skills in participants. The courses can often include peer-driven activities to manage the increased student-instructor ratio. Clark (2013) stated that courses from Udacity often have these characteristics.
- **miniMOOCSs**. With their more concentrated focus and shorter timeframe, miniMOOCs can aid students in mastering content in a matter of hours or days. These courses often have very explicit learning objectives and have been associated with Open Badges.
- **connectivistMOOCS**. Connectivist MOOCs, also known as cMOOCs, focus on networked learning and encouraging participants to leverage networks to expand their learning. cMOOCs also often require participants to have a product at the end of the course experience.
- **groupMOOCs**. These MOOCs focus on student retention and begin with a small group of students who collaborate. Groups are organized according to various categories and are dismantled and restructured during the course. Mentors are also a part of each group, and the groups can comment on each other's progress.

Siemens' (2012) approach is one of the earliest categorizations and perhaps one of the most often used to date. He described MOOCs according to pedagogy: cMOOCs and xMOOCs. cMOOCs, as noted previously, are based in a connectivist pedagogy. According to Siemens (2014), connectivism "is the integration of principles explored by chaos, network, and complexity and self-organization theories" and is "driven by the understanding that decisions are based on rapidly altering foundations" (p. 7). The principles of connectivism are as follows:

- Learning and knowledge rests in diversity of opinions
- Learning is a process of connecting specialized nodes or information sources
- Learning may reside in non-human appliances
- Capacity to know more is more critical than what is currently known
- Nurturing and maintaining connections is needed to facilitate continual learning
- Ability to see connections between fields, ideas, and concepts is a core skill
- Currency (accurate, up-to-date knowledge) is the intent of all connectivist learning activities

- Decision-making is itself a learning process. Choosing what to learn and the meaning of incoming information is seen through the lens of a shifting reality. While there is a right answer now, it may be wrong tomorrow due to alterations in the information climate affecting the decision. (Siemens, 2014)

Downes, an early pioneer of MOOCs, coined the term xMOOCs. He suggested that xMOOCs are based on traditional pedagogy and traditional university courses.

In addition, Conole (2013) categorized MOOCs according to degrees—low, medium, and high—for numerous areas, including

- The degree of openness,
- The scale of participation (massification),
- The amount of use of multimedia,
- The amount of communication,
- The extent to which collaboration is included,
- The type of learner pathway (from learner-centered to teacher-centered and highly structured),
- The level of quality assurance,
- The extent to which reflection is encouraged,
- The level of assessment,
- How informal or formal it is,
- Autonomy, and
- Diversity.

These ideas suggested to us that we should be looking across multiple categories and allow for variation within categories instead of making the system binary.

Methods

The research questions for our study are as follows:

1. Along what lines do MOOCs differ from each other?
2. What patterns of offerings are evident in the data?

Typology

To answer these questions, we applied a typology for classifying MOOCs (Major & Blackmon, 2016). Typologies are organized systems of types. They are a well-established analytic tool in social science fields. They can contribute to several diverse analytic tasks such as forming and refining concepts, drawing out underlying dimensions, creating categories for classification and measurement, and sorting cases. Typologies can help researchers form concepts, refine measurement, explore dimensionality, and organize explanatory claims (Collier, LaPorte, & Seawright, 2012). Well-known typologies include Weber's (1978) distinction among traditional, charismatic, and rational authority, and Krasner's (1977) discussion of makers, breakers, and takers in the formation of international regimes.

Based upon our research and our conceptual framework, we developed the following typology, an extension of our previous work:

Dimension	**Research grounding**	**Conceptual grounding**	**Aspects**
Affiliation	Organizational	Moessinger	Hosted by companies or universities Universities run independently No affiliation
Size	Organizational	Conole	Massive (10,000 or more) Medium (5,000–10,000) Small (fewer than 5,000)
Accessibility	Organizational	Conole	Open (open to anyone at anytime) Open and closed (open to anyone at specific times) Closed or private (open to certain people at specific times)
Duration	Organizational	Clark	Long term (15 weeks or more) Medium term (6–15 weeks) Short term (fewer than 6 weeks)
Timing	Technological	Clark	Synchronous Asynchronous
Relation to knowledge	Pedagogical	Mason & Rennie Siemens Clark	cMOOCs xMOOCs
Content	Pedagogical	Mason & Rennie	Fixed Emergent
Structure	Technological	Clark	Linear Adaptive
Authority and control	Pedagogical	Dabbagh Conole	Teacher centered/driven Learner centered/driven
Pedagogy	Pedagogical	Dabbagh	Traditional Innovative

Table 1. A Typology for Classification of MOOCs

Data Sources

We developed a purposeful sample of courses, choosing maximum variation sampling. To locate courses, we culled lists from the major MOOC providers (MOOC List, 2017). Schreir (2014) indicated that qualitative content analysis is systematic, so we took the following steps:

Step 1: Selected MOOCs that fulfilled a number of categories (so courses hosted by companies or universities, courses run independently from universities/colleges, courses with no affiliation to a formal institution). We also attempted to select courses that were various sizes (e.g. massive or medium) and types (e.g. cMOOCs or xMOOCs). There are 30 MOOCs included in the current work.

Step 2: We attempted to ensure coverage across disciplines and fields, including humanities, social sciences, professional studies, and health.

Through our search, we identified the following MOOCs:

- MOOC MOOC: Critical Pedagogy (doubled MOOC intentional)
- DS 106: Digital StoryTelling (ds106)
- Masterpieces of World Literature
- Physical Theatre: Exploring the Slap
- Creative Writing: The Craft of Character
- Theatre and Globalization
- M101JS: MongoDB for Node.js Developers
- Developing Software Using Design Thinking
- A Developer's Guide to Exploring and Visualizing IoT Data
- Computation Structures 3: Computer Organization
- Accounting and Finance for IT professionals
- Agriculture, Economics and Nature
- Economic Growth and Distributive Justice Part II-Maximize Social Wellbeing
- Statistical Shape Modelling: Computing the Human Anatomy
- China's Perspective on Climate Change
- The Genomics Era: The Future of Genetics in Medicine
- Bioelectricity: A Quantitative Approach
- Climate Change Mitigation in Developing Countries
- Applying to U.S. Universities
- Teaching Mathematics with Technology
- Art & Activity: Interactive Strategies for Engaging with Art
- To Flip or not to Flip—Discover the Flipped Classroom Methodology
- Disciplinary Literacy for Deeper Learning
- Cultural Diversity in Your Classroom
- Advanced Linear Models for Data Science 1: Linear Models
- Basic Data Descriptors, Statistical Distributions, and Application to Business Decisions
- Rethinking International Tax Law
- Business Fundamentals: Effective Networking
- Disability and a Good Life: Working with Disability
- Introduction to Business Decision Modeling with DMN

Data Analysis

We applied the full typology to each course. We worked systematically through public information about each course. For this initial analysis, we drew upon qualitative content analysis and keyword analysis of the MOOCs. According to Schreir (2014), qualitative content analysis involves “describing the meaning of qualitative data” (p. 170). In keeping with qualitative content analysis, we focused on information about the MOOCs that related to the components of our typology, since our research questions for this text center on the implementation of that typology. We also used keyword analysis and highlighted those terms and phrases from our typology as they appeared in the course descriptions and other information about the courses. Some information was easily accessible, such as affiliation, duration, and timing, and some was not as easily accessible. For example, finding the course size information was sometimes challenging because not all courses listed information about course size. However, if we could glean data about course size from the course description, syllabus, or other materials provided, then we noted that in our chart.

Trustworthiness

The basis of our efforts at trustworthiness include triangulation. We used multiple data sources for each MOOC from multiple MOOC providers. For example, we reviewed the general websites for each MOOC, the syllabi, and available video content. Because we relied on each course’s descriptions and other course information to apply the typology, we have included a brief verbatim description of each course exactly as noted on the course website, as well as a hyperlink to expanded details regarding each course, which is a form of thick description. Therefore, the descriptions are direct quotes from the websites and include the citations as well as hyperlinks to the courses (see Appendix A).

Results

The results for the current study are organized according to the typology categories (Major & Blackmon, 2016) and displayed on corresponding charts, where appropriate. The course names are abbreviated.

Affiliation

The chart below shows the courses and their respective affiliations. The more popular platforms are listed as categories along with a category for “Other” platforms, with the respective names of institutions and platforms alongside the corresponding courses.

Provider	Course	Partner
edX	• World Literature • Computation Structures 3 • China…Climate Change	• Harvard • MIT • Tsinghua University
Coursera	• Creative Writing • Theater and Globalization • Developer’s Guide…IoT Data • Accounting & Finance…IT Professionals • Agriculture, Economic and Nature • Economic Growth…Part II • Bioelectricity • Climate Change…Developing Countries	• Wesleyan University • Ludwig-Maximillians-Universität München • IBM • Indian School of Business • University of Western Australia • Tel Aviv University • Duke • University of Cape Town

Table 2. Affiliation

	• Applying to U.S. Universities • Art & Activity • Advanced Linear Models 1 • Basic Data Descriptors • Rethinking International Law	• University of Pennsylvania • The Museum of Modern Art (MoMA) • Johns Hopkins University • Rice University • Universiteit Leiden
FutureLearn	• Physical Theatre • Statistical Shape Modelling • Genomics Era • Business Fundamentals • Disability & a Good Life	• University of Leeds • University of Basel • St. George's University • The Open University • UNSW Australia
Other	• MOOC MOOC • DS106 • M101JS: MongoDB • Developing Software…Design Thinking • Teaching Math w/Tech • To Flip or Not to Flip • Disciplinary Literacy…Learning • Cultural Diversity in Your Classroom • Intro to Business Decision Modeling	• Digital Pedagogy Lab • University of Mary Washington • MongoDB University • SAP: Systeme, Anwendungen and Produkte in Datenverarbeitung, openSAP • The Friday Institute for Educational Innovation, MOOC-Ed • Politecnico di Milano, POK-Polimi Open Knowledge • NC State University, MOOC-Ed • School Education Gateway, Directorate General for Education and Culture of the European Commission, SchoolEducation Gateway • Signavio, mooc.house

Table 2 (cont). Affiliation

Although the major platforms like Coursera and FutureLearn partnered with several universities to provide MOOCs, there are a number of other outlets that provided MOOCs as well. For example, a university and an organization both used MOOC-Ed, and certain areas of the world offered platforms to provide MOOCs in their particular regions, such as POK for Politecnico di Milano.

There were also a number of non-U.S. universities offering MOOCs, and Coursera partnered with many of them. For example, they listed MOOCs connected with the University of Cape Town, the Indian Business School, and Tel Aviv University. There was also a non-U.S. institution for edX, Tsinghua University, and several for platforms categorized as Other. However, Coursera boasted a higher number of partnerships with non-U.S. outlets.

Size

None of the courses indicated a size; however, the MOOC MOOC: Critical Pedagogy webpage indicates that the course is focused on community building, not "amassing registrants" (Digital Pedagogy Lab, 2017). The lack of size data shows yet another distinction between MOOCs and traditional online courses. Even in traditional online classes, participants have a sense of the course size because they can access that information during the more formal registration process. For MOOCs, however, that information was uniformly omitted.

Accessibility

The chart on accessibility is divided into four categories: open, which includes information on timeframes for accessing certain courses, as well as other forms of accessibility such as language; free, which includes courses that did not have a paid certificate option, although some had credentials available for completing certain course tasks; free to audit, which includes courses that had a paid certificate option; and paid credential option, which includes the type of certificate and cost, if available.

Open	• MOOC MOOC (at specific times) • Accounting & Finance…IT Professionals (limited access to graded materials w/audit) • Economic Growth…Part II (subtitles in Arabic) • China…Climate Change (information in English & Mandarin) • Applying to U.S. Universities (Spanish subtitles) • Basic Data Descriptors (limited access to graded materials w/audit)
Free	• MOOC MOOC • DS 106 • Theatre & Globalization • M101JS: MongoDB (certificate for score over 65%) • Developing Software…Design Thinking (statement of accomplishment) • Applying to U.S. Universities • Teaching Math w/Tech (certificate available for 20 hrs—2 CEUs with completion of certain course activities) • To Flip or Not to Flip (statement of accomplishment) • Disciplinary Literacy…Learning (20 hours of professional development for completing certain course components) • Cultural Diversity in Your Classroom (open badges and statement of accomplishment, only available during formal offering of the course) • Intro to Business Decision Modeling (statement of accomplishment)
Free for Audit	• World Literature • Physical Theatre • Creative Writing • Developer's Guide…IoT Data • Computation Structures 3 • Accounting & Finance…IT Professionals • Agriculture, Economics and Nature • Economic Growth…Part II • Statistical Shape Modelling • China…Climate Change • Genomics Era • Bioelectricity • Climate Change…Developing Countries • Art & Activity

Table 3. Structure

	• Advanced Linear Models…1 • Basic Data Descriptors… • Rethinking International Law • Business Fundamentals • Disability & a Good Life
Paid Credential Option	• World Literature ($99 certificate) • Physical Theatre ($39 certificate) • Creative Writing (paid certificate) • Developer's Guide…IoT Data (73€ certificate) • Computation Structures 3 ($49 certificate) • Accounting & Finance…IT Professionals (paid certificate) • Agriculture, Economics and Nature, (paid certificate) • Economic Growth…Part II (43€ certificate) • Statistical Shape Modeling ($49.39 certificate of achievement + transcript; statement of participation, $30.40) • China…Climate Change ($49 certificate) • Genomics Era ($104 certificate of achievement and unlimited access to course) • Bioelectricity (paid certificate) • Climate Change…Developing Countries (paid certificate) • Art & Activity (paid certificate) • Advanced Linear Models…1 (paid certificate) • Basic Data Descriptors… (paid certificate) • Rethinking International Law (paid certificate) • Business Fundamentals ($64 certificate of achievement, unlimited access, access to tests) • Disability & a Good Life (49 GBP certificate)

Table 3 (cont). Structure

Credentialing is a large part of the MOOC experience. However, there were some courses that offered a paid credentialing service but did not indicate the cost on the course page. There were also limitations associated with auditing courses that offered a paid certificate. For example, those who only audited the Basic Data Descriptors...course had limited access to graded materials with the free-to-audit option. Also, all of the courses that offered credentialing were xMOOCs, where there is no emphasis on connectivism and production like there is for cMOOCs. One could argue that the xMOOC experience has become tiered in some way—with those looking to access information possibly signing up for the audit-only option and those looking for a credential and opportunities to interact with others in the course opting for the paid certificate.

Although all the courses were considered open, there is the matter of the various forms of open. For example, our research indicated that the idea of course openness went beyond issues of when participants could access the course and extended to openness in terms of language. The courses Economic Growth... Part II, China...Climate Change, and Applying to U.S. Universities all provided options for course materials in languages other than English, which could lead to the courses being more open to those who are more comfortable with those languages.

Duration

The chart for duration outlines the timeframes for each course as well as additional information pertinent to the availability of course materials.

Duration	Courses
5 units (or sessions, 20-30 hours)	• Teaching Math w/Tech
6 units	• Disciplinary Literacy…Learning
2 weeks	• Physical Theatre
3 weeks	• Cultural Diversity in Your Classroom
4 weeks	• Creative Writing • Developer's Guide…IoT Data (180 days of course access) • Accounting & Finance…IT Professionals • Applying to U.S. Universities • Art & Activity • Basic Data Descriptors… • Business Fundamentals • Intro to Business Decision Modeling
5 weeks	• Economic Growth…Part II (180 days of course access) • Genomics Era • To Flip or Not to Flip
6 weeks	• MOOC MOOC (January 19, 2015-February 27, 2015) • Theatre & Globalization • Climate Change…Developing Countries • Advanced Linear Models…1 • Rethinking International Law (with 180 days of course access) • Disability & a Good Life
7 weeks	• M101JS: MongoDB • Developing Software…Design Thinking (6 weeks of coursework and 1 for final project) • Agriculture, Economics and Nature • Bioelectricity (180 days of course access)
8 weeks	• Statistical Shape Modelling
10 weeks	• Computation Structures 3 • China…Climate Change (listed as self-paced)
12 weeks	• World Literature
15 weeks	• DS106

Table 4. Duration

The duration of the MOOCs varied, with the shortest listed as 2 weeks (Physical Theatre), and the longest listed as 15 weeks (DS106). Two of the courses, Disciplinary Literacy...Learning and Teaching Math w/Tech, only listed the number of units for the MOOC, which seemed to imply that participants could complete and access the courses at any time; these courses were not time-bound, a factor not originally considered when we created the typology. That could also mean that there were no interactive opportunities in the courses because participants were almost always completing course tasks at drastically different times. DS106, at 15 weeks, and World Literature, at 12 weeks, both seemed to fit a more traditional academic calendar.

Timing

The Timing category of the typology discussed whether each course was synchronous or asynchronous. All of the courses were asynchronous, but the MOOC MOOC course had synchronous sessions available via outlets like Twitter and Google Hangout each week. Previous categorizations discussed synchMOOCs and asynchMOOCs (Clark, 2013), but MOOC MOOC employed aspects of both, making it a type of hybrid MOOC. Although the chart shows variations between the cMOOCs and xMOOCs, there were also variations between the cMOOCs as well, with MOOC MOOC offering synchronous and asynchronous components for connectivity and DS106 offering asynchronous components for connectivity.

Relation to Knowledge

The following chart shows which courses were categorized as cMOOCs and which were categorized as xMOOCs. Because xMOOCs are not often discussed in terms of their opportunities for connecting, we noted when an xMOOC description included information about creating connections in the course.

cMOOC	• MOOC MOOC • DS106
xMOOC	• World Literature • Physical Theatre (with some sharing activities) • Creative Writing • Theatre & Globalization • M101JS: MongoDB • Developing Software…Design Thinking (with group exercise/peer activity; with group work that must be completed for record of achievement and has a limited number of participants) • Developer's Guide…IoT Data (with peer review assignments) • Computation Structures 3 • Accounting & Finance…IT Professionals (with peer review components) • Agriculture, Economics and Nature • Economic Growth…Part II • Statistical Shape Modeling • China…Climate Change • Genomics Era • Bioelectricity

Table 5. Relation to Knowledge

	• Climate Change…Developing Countries • Applying to U.S. Universities • Teaching Math w/Tech (with some focus on interactive peer components) • Art & Activity (participants encouraged to share on discussion forum) • To Flip or Not to Flip • Disciplinary Literacy…Learning • Cultural Diversity in Your Classroom (with focus on learning as a "community of peers") • Advanced Linear Models…1 • Basic Data Descriptors… • Rethinking International Law • Business Fundamentals • Disability & a Good Life • Intro to Business Decision Modeling

Table 5 (cont). Relation to Knowledge

Only two of the courses, MOOC MOOC and DS106, were identified as cMOOCs, and the rest were xMOOCs. However, Table 5 shows that 7 of the 28 xMOOCs made it a point to highlight opportunities for community building and other forms of peer interaction in the course. Several of those interactive opportunities involved peer review. For example, Developer's Guide…IoT Data and Accounting & Finance…IT Professionals both mentioned peer review as a component of each course. Other courses mentioned the discussion forum, group exercises, and sharing activities.

Content

The Content category includes the MOOCs that had fixed content and the ones that had emergent content. MOOC MOOC and DS106 were the only courses that had emergent content. Because of the size of many MOOCs, the idea of emerging content could seem daunting. Instructors would have to adjust content day-to-day or week-to-week, depending on the goals for courses and assignments. MOOC MOOC had fixed course information but also based course content on the contributions of MOOC participants.

Structure

The category on course structure addresses which of the courses had linear structures and which had adaptive structures. Like the previous typology category for Content, the two cMOOCs seemed to be more flexible in terms of course structure. Both MOOC MOOC and DS106 had adaptive course structures, and the other MOOCs, xMOOCs, had linear structures. Although DS106 did not show emergent course data like MOOC MOOC for the Content category, the user-generated course content of MOOC MOOC and the emphasis on interaction via user contributions in DS106 made their course models more adaptive. The formats for the xMOOCs listed were more linear.

Authority and Control

The Authority and Control chart indicates which courses were teacher-centered, with the instructors providing most of the content for the course as evidenced by the descriptions and assignments, and learner-centered, with MOOC participants providing more of the content for the course, also as evidenced by descriptions and assignments.

	Learner-Centered	Teacher-Centered
MOOC MOOC	X	
DS106	X	
World Literature		X
Physical Theatre	X	
Creative Writing		X
Theatre & Globalization		X
M101JS: MongoDB		X
Developing Software…Design Thinking		X
Developer's Guide…IoT Data		X
Computation Structures 3		X
Accounting & Finance…IT Professionals		X
Agriculture, Economics and Nature		X
Economic Growth…Part II		X
Statistical Shape Modelling		X
China…Climate Change		X
Genomics Era		X
Bioelectricity		X
Climate Change…Developing Countries		X
Applying to U.S. Universities		X (with the exception of a self-assessment portion for students, which is learner focused)
Teaching Math w/Tech		X
Art & Activity		X
To Flip or Not to Flip	X (reflection on the MOOC itself and focus on learners' courses)	X (providing of content)
Disciplinary Literacy…Learning		X (with some learner-centered components based on individual projects)

Table 6. Authority and Control

	Learner-Centered	Teacher-Centered
Cultural Diversity in Your Classroom		X
Advanced Linear Models…1		X
Basic Data Descriptors…		X
Rethinking International Law		X
Business Fundamentals		X
Disability & a Good Life		X
Intro to Business Decision Modeling		X

Table 6. Authority and Control

We found that although six of the courses had learner-centered elements, only four of the courses were structured in a learner-centered format. In the current category, both of the cMOOCs and two of the xMOOCs were learner-centered. For example, in To Flip or Not to Flip, although the instructor determined the general direction of the course, one focal point of the class was participants' application of course principles to their own classes. Therefore, even though instructors provided guidance, the course, and others listed as learner-centered, centered on the contributions of learners. Although some of the other courses had learner-centered opportunities at one or more points during the class, the courses, on the whole, were not learner-centered, at least based on the information provided on their websites, syllabi, and available videos.

Pedagogy

The Pedagogy category notes the courses that follow a traditional format—where the assignments, course structure, and content followed what is usually associated with face-to-face and non-MOOC online courses—and those that followed a more innovative format. Only two of the courses, MOOC MOOC and DS106, had innovative course formats. Beyond the fact that both courses were cMOOCs, MOOC MOOC and DS106 functioned in innovative ways that were not exactly the same. For example, MOOC MOOC, as noted earlier, had both fixed and emergent content, and synchronous as well as asynchronous properties. DS106, on the other hand, relied on connectivist activities such as syndicated blog posts and participants' iterative and interactive practices.

Discussion

We recognized several patterns across typology categories. For example, most of the courses from a particular company employed a similar pedagogical approach. This is expected because the platform capabilities have a strong influence on what can and will be done pedagogically (technology is not neutral). Content is also related, as a company-based MOOC tends to use fixed readings, whereas some of the independently-offered MOOCs work from a less content-centered model, and thus content emerges as the course progresses. We also recognized that we needed to adjust our typology to address the variations related to duration, as there was a distinction between courses that were time-bound and courses that were not time-bound.

Another more recent development is MOOC certification. Often, those perusing the MOOC lists were offered the option to audit a course for free or pay (prices varied) for certification. Auditing a course for free may or may not include access to all course materials, and typically does not include access to assessments (or grades on the assessments, if they are accessible). MOOCs began as a free initiative and have quickly become monetized. However, the data did not show a corresponding increase in course information. For example, some courses did not list the cost for credentials, and none of the courses mentioned course size, something that participants may come to expect once they begin paying for a course experience. Also, the idea that more interactive course components are available for the paid option, and not with the free audit option, seems counter to the idea of democratization and accessibility, as interactivity would seemingly only be available to those who could afford it.

The process of coding and categorizing course descriptions was a slow and painstaking one, but it is one that we found to be useful and that will add to the overall literature that surrounds MOOCs. Such structural investigations of online courses are long overdue. Just as there is no monolithic online course, there is no monolithic MOOC. There are variations, and educators and researchers need to come to grips with these variations so that when we discuss them, we can use a common language. Understanding these variations is also important because the descriptions instructors and MOOC platforms provide to participants impact their course expectations. For example, cMOOC participants are often expected to have a much higher level of engagement with other participants. However, the data showed that several xMOOCs are highlighting interactive components in their course descriptions, which may come as a surprise to those who anecdotally refer to xMOOCs as non-interactive spaces.

There is also the matter of MOOC size. Unless instructors and providers have caps for MOOC size, it can be quite difficult to know what the size of a MOOC will be before, and even during, the offering of the course. However, it is possible for instructors and platform providers to design a course based on a target, maximum, or minimum course size. Providing that information in the overview or description of the MOOC can give participants a better idea of the type of experience to expect. Furthermore, with the increased number of certificate options for MOOCs, participants may want to know more information about the type of experience they can expect to have, in addition to the information currently provided regarding access to course materials and assessments. These MOOC certificates are provided for a fee and serve as credentials, so participants as well as outlets that consider accepting the certificate, including employers, higher education institutions, etc., may come to expect more information about the MOOC experience. Providing more information about the type of MOOC experience also has the potential to set certain MOOCs apart from each other. For example, if an employee wants to use a MOOC for professional development, her employer may have a more favorable perspective on MOOCs with a better description of the experience the employee will likely have in the course.

Overall, the typology was useful, but it was modified based on what worked and what did work in theory but did not work in practice. For example, the affiliation section was redefined because some MOOCs were offered jointly (i.e., through a third-party company and a university or through a third-party company as a part of another company). Also, because many MOOCs did not include information about course size, or expected course size, we could not provide that information. To answer the research questions, we found quite a few similarities between the MOOCs overall, including between cMOOCs and xMOOCs, and we found that there are differences among the course types as well: Not all cMOOCs address connectivity in the same way, and not all xMOOCs are simply "talking heads."

Conclusion and Scholarly Significance

The categorizations we have developed are important for a number of reasons. For example, MOOC instructors and MOOC learners could benefit from a more detailed description of courses. If we had wanted to sign up for one or more of the MOOCs from the study, we would have had to rely on the information provided via the information used as data, which did not always include a discussion of the type of course atmosphere participants could expect because that information was not always available. The chart could also prove useful during the planning stages of MOOC creation. Instructors may have thought through some of these areas already, of course, but some of the elements may not be considered until the instructor is in the middle of providing the course (or in some instances, after the course is over). Laying out many of these details ahead of time could help the instructor think through resource needs. For example, will s/he need a teaching assistant to make some aspects of the course possible? Will there be additional technology/software needs?

Another important aspect of these categorizations harkens back to ideas about "democratized" educational opportunities. In order to understand the benefit of MOOCs in a number of areas for a number of audiences, it is integral to explicate the varied nature of these courses. For example, we found that several xMOOC descriptions noted interactive components, which are often associated with cMOOCs. MOOCs are not a singular entity, and the more those who seek to create and deliver MOOCs think through these variations and ways to adjust or enhance them, the more robust the conversation will be related to leveraging them for greater educational purposes.

By having a clearer delineation of terms related to these courses, those interested in offering and/or taking them can have more detailed conversations about what the courses are, and any benefits or challenges associated with them. Our work adds the growing body of work on online learning in higher education. It also adds to organizational studies and the new field of MOOCs.

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References

Andersen, R., & Ponti, M. (2014). Participatory pedagogy in an open educational course: Challenges and opportunities. *Distance Education*, *35*(2), 234-249. Retrieved from: http:// www.tandfonline.com/doi/abs/10.1080/01587919.2014.917703.

Aparicio, M., Bacao, F. & Oliveira (2016). An e-Learning theoretical framework. *Educational Technology & Society*, *19*(1), 292-307.

Major, C., & Blackmon, S. J. (2016). Massive open online courses: Variations on a new instructional form. In S. J. Blackmon & C. Major (eds.), MOOCs and higher education: Implications for institutional research. *New Directions for Institutional Research*. San Francisco, California: Jossey-Bass.

Bruff, D. O., Fisher, D. H., McEwen, K. E., & Smith, B. E. (2013). Wrapping in a MOOC: Student perceptions in blended learning. *Journal of Online Learning and Teaching, 9*(2), 187-199. Retrieved from: http://jolt.merlot.org/vol9no2/bruff_0613.htm.

Carver, L., & Harrison, L. (2013). MOOCs and democratic education. *Liberal Education, 99*(4). Retrieved from https://aacu.org/liberaleducation/2013/fall/carver-harrison

Castaño, C., Maiz, I., & Garay, U. (2015a). Design, motivation and performance in a cooperative MOOC course. *Comunicar. Revista Cientí ca de Educación y Comunicación*, *44,* 19-26. Retrieved from: http://www.revistacomunicar.com/verpdf.php?numero=44&articulo=44-2015- 02&idioma=en.

Castaño, C., Maiz, I., & Garay, U. (2015b). Students perceptions of a university MOOC. *RIED*, *18*(2), 197-224. Retrieved from: http://revistas.uned.es/index.php/ried/article/view/13444/13058.

Cheng, J. C. Y. (2014). An exploratory study of emotional affordance of a massive open online course. *European Journal of Open, Distance and e-Learning*, *17*(1), 43-55. Retrieved from: http://www.eurodl.org/?p=archives&year=2014&halfyear=1&article=607.

Clark, D. (2013, April 16). MOOCs: Taxonomy of 8 types of MOOC [Web log message]. Retrieved from http://donaldclarkplanb.blogspot.com/2013/04/moocs-taxonomy-of-8-types-of-mooc.html

Collier, D., LaPorte, J., Seawright, J. (2012). Putting typologies to work: Concept formation, measurement, and analytic rigor. *Political Research Quarterly*, *65*(1), 217-232. Retrieved from http://polisci.berkeley.edu/sites/default/files/people/u3827/PuttingTypologiesAppendixandArticle_0.pdf

Conole, G. (2013, June 4). Week 5: A new classification of MOOCs [Web log message]. Retrieved from http://mooc.efquel.org/a-new-classification-for-moocs-grainne-conole/

Coursera (2017). *Creative writing: The craft of character*. Retrieved from https://www.coursera.org/learn/craft-of-character

Dabbagh, N. (2005). Pedagogical models for e-learning: A theory-based design framework. *International Journal of Technology in Teaching and Learning*, *1*(1). 25-44.

Delgado Kloos, C., Muñoz-Merino, P. J., Alario-Hoyos, C., Estevez Ayres, I., & Fernández Panadero, C. (2015, March). Mixing and blending MOOC technologies with face-to-face pedagogies. In *Global Engineering Education Conference (EDUCON)*, *2015 IEEE.* Retrieved from: http://ieeexplore.ieee.org/xpls/icp.jsp?arnumber=7096090&tag=1.

Digital Pedagogy Lab. (2015). *MOOC MOOC : Critical pedagogy.* Retrieved from http://www.digitalpedagogylab.com/hybridped/mooc-mooc-critical-pedagogy/

DS106 (2017). *DS106*. Retrieved from http://ds106.us/about/

Dillenbourg, P., Fox, A., Kirchner, C., Mitchell, J., & Wirsing, M. (2014). Massive open online courses: Current state and perspectives. *Dagstuhl Manifestos*, *4*(1), 1-27. Retrieved from: http://drops.dagstuhl.de/opus/volltexte/2014/4786/pdf/dagman-v004-i001-p001-14112.pdf.

edX. (2017). *Computation structures 3: Computer organization*. Retrieved from https://www.edx.org/course/computation-structures-3-computer-mitx-6-004-3x-0

Fidalgo, A., Sein-Echaluce, M. L., & García-Peñalvo, F. J. (2013). MOOC cooperativo. Una integración entre cMOOC y xMOOC. In A. Fidalgo & M. L. Sein-Echaluce (Eds.), *Actas del II Congreso Internacional sobre Aprendizaje, Innovación y Competitividad, CINAIC.* (481-486) Madrid: Fundación General de la Universidad Politécnica de Madrid. Retrieved from: http://gredos.usal.es/jspui/bitstream/10366/122486/1/DIA_PaperMOOCs.pdf.

Firmin, R., Schiorring, E., Whitmer, J. & Willett, T. (2014). Case study: Using MOOCs for conventional college coursework. *Distance Education*, *35*(2), 178-201. Retrieved from: http:// www.tandfonline.com/doi/abs/10.1080/01587919.2014.917707.

FutureLearn (2017). *Physical theatre: Exploring the slap*. Retrieved from https://www.futurelearn.com/courses/physical-theatre-exploring-the-slap

Gallego, M.J., Gámiz, S., & Gutiérrez, E. (2015). Tendencias en la evaluación del aprendizaje en cursos en línea masivos y abiertos. *Educación XXI*, *18*(2), 77-96. Retrieved from http://revistas.uned.es/index.php/educacionXX1/article/viewFile/14596/12996.

Guo, P. J., Kim, J. and Rubin, R. (2014, March). How video production affects student engagement: An empirical study of MOOC videos. *ACM Conference on Learning at Scale*. Retrieved from http://www.pgbovine.net/publications/edX-MOOC- video-production-and-engagement_LAS-2014.pdf.

Israel, M.J. (2015). Effectiveness of integrating MOOCs in traditional classrooms for undergraduate students. *The International Review of Research in Open and Distance Learning*, *16*(5), 102-118. Retrieved from: http://www.irrodl.org/index.php/irrodl/article/view/2222/3437.

Krasner, S. (1977). United States commercial and monetary policy: Unraveling the paradox of external strength and internal weakness. *International Organization, 31,* 635-671.

Mason, R., & Rennie, F. (2006) *E-Learning: The key concepts*. Abingdon Great Britain: Routledge.

Milligan, C., Littlejohn, A. & Margaryan, A. (2013). Patterns of engagement in connectivist MOOCs. *Journal of Online Learning and Teaching, 9*(2), 149-159. Retrieved from: http:// jolt.merlot.org/vol9no2/milligan_0613.pdf.

Moessinger, S. (2013, September 13). MOOC around the world, part 6—"MOOCish" online ed resources. *MOOC News & Reviews.* Retrieved from http://moocnewsandreviews.com/mooc-around-the-world-part-6-moocish-online-ed-resources/

Monedero, J. J., Cebrián, D., & Desenne, P. (2015). Usability and satisfaction in multimedia annotation tools for MOOCs. *Comunicar. Revista Cientí ca de Educación y Comunicación*, *44,* 55-62. Retrieved from: http://www.revistacomunicar.com/verpdf.php?numero=44&articulo=44- 2015-06&idioma=en.

MOOC.House. (2017). *Introduction to business decision modeling with DMN*. Retrieved from https://mooc.house/courses/signavio-dmn-intro

MOOC List. (2017). Retrieved from https://www.mooc-list.com

openSAP (2017). *Developing software using design thinking*. Retrieved from https://open.sap.com/courses/dt1

Politecnico Milano. (2017). To flip or not to flip: Discover the flipped classroom methodology Retrieved from https://www.pok.polimi.it/courses/course-v1:Polimi+FC101+2016_M1/about

Sangrá, A., González-Sanmamed, M., & Anderson, T. (2015). Metaanálisis de la investigación sobre MOOC en el período 2013-2014. *Educación XXI*, *18*(2), 21-59. Retrieved from: http:// revistas.uned.es/index.php/educacionXX1/article/view/14594.

SchoolEducation Gateway. (2017). Cultural diversity in your classroom. Retrieved from https://www.pok.polimi.it/courses/course-v1:Polimi+FC101+2016_M1/about

Schreier, M. (2014). Qualitative content analysis. *The SAGE handbook of qualitative data analysis*, 170-183.

Shah, D. (2017). https://www.class-central.com/report/mooc-course-report-may-2017/

Siemens, G. (2014). Connectivism: A learning theory for the digital age. Retrieved from http://er.dut.ac.za/bitstream/handle/123456789/69/Siemens_2005_Connectivism_A_learning_theory_for_the_digital_age.pdf?sequence=1

Siemens, G. (2012). MOOCs are really a platform. *Elearnspace.* Retrieved from http://www.elearnspace.org/blog/2012/07/25/moocs-are-really-a-platform/

Vargas, J. (2014). What can online course designers learn from research on machine-delivered instruction? *Academe*, *100*(3). Retrieved from https://www.aaup.org/article/what-can-online-course-designers-learn-research-machine-delivered-instruction#.WXzU0TOZMcg

Veletsianos, G. (2013). *Learner experiences with MOOCs and open online learning*. Hybrid Pedagogy. Retrieved from: http://hybrid-pedagogy.github.io/LearnerExperiencesInMOOCs/.

Weber, Max (1978/1922). *Economy and Society.* Guenther Roth & Claus Wittich (Eds.). Berkeley: University of California Press.

Wexler, E. (2015, October 19). *MOOCs are still rising, at least in numbers.* Retrieved from http://www.chronicle.com/blogs/wiredcampus/moocs-are-still-rising-at-least-in-numbers/57527

Appendix A

The course descriptions below are verbatim from course websites:

MOOC MOOC: Critical Pedagogy
MOOC MOOC: Critical Pedagogy is a six-week exploration of Critical Pedagogy. As with previous iterations of MOOC MOOC, we are aiming less at amassing registrants and more at building community. Starting the week of January 19, 2015, we'll engage directly with both the foundational texts of Critical Pedagogy, and with modern thinkers whose work—by design or by coincidence—aligns with that approach. (Digital Pedagogy Lab, 2015)

DS106: Digital StoryTelling (ds106)
Digital Storytelling (also affectionately known as ds106) is an open, online course that happens at various times throughout the year the University of Mary Washington…but you can join in whenever you like and leave whenever you need. This course is free to anyone who wants to take it, and the only requirements are a real computer, a hardy internet connection, preferably a domain of your own and some commodity web hosting, and all the creativity you can muster. (DS106, 2017)

Masterpieces of World Literature
This literature course explores how great writers refract their world and how their works are transformed when they intervene in our global cultural landscape today. No national literature has ever grown up in isolation from the cultures around it; from the earliest periods, great works of literature have probed tensions, conflicts, and connections among neighboring cultures and often more distant regions as well. (MOOC List, 2017)

Physical Theatre: Exploring the Slap
This course introduces you to world-renowned Russian director Meyerhold's technique of biomechanics. It invites you to study and experience first-hand his revolutionary biomedical étude, 'The Slap'. Through a mixture of video, animation, discussion forums and practical exercises you will begin to understand Meyerhold's Russian actor training technique—a two-minute repeatable exercise used to develop balance, awareness, and expression. You will be invited to explore your own response to this unique approach to training and will share these responses with your fellow leaners. (FutureLearn, 2017)

Creative Writing: The Craft of Character
We will study the choices a writer makes to bring all characters to life on the page, and we will perform written exercises in order to develop a variety of writing and pre-writing techniques, in order to create a variety of characters. We will learn how to use our own life experiences, and the people we know (and how not to!). We will develop inner (thoughts and feelings) and out (appearance, habits, behavior) lives for our characters and see how that can lead us to richer and more interesting stories… (Coursera, 2017)

Theatre and Globalization
Learn how theatre and globalization have affected each other over the past century, and how to conduct your own research on global theatre histories. There are no prerequisites for this course. That said, an interest in common media depictions of globalization will help you understand the

main arguments more quickly. Relatedly, reading and writing comfortably in English at the undergraduate level will enable your more active engagement in course discussion forums and peer assessment exercises. A basic understanding of theatre history, especially in the 20th century, would be advantageous. (Coursera, 2017)

M101JS: MongoDB for Node.js Developers
Learn everything you need to know to get started building a MongoDB-based app. This course will go over basic installation, JSON, schema design, querying, insertion of data, indexing and working with the Node.js driver. In the course, you will build a blogging platform, backed by MongoDB. (MOOC List, 2017)

Developing Software Using Design Thinking
…In this course, you will experience design thinking. To start down the path toward innovative solutions, focus on the problem first: Develop empathy for your users by 'putting yourself in their shoes,' and further understand their perspectives by defining a point-of-view statement. From there, you will start generating ideas and then move on to building low-resolution prototypes, which you can take back to your users for feedback. This will prepare you for the deliver phase, where you will learn how design thinking is connected to lean principles and single-piece processing. (OpenSAP, 2017)

A Developer's Guide to Exploring and Visualizing IoT Data
With a focus on the topic of Exploratory Data Analysis, the course provides an in-depth look at mathematical foundations of basic statistical measures, and how they can be used in conjunction with advanced charting libraries to make use of the world's best pattern recognition system—the human brain. Learn how to work with the data, and depict it in ways that support visual inspections, and derive to inferences about the data. Identify interesting characteristics, patters, trends, deviations or inconsistencies, and potential outliers. The goal is that you are able to implement end-to-end analytic workflows at scale, from data acquisition to actionable insights. (Coursera, 2017)

Computation Structures 3: Computer Organization
This computer science course is a bottom-up exploration of the abstractions, principles, and techniques used in the design of digital and computer systems. If you have a rudimentary knowledge of electricity and some exposure to programming, roll up your sleeves, join in and design a computer system! This is Part 3 of a 3-part series on digital systems, providing an introduction to the hardware/software interface and is based on a course offered by the MIT Department of Electrical Engineering and Computer Science. (edX, 2017)

Accounting and Finance for IT Professionals
This course presents an introduction to the basics of financial accounting and finance for IT professionals. The first part of the course will focus on understanding the most important financial statements, namely, the balance sheet, the income statement, and the statement of cash flows…The second part of the course will focus on the basics of finance…The course will also introduce the idea of real options, how they affect a project's NPV, and their impact of the decision to accept/reject a project… (Coursera, 2017)

Agriculture, Economics and Nature
…This course will help you to contribute better decision making by farmers, or by agencies servicing agriculture, and it will help you to understand why farmers respond to policies and economic opportunities in the ways they do. You can use this course to improve your skills and knowledge, and to assess whether this is a subject that you'd like to study further. The course includes high-quality video lectures, interviews with experts, demonstrations of how to build economic models in spreadsheets, practice quizzes, and a range of recommended readings and options readings. Assessment is by a final exam. (Coursera, 2017)

Economic Growth and Distributive Justice Part II-Maximize Social Wellbeing
If you really care about the big questions in the economies and societies of the 21st century, such as distributive justice—namely, inequality of income or wealth, and its correlation with economic growth—this course is meant for you. The knowledge you will gain can truly change your outlook on our world. (Coursera, 2017)

Statistical Shape Modelling: Computing the Human Anatomy
In this free online course, you will get insights form mathematics, statistics and machine learning, in order to address practical problems, as well as a theoretical and practical introduction to the open source software Scalismo (FutureLearn, 2017).

China's Perspective on Climate Change
This course will provide China's perspectives, policies, actions and effects on global climate changes to the international community. You will learn about the challenges and opportunities we are faced with on global climate in the world and in China, and will familiarize yourself with main policies, technical routines and international regulations. The knowledge presented in the course will benefit your understanding of significant theories and practical problems such as the energy revolution, economic development transition, low carbon economy development and the ecological civilization construction. (MOOC List, 2017)

The Genomics Era: The Future of Genetics in Medicine
This free online course will provide healthcare professionals with a basic grounding in genomic medicine. It will introduce you to new genomic technologies, which are revolutionising medicine and will, in time, provide the mainstay of patient diagnosis, treatment and disease prevention. (FutureLearn, 2017)

Bioelectricity: A Quantitative Approach
"Nerves, the heart, and the brain are electrical. How do these things work? This course presents fundamental principles, described quantitatively" (Coursera, 2017).

Climate Change Mitigation in Developing Countries
This course challenges you to consider how one might lift societies out of poverty while also mitigating greenhouse gas emissions. We explore the inherent complexity of developing country governments wanting to grow their economies in a climate friendly way. You will be introduced to an approach with which to address this challenge. The approach consists of a facilitated process whereby academic researchers and high-level influential actors within society co-produce

knowledge. You will track this process in four Latin American countries—Brazil, Chile, Colombia, Peru, and South Africa. You will hear from various professionals about their contexts and the different challenges and opportunities the process includes. (Coursera, 2017)

Applying to U.S. Universities
This course will help international students (non-U.S. citizens) and non-native English speakers navigate the U.S. university admission process by offering practical information about the documents and pieces that make up a U.S. university application. More importantly, admission officers will discuss how they use those pieces to decide who is accepted and who is denied, so that you can understand the process beyond the pieces…Please note, while the English Language Programs are part of the University of Pennsylvania, this is not a course about applying to Penn. (Coursera, 2017)

Teaching Mathematics with Technology
Technology is an essential component of today's workplace and is a ubiquitous component of our society. Technology can be a useful tool to support students' engagement in and learning of mathematics. This course allows you to learn, along with colleagues from other schools and around the world, instructional practices that utilize technology to support students' mathematical learning. (MOOC List, 2017)

Art & Activity: Interactive Strategies for Engaging with Art
Art can be a powerful catalyst for building skills and understanding a range of subjects. Intended for primary and secondary teachers of all disciplines, Art & Activity builds upon the inquiry-based approaches of Art and Inquiry: Museum Teaching Strategies for Your Classroom, while delving into activity-based strategies that will make your students empowered participants. (Coursera, 2017)

To Flip or not to Flip—Discover the Flipped Classroom Methodology
This MOOC is part of the MOOCs for Teachers series, which is devoted pedagogical innovation and is aimed at giving the change to teachers and people involved in instructional design to develop skills in the didactical area…In this MOOC you will have the chance to: learn the basics about flipped classroom; explore some shared experiences and identify key issues; start thinking about how to try it out in your course, using also the set of tools we will provide you with, and—why not—any useful open resource you find online. (Politecnico Milano, 2017)

Disciplinary Literacy for Deeper Learning
Disciplinary Literacy for Deeper Learning explores what it means to read, write, speak, and listen for learning and creating knowledge across disciplines, including science, mathematics, history/social studies, and English/language arts. In this six unit course, participants will learn how to engage students in deeper learning through disciplinary literacy practices and explore the model for inquiry-based disciplinary literacy. (MOOC List, 2017)

Cultural Diversity in Your Classroom
The course offers teachers an opportunity to access useful resources and exchange with peers on the challenging topic of cultural diversity in classrooms. The course is part of a 3-part series of courses exploring the topic of cultural diversity, the situation of newly arrived migrants in general

and how to integrate newly arrived migrant students in schools and classrooms. (School Education Gateway, 2016)

Advanced Linear Models for Data Science 1: Linear Models
This class is an introduction to least squares from a linear algebraic and mathematical perspective. Before beginning the class make sure that you have the following: a basic understanding of linear algebra and multivariate calculus; a basic understanding of statistics and regression models; at least a little familiarity with proof based mathematics; basic knowledge of the R programing language. After taking this course, students will have a firm foundation in a linear algebraic treatment of regression modeling. (Coursera, 2017)

Basic Data Descriptors, Statistical Distributions, and Application to Business Decisions
This course is designed to introduce you to Business Statistics. We begin with the notion of descriptive statistics, which is summarizing data using a few numbers. Different categories of descriptive measures are introduced and discussed along with the Excel functions to calculate them. The notion of probability or uncertainty is introduced along with the concept of a sample and population data using relevant business examples… (Coursera, 2017)

Rethinking International Tax Law
In recent years, the international tax planning strategies of multinationals have become a source of—often heated—debate. This course provides learners with the tools to become fully informed participants in the debate by explaining the foundations and practice of international tax law as well as addressing current developments and the ethical aspects of tax planning. (Coursera, 2017)

Business Fundamentals: Effective Networking
Learn how to build and sustain your network to enhance your professional relationships and open up career opportunities (FutureLearn, 2017).

Disability and a Good Life: Working with Disability
Learn how disability intersects with human rights, and how a good life can be made possible for everyone (FutureLearn, 2016).

Introduction to Business Decision Modeling with DMN
In this course you will learn what DMN is, and how to read, use, understand, and model decision diagrams to guide your own organization to better business outcomes (Hasso Plattner Institute, 2017).

How Much Does Student Engagement with Videos and Forums in a MOOC Affect Their Achievement?

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Abstract

Engagement in Massive Open Online Courses (MOOCs) is based on students who self-organize their participation according to their own goals and interests. Visual materials such as videos and discussion forums are basic ways of engaging students in MOOCs. Student achievement in MOOCs is typically measured using assessments distributed throughout the course. Although there is research on the basic forms of student's engagement and assessment in MOOCs, little is known about their effect on students' achievement in the form of students completing a MOOC. Using binomial logistic regression models, this paper addresses this gap in the literature by presenting the degree to which student engagement with videos and forum posts can predict students' probability of achievement in a MOOC. It also explores the extent to which participation behaviors and their intention to receive the course certification can be used to predict achievement in MOOCs. Using qualitative content analysis, this paper discusses the quality of the forum posts exchanged by participants in this MOOC. The findings from quantitative analysis support MOOC's pedagogical assumptions, showing that students' engagement in forums and with videos increases the probability of course achievement. It also shows that intention to certify plays a moderator effect on the number of videos watched, enhancing achievement in MOOCs. The findings from qualitative analysis reveal that most students' posts in forums display more information acquisition than critical thinking. Implications for practice suggest MOOC designers and MOOC instructors foster engagement in forums by implementing discussion prompts that foster interactions about deep meaning of concepts or application of concepts covered in the MOOC. In regard to videos, implications for practice suggest the creation of interactive videos that promote students' engagement and control such as inserting guiding questions and segmenting the video content. Future research comprising multiple MOOC cohorts is suggested to validate the empirical model presented in this study.

Keywords: MOOCs, students' achievement in MOOCs, MOOC forums, videos in MOOCs

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How Much Does Student Engagement with Videos and Forums in a MOOC Affect Their Achievement?

Massive Open Online Courses (MOOCs) are open learning environments that have the capacity to enroll a large number of participants. In MOOCs, participants freely engage and disengage with available resources and share their learning experiences with other participants in discussion forums. MOOC resources are commonly comprised of online reading materials, videos, quizzes, discussion forums, and assessments. Due to their open nature and students' autonomy, MOOCs are also known for having a high number of students drop out (Ho et al., 2014; Coetzee, Fox, Hearst, & Hartmann, 2014). The combination of students' autonomy and students' dropout rates has drawn the attention of researchers for better understanding the forms of students' engagement and its contribution to students' achievement in MOOCs (e.g., Onah, Sinclair, & Boyatt, 2014).

In this paper, we explore the effect of students' intention to complete the MOOC and their engagement with videos and forums on their achievement in the Creativity, Innovation and Change MOOC (CIC MOOC) delivered by The Pennsylvania State University. Binomial logistic regression models were used to present the degree to which learner's engagement with videos and forum posts can be the basis for predicting course completion and receiving a certificate. We use qualitative content analysis to gain knowledge about the quality of the forum posts exchanged by participants in this study. For that, we make use of the Interaction Analysis Model (IAM) provided by Gunawardena, Lowe, and Anderson (1997) to evaluate participants' online messages in terms of co-construction of knowledge. Afterwards, we discuss the results through the lens of the literature and indicate implications for practice and research.

Review of Related Literature

The most common ways to engage students in MOOCs are insertion of visual materials such as videos and the use of discussion forums. Formative assessments (low or no point value quizzes) and summative assessments (graded evaluations) are often used to evaluate participants performance in MOOCs. This section presents a brief review of the literature about students' engagement with videos and forums, students' completion and their assessment in MOOCs.

Student Engagement with Videos in MOOCs

The majority of MOOCs delivered through platforms such as Coursera, edX, and Udacity heavily rely on videos to deliver course content. Videos give flexibility to participants and allow scalability for MOOC providers in delivering course content (Lee et al., 2015). These videos vary in length, in position within the course, and in purpose. According to Morris and Lambe (2014), MOOC videos are characterized by: (a) introductory videos in which course instructors explain the course and its purpose, (b) animations with audio narration in which the course content is explained, (c) video lectures given to real students, (d) documentary style video, (e) interviews or conversations among instructors and guests, and (f) video with built-in questions. A MOOC may make use of a particular video style or a combination of different styles according to its purpose of learning.

Benefits of videos in online learning can be found in the literature (Triay, Sancho-Vinuesa, Minguillón, & Daza, 2016; Morris & Lambe, 2014). For instance, videos can be paused, repeated, or skipped through, allowing flexibility in the learning process and reinforcing student autonomy in MOOCs. Short videos intertwined with quizzes emulate one-on-one tutoring and tend to fit into a manageable period of time that students can dedicate to MOOCs (Glance, Forsey, & Riley, 2013).

Although videos are the primary vehicle for delivering content in MOOCs, research seems to suggest that high quality videos are not enough to provide high quality experience to participants (Guo, Kim, & Rubin, 2014; Coetzee et al., 2014). Lately, Lee et al. (2015) are investigating the potential of including time-anchored commenting interfaces along with videos that allow participants to watch the video and at the same time to exchange comments with others about the content being learned. This initiative has the potential to transform engagement with videos from passive to active.

Student Engagement with Forums in MOOCS

MOOC forums have many purposes. They can be a space for students to interact with other participants, get to know their peers, and learn through their experiences (Young, 2012). They can also be a space for students to check their understanding of the subject matter and to ask questions regarding a task or a problem (Young, 2012; Darabi, Arrastia, Nelson, Cornille, & Liang, 2011). Forums are an environment for cooperation among students (Coetzee et al., 2014) in which students can learn as much from their interactions with others as they do from their interactions with course materials (Thomas, 2002). Forums can be a space where participants create new knowledge by interacting with others about concepts and techniques (Dubosson & Emad, 2015).

According to Dubosson and Emad (2015), Young (2012) and Koller (2012), MOOC forums have been proven to be a good environment for peer assistance, in which students tend to answer each other's questions without instructor intervention. However, research is unclear regarding the effectiveness/benefits of discussion forums. Some researchers found that discussion forums promote high quality discussion of course content, allowing students to reflect upon course materials and upon each other's comments (e.g., Walker, 2007). Additionally, the implementation of discussion forums allows students the opportunity to initiate discussions and to drive their own learning (Darabi et al., 2011). In contrast, critiques of the use of discussion forums state that only a small fraction of participants contribute to forums, producing a high quantity of posts in relation to most participants (Coetzee et al., 2014). Threads may cover different topics, in different languages, showing problems of organization, which may intimidate participants and diminish their engagement (Anderson, Huttenlocher, Kleinberg, & Leskovec, 2014). As the number of posts and discussion threads become overwhelming, participants may feel less confident about engaging in forums (Dooley & Wickersham, 2007). In this sense, forums become spaces in which most students' posts tend to display information acquisition instead of critical thinking (Kanuka & Anderson, 2007). For these authors, forums may support students' increase of knowledge, but still fall short in presenting evidence as a venue for development of students' new knowledge.

Student Completion in MOOCs

In open online environments such as MOOCs, participants are allowed to choose how they want to pursue their engagement. MOOC completion has emerged as an important metric being used by MOOC researchers to define course performance (Belanger & Thornton, 2013; Breslow, Pritchard, DeBoer, Stump, Ho, & Seaton, 2013). MOOC completion here is understood as completing course requirements and earning the Statement of Accomplishment certificate. The reason for choosing participant completion as a metric in MOOC is related to the straightforward way to collect information from the platform and completion being a variable that can be used to compare students' performance in different MOOCs (Wang & Baker, 2015; Moore & Kearsley, 2011). However, when analyzing the literature of MOOC completion, the high levels of participant dropout emerge as a concern for MOOCs as a pedagogical environment, with completion rates varying between 5% and 15% as presented by Kizilcec and Schneider (2015), Ho et al., (2014), and Jordan (2014).

Due to the open environment of MOOC's and participants' autonomy of engagement, different participants may have different perspectives of what completion means. Our view is that completion in MOOCs gains a personal connotation that is aligned with participant's goals in that MOOC. Loizzo et al. (2017) highlight that for some participants completion was related to acquiring new resources and interacting with the MOOC platform. McAuley, Stewart, Siemens, and Cormier (2010) also pointed out differences in participant views when defining MOOC completion. These authors noticed that as participants define completion they tend to do it based on their "learning goals, prior knowledge and skills, and common interests" (p. 4). On the other hand, as described by Anderson (2013), many participants who enroll in MOOCs do not have the intention of completing the course. This divergence of perceptions between MOOC providers and MOOC participants has led the field to explore alternative approaches to understanding MOOC completion (Koller, Ng, Do, & Chen, 2013). One of them is to focus on comparing students' performance against their intentions in a MOOC (Kizilcec & Schneider, 2015).

Student Assessment in MOOCs

MOOCs offer regular opportunities for students to verify and test their understanding throughout the course. Thus, participants engage with non-graded quizzes as a way to test their knowledge, and at the end of the course they can elect to take a scored test for a course certificate. Student achievement in MOOCs is measured using assessments, which are mainly distributed into automated assessments (e.g. multiple-choice quiz), peer-assessment (e.g., students evaluate each other's work), and self-assessment (students assess their own work). Since MOOC pedagogy is primarily based on mastery of learning (Glance et al., 2013) and there are a large number of students enrolled, the above approach seems to work well with MOOCs focused on serving a high volume of participants.

As noted by O'Toole (2013), automated assessment may be used in situations where knowledge is fragmented into simple facts, algorithms, procedures, or explicit chains of reasoning. When knowledge is embedded in more complex situations, other forms of assessment may be applicable (e.g., peer-assessment). In a broad view, the literature on assessment indicates a need for online courses to create assessments *for* learning and not only assessments *of* learning (Admiraal, Huisman, & van de Ven, 2014). It is important to create assessments and feedback that are scalable, in which students can benefit from a reliable evaluation process with usable feedback that fosters opportunities for student learning (O'Toole, 2013).

How Much Does Students' Engagement in MOOCs Add to Their Achievement?

Previous research indicates that student engagement in forums and watching of videos are related to their achievement in online courses (Kizilcec, Piech, & Schneider, 2013). The main purpose of the current study is to determine the effect of these two activities on student achievement in a MOOC. When analyzing student achievement in online learning, one must consider that achievement is related to a unique combination of the course characteristics and participants' profile. This means that other MOOCs with similar course characteristics (videos and forums) may not produce the same degree of student achievement as seen in the MOOC analyzed in this study.

Thus, this study aims to answer the following research questions: (I) To what extent is students' achievement in MOOCs associated with the number of posts made and the number of videos watched? (II) What effects does intention to certify have on student achievement in MOOCs? (III) What effects does intention to certify have on the number of videos watched and the number of posts made when considering student achievement in a MOOC? (IV) What cognitive activities are performed by participants as they interact in forums?

Methods

Study Context

This study was conducted with students from the Creativity, Innovation, and Change (CIC) 2.0 MOOC via the Coursera platform from July to August, 2014. The CIC MOOC was delivered over six weeks focusing on supporting students in achieving their creative potential, empowering them to transform their personal lives, organizations, and community. No pre-requisites were required to register for this course and students had to submit their work on a weekly basis for the full six weeks. Weekly lessons were comprised of students' engagement with videos about explanations of new concepts and tools (e.g., CIC mindset and Intelligent Fast Failure), performing self-assessment upon their creative style, completing projects (e.g., shoes tower), readings, exercises, quizzes, and engaging in forums (Jablokow, Matson, & Velegol, 2014). For students who were interested in obtaining a certificate of completion, two options were offered. To receive a Statement of Accomplishment certificate, students had to submit six weekly tasks. To receive a Statement of Accomplishment with Distinction certificate, students had to complete the requirements for a Statement of Accomplishment certificate and submit 12 peer reviews throughout the course.

Data Collection and Data Analysis

Participation in this study was voluntary (N = 222), and recruitment was done upon students' completion of a survey that explored the effect of groups on students' success (course completion). Students of the CIC MOOC were invited to participate in an online survey that requested information regarding demographics, employment status, intention to complete the course, and preferred language. Data from the survey was used to gain knowledge about the characteristics of participants (demographics) and their intentions to complete the course. The data on number of videos watched, number of posts, and post content were retrieved from the Coursera platform.

Students' responses to the online survey along with their course interactions (i.e., number of videos watched and number of posts) were used in statistical analyses to build answers to research questions I, II, and III. Student's forum posts were qualitatively analyzed using the Interaction Analysis Model (IAM) developed by Gunawardena et al. (1997) in order to build answers to research question IV. In answering the research questions I, II, and III, we created statistical models using stepwise binomial logistic regression. Age, gender, number of posts, and number of videos were the initial independent variables used to predict participants' probability of achievement in the course. Participants were categorized into six age levels: 15-25 (25.87%), 26-35 (24.13%), 36-45 (18.53%), 46-55 (17.83%), 56-65 (9.44%), and 65 and above (4.20%).

Participants self-identified themselves as female (63.06%) and male (36.94%). Number of posts is comprised of participants (N = 222) posting new discussion threads and replying to each other's posts. Number of videos watched represents all instances in which participants clicked the play button of a video in this MOOC. By design, data collection did not focus on participants' engagement within videos such as pausing, fast-forwarding, and skipping video parts. Intention to certify were measured using a 5-likert scale 1-5 (strongly disagree – strongly agree). Participant achievement was coded as none, normal, and distinction, and later recoded as a binary variable indicating whether they achieved certification in the course. Next, we describe the Interaction Analysis Model used to build answers to research question IV.

The IAM model (Table 1) was used as a tool to examine the cognitive activities performed by participants in their forums interactions. Data collection was comprised of all posts (450 posts) generated by the 222 participants across all forum categories (e.g., week1, week2, etc.). The IAM model comprises five phases of knowledge co-construction that occur during the online discussions (Gunawardena et al., 1997). They are: phase 1–sharing or comparing information, phase 2–discovery and exploration of dissonance or inconsistency among ideas, concepts or statements, phase 3–negotiating of meaning or co-construction of knowledge, phase 4–testing and modification of proposed synthesis or co-construction, and phase 5–agreement statement(s) or application of newly constructed meaning. Four hundred and fifty forum posts were analyzed according to the model. The unit of analysis was participant posts in the discussion forums. Each post was independently coded by the first and the third authors according to the level of cognitive activity (see column *code*, Table 1) and later checked for consistency and divergence. If any disagreement occurred in the coding, the code selected was the one based on a majority amount of evidence presented in the post. The inter-rater reliability was Cohen's Kappa = 0.99, indicating substantial degree of agreement between the two coders.

Phase	***Operation which occur at this include***	***Code***
PHASE 1 Sharing/Comparing of information	A. Statement of initial proposal, idea	Ph1/A
	B. A statement of agreement from one or more other participants	Ph1/B
	C. Corroborating examples provided by one or more participants	Ph1/C
	D. Asking and answering questions to clarify details of statements	Ph1/D
	E. Definition, description, or identification of a problem	Ph1/E
PHASE 2 The discovery and exploration of dissonance or inconsistency among ideas, concepts or statements	A. Identifying and stating areas of disagreement	Ph2/A
	B. Asking and answering questions to clarify the source and extent of disagreement	Ph2/B
	C. Restating the participant's position, and possibly advancing arguments or considerations in its support by references to the participant's experience, literature, formal data collected. or proposal of relevant metaphor or analogy to illustrate point of view	Ph2/C

Table 1. Gunawardena, Lowe & Anderson's (1997) Interaction Analysis Model

PHASE 3 Negotiation of meaning or construction of knowledge	A. Negotiation or clarification of the meaning of terms	Ph3/A
	B. Negotiation of the relative weight to be assigned to types of argument	Ph3/B
	C. Identification of areas of agreement or overlap among conflicting concepts	Ph3/C
	D. Proposal and negotiation of new statements embodying compromise, co-construction	Ph3/D
	E. Proposal of integrating or accommodating metaphors or analogies	Ph3/E
PHASE 4 Testing and modification of proposed synthesis or co-construction	A. Testing the proposed synthesis against "received fact" as shared by the participants and/or their culture	Ph4/A
	B. Testing against existing cognitive schema	Ph4/B
	C. Testing against personal experience	Ph4/C
	D. Testing against formal data collected	Ph4/D
	E. Testing against contradictory testimony in the literature	Ph4/E
PHASE 5 Agreement statement(s)/applications of newly constructed meaning	A. Summarization of agreement(s)	Ph4/A
	B. Applications of new knowledge	Ph4/B
	C. Metacognitive statements by the participants illustrating their understanding that their knowledge or ways of thinking (cognitive schema) have changed as a result of the conference interaction	Ph4/C

Table 1 (cont.). Gunawardena, Lowe & Anderson's (1997) Interaction Analysis Model

Participants Demographics

Participants who took part in this study (N = 222) came from all over the world. Table 2 presents participants distribution and the countries where they were located. Data shows that Chinese participants accounted for the largest number of volunteers who participated in our study (21.6%), followed by participants from the United States (17.6%). This large number of Chinese students is related to the fact that the course has been translated into Chinese language.

Country	Number of Participants	Country	Number of Participants	Country	Number of Participants	Country	Number of Participants	Country	Number of Participants
AR	3	CO	4	IR	2	PK	3	UK	3
AU	5	CR	1	KW	1	PT	4	US	39
AZ	1	DE	1	LC	1	RO	3	VE	2
BA	1	DK	1	LV	1	RS	2	ZA	3
BB	1	DO	1	MG	1	RU	1	ZW	1
BG	1	EG	3	MX	10	SA	1		
BO	1	ES	5	MY	3	SD	1		
BR	6	FJ	1	NE	5	SE	1		
BW	1	GR	2	NI	1	TN	1		
CA	10	HR	1	NL	4	TW	3		
CL	1	ID	1	NZ	1	UA	1		
CN	48	IN	18	PE	3	UG	1		

Table 2. Distribution of Participants by Country

The demographics indicate a sample of 140 females and 82 males. From a total of 222 participants in this study, they classified themselves on a scale of four English levels as Poor (5.4%), Basic (22.5%), Fluent (41.4%), and Native (30.6%). Their age levels were classified into six ranges: 15-25 (30.6%), 26-35 (25.2%), 36-45 (16.6%), 46-55 (7.6%), and 66 and above (4.5%). In regard to their job status, 76 participants stated they are employed full-time (34.23%), 45 participants were full-time students (20.27%), 37 participants were self-employed (16.67%), 17 participants were employed part-time (7.66%), 16 participants were looking for a job (7.21%), 10 participants were part-time students (4.5%), and 21 participants were retired, not working, or on maternity leave (9.46%). Regarding their intention to complete this MOOC, participants were asked to choose from a 5-likert scale 1–5 (strongly disagree–strongly agree) upon the statement "Intent to complete the course". The distribution of participants' answers to this survey question was: Strongly Disagree (3.15%), Disagree (6.70%), Neither Agree nor Disagree (54.30%), Agree (29.40%), and Strongly Agree (6.45%). It shows that in the pre-course survey, thirty-five percent of participants in this study indicated an intention to complete the entire MOOC. Participants' course completion data was collected through Coursera with three levels of completion: none, normal, and distinction. These three levels of completion were recoded as a binary variable indicating whether they achieved certification in the course: complete (the combination of normal completion and completion with distinction) and non-complete. Participants' achievement in this MOOC was distributed as: complete (41.52%) and non-complete (58.48%). On average, participants posted twice in forums and watched 40 videos throughout the course. The number of videos watched includes the possibility that some participants may have watched a video more than once.

Results

This section presents results of the analyses conducted to examine the extent to which student achievement in MOOC is associated with the number of posts made and the number of videos watched. It explores the effects of intention to certify on student achievement and on number of videos watched and number of posts made by students in MOOC. It also presents the cognitive level performed by participants as they interacted in forums. Statistical analyses were performed using the R programming language and the R-Studio Integrated Development Environment. Afterwards, discussion and conclusion are presented.

To what extent is student achievement in MOOCs associated with the number of posts made and the number of videos watched?

Results from binomial logistic regression model 1 (Table 3), presented both NofPost ($p = 0.0236$) and NofVideoWatch ($p = 9.98e\text{-}12$) as statistically significant when considering participants' achievement (Akaike Information Criterion, AIC = 220.7). Age and gender were not statistically significant regarding participants' achievement. Parameter estimate for number of posts regarding the student achievement was 0.27, meaning that the number of posts is positively associated with student achievement. The 1.31 odds ratio for NofPost indicates that a one-point increase in the number of posts made is associated with the probability of MOOC achievement increasing by a multiplicative factor of 1.31 (Table 4). The estimate for frequency of videos watched on student achievement was estimated at 0.06 which informs that the number of videos watched is positively associated with student achievement. The 1.061 odds ratio for NofVideoWatch indicates that a one-point increase in the number of videos watched is associated with the probability of MOOC achievement increasing by a multiplicative factor of 1.061 (Table 4). In answering our first research question, students' achievement in MOOC is positively associated with the number of posts they made and the number of videos they watched.

Coefficients	*Estimate*	*z value*	*Pr(>|z|)*
(Intercept)	-3.01187	-4.963	6.95e-07 ***
Age	-0.014502	-1.221	0.2222
Gender	-0.573418	-1.572	0.1159
NofPost	0.267124	2.263	0.0236 *
NofVideoWatch	0.059167	6.807	9.98e-12 ***
	Note: *p<0.1; **p<0.05; ***p<0.01		
Observations	222		
Null deviance	287.84 on 221 degrees of freedom		
Residual deviance	210.70 on 217 degrees of freedom		
AIC	220.7		

Table 3. Binomial Logistic Regression Presenting Number of Posts and Number of Videos as Statistical Predictors

Coefficients	***Odds Ratio***	***Confidence Interval (2.5%, 97.5%)***	
(Intercept)	0.04919961	0.01411108	0.1538637
Age	0.98560263	0.96239826	1.0085036
Gender	0.56359587	0.27112845	1.1397070
NofPost	1.30620194	1.03895722	1.6540583
NofVideoWatch	1.06095251	1.04397637	1.0803150

Table 4. Odds Ratio of Binomial Logistic Regression Coefficients for Model 1

What effects does intention to certify have on student achievement in MOOCs?

Next, we added participants' intention to obtain a course certificate as an independent variable in the logistic regression model 2 (Table 5). The results for NofPost (p-value = 0.02297), NofVideoWatch (p = 9.87e-12), and CertificateIntention (p = 0.00447) were statistically significant when considering participants' achievement. The model improves when compared to the previous one, presenting a lower AIC = 213.45.

Coefficients	*Estimate*	*z value*	*Pr(>|z|)*
(Intercept)	-5.502032	-4.99	6.03e-07 ***
Age	-0.009325	-0.758	0.44856
Gender	-0.61314	-1.643	0.10044
NofPost	0.278766	2.274	0.02297 *
NofVideoWatch	0.060217	6.808	9.87e-12 ***
CertificateIntention	0.535203	2.843	0.00447 **
	Note: *p<0.1; **p<0.05; ***p<0.01		
Observations	222		
Null deviance	287.84 on 221 degrees of freedom		
Residual deviance	201.45 on 216 degrees of freedom		
AIC	213.45		

Table 5. Binomial Logistic Regression Presenting Number of Posts, Number of videos, and Intention of Certification as Statistical Predictors

The odds ratio of binomial logistic regression coefficients for model 2 is presented in Table 6. The 1.32 odds ratio for NofPost indicates that a one-point increase in the number of posts made is associated with the probability of MOOC achievement increasing by a multiplicative factor of 1.32. The 1.062 odds ratio for NofVideoWatch indicates that a one-point increase in the number of videos watched is associated with the probability of MOOC achievement increasing by a multiplicative factor of 1.062. Likewise, the 1.708 odds ratio for certificate intention indicates that a one-point increase in certificate intention is associated with the probability of MOOC achievement increasing by a multiplicative factor of 1.7. Answering our second research question, model 2 shows that for the ones who intended to obtain a certificate, their probability of MOOC achievement increases by a multiplicative factor of 1.7 when compared to the ones who didn't intend to receive a MOOC certification. Thus, the results above support the basic model that predicts student achievement in the CIC MOOC. In ANOVA test, model 2 presented a significant reduction of deviance (9.250) when compared to deviance in model 1 (75.799), as presented in Table 7.

Coefficients	***Odds Ratio***	***Confidence Interval (2.5%, 97.5%)***	
(Intercept)	0.004078477	0.000412727	0.03168829
Age	0.990718375	0.966595199	1.01460691
Gender	0.541647414	0.255939155	1.11289408
NofPost	1.321497502	1.042604897	1.69005426
NofVideoWatch	1.062066797	1.044785161	1.08180454
CertificateIntention	1.707795659	1.200836587	2.52256616

Table 6. Odds Ratio of Binomial Logistic Regression Coefficients for Model 2

Models	*Df Resid.*	*Dev*	*Df*	*Deviance*	*Pr(>Chi)*
Model 1: Achievement ~ Age + Gender + NofPost + NofVideoWatch	217	210.7	2	*75.799*	<2.2e-15***
Model 2: Achievement ~ Age + Gender + NofPost + NofVideoWatch + CertificateIntention	216	201.45	1	*9.25*	0.002355**
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1					

Table 7. Analysis of Deviance for Models 1 and *2*

What effects does intention to certify have on the number of videos watched and the number of posts made when considering student achievement in MOOC?

To understand the effects that intention of certification has on the number of videos watched and the number of posts made by MOOC students, we explored the logistic regression including interaction terms related to intention to certify and their moderation effects in students' achievement (model 3). For the moderation effect of intention of certification, we used stepwise binomial logistic regression as presented in Table 8. Model 3 showed the best outcome when comparing results from other models (lower AIC). By including the interaction in the model, previously significant estimation of independent terms was reduced, and some independent variables became insignificant.

Analyzing the predictors of model 3 in Table 8, only the interaction between "number of videos watched" and "intention of certification" was statistically significant (p-value = 0.0113) with odds ratio =1.019 (Table 9). Model 3 shows us that intention to certify does not play a moderating effect between the number of posts and student achievement. On the other hand, intention to certify has a moderating effect between the number of videos watched and student achievement. Answering our third research question, model 3 shows that an increase in engagement in videos for the ones who intend to receive a certificate is positively associated with an increase in their MOOC achievement.

Coefficients	*Estimate*	*z value*	*Pr(>|z|)*
(Intercept)	-1.813215	-1.098	0.2724
Age	-0.01057	-0.829	0.4069
Gender	-0.608227	-1.572	0.1158
NofPost	0.266914	2.164	0.0304 *
NofVideoWatch	-0.016493	-0.545	0.5859
CertificateIntention	-0.356683	-0.952	0.341
NofPost x CertificateIntention	0.045786	0.359	0.71953
NofVideoWatch x CertificateIntention	0.019166	2.535	0.0113 *
	Note: *p<0.1; **p<0.05; ***p<0.01		
Observations	222		
Null deviance	287.84 on 221 degrees of freedom		
Residual deviance	195.18 on 215 degrees of freedom		
AIC	209.18		

Table 8. Binomial Logistic Regression Presenting Number of Posts, Number of Videos, Intention of Certification and Interaction Terms as Statistical Predictors

Coefficients	***Odds Ratio***	***Confidence Interval (2.5%, 97.5%)***	
(Intercept)	0.3262011	0.004438981	13.591961
Age	0.9901849	0.965077567	1.01487
Gender	0.550822	0.252556101	1.160282
NofPost	1.0156994	0.385860806	2.495412
NofVideoWatch	0.9821625	0.924557622	1.044336
CertificateIntention	0.587316	0.234989466	1.586455
NofPost x CertificateIntention	1.0647178	0.858939199	1.342143
NofVideoWatch x CertificateIntention	1.0196866	1.004576628	1.035409

Table 9. Odds Ratio of Binomial Logistic Regression Coefficients for Model 3

Synthesizing the results from our first three research questions, this study showed that student achievement in MOOCs is positively associated with the number of posts made and the number of videos watched. From model 2 we learned that a one-point increase in NofPost is associated with the probability of MOOC achievement increasing by a multiplicative factor of 1.32, and a one-point increase in NofVideoWatch is associated with the probability of MOOC achievement increasing by a multiplicative factor of 1.062. For students who intend to obtain a certificate, their achievement in the MOOC increases by a multiplicative factor of 1.7 when compared to the ones who do not intend to obtain a course certificate. We also learned that intention to certify does not play a moderating effect between the number of posts and student achievement. On the other hand, intention to certify has a positive moderating effect between the number of videos watched by students and their achievement in this MOOC. In the next section, we qualitatively analyze participants' posts to depict the cognitive activities performed by them through their interactions in forums.

What cognitive activities are performed by participants as they interact in forums?

We used the Interaction Analysis Model (IAM) from Gunawardena et al. (1997) to examine the cognitive activities performed by participants in their forums interactions. Results from qualitative coding on 450 forum posts are shown in Table 10. Participants' forum posts were coded through the IAM's levels from phase 1 to phase 3 (see Table 10). No forum posts were located under phase 4 (testing tentative constructions) and phase 5 (statement/applications of newly constructed knowledge) of the IAM. Data shows that the majority of participants' posts were situated on making statements of observations related to the course and statements showing participants' opinions, as represented under the code Ph1/A comprising 72.07% of the data. This prominent characteristic of participants' posts may be understood by looking at the forum design of the CIC MOOC. In the forums, it was recommended that participants post to others by using the P.U.R.E approach of giving feedback. According to the CIC MOOC page (https://www.coursera.org/learn/creativity-innovation), the P.U.R.E. approach stands for *Positive*, *Unique*, *Revision* and *Education* as described in Table 11.

Analyzing the P.U.R.E. framework recommended to CIC MOOC participants as they interact with others in forums, we noticed that the suggested script enhances participants' collaboration, minimizing conflict among them. According to Gunawardena et al. (1997) in discussions where there is little conflict among participants' ideas, participants tend to "accept each others' statements or examples as consistent with what the group members already know or believe and the discussion may never advance out of phase one" (p. 415). Another factor that may have contributed to participants' lack of higher levels of cognitive activities might be related to the nature of the posts in this sample. Although data collection comprised all posts from the 222 participants across all forum categories (e.g., week1, week2, etc.), when content of these posts was qualitatively analyzed through the IAM we noticed that many of these posts' content resembled the structure of participants' initial posts in MOOCs, in which they typically introduce themselves and state their goals and expectations for the course without challenging ideas of each other. For example, "Hello I'm Jaime [pseudonym]. I'm a software engineer in Taiwan. I like innovative products and want to know more about creativity. Cheers, Jaime." This piece of evidence leads us to hypothesize that these participants may have had a higher engagement at the beginning at the course.

	Low mental level					***High mental level***					
Phases	Ph1/A	Ph1/B	Ph1/C	Ph1/D	Ph1/E	Ph2/A	Ph2/B	Ph2/C	Ph3/A	Ph3/B	Total
# of codes	387	22	11	76	24	10	1	3	2	1	537
% of codes	72.07%	4.10%	2.05%	14.15%	4.47%	1.86%	0.19%	0.56%	0.37%	0.19%	100.00%

Table 10. Participants' Posts Analyzed According to the Interaction Analysis Model (IAM) (Gunawardena et al, 1997)

Positive	First, highlight the strengths of the submission - what was done well? Give "happy comments" right away, and be considerate and constructive
Unique	Next, comment on interesting and unique aspects of the submission - what did you find interesting about it?
Revision	Third, be a "critical friend" - what suggestions do you have for improvement or revision. The purpose is not so much "to grade" as to interact and suggest.
Education	Close by reflecting on what you learned and how you were educated from the submission as a feedback provider.

Table 11. P.U.R.E Approach of Giving Feedback Used in CIC MOOC

Qualitative analysis of participants' forum posts showed that they tend to post in the format of statement of opinion followed by a question. For example, "I'm struggling with creative blocks. I think part of it is fear of failure but what are some strategies to get your creative juices flowing?" This intrinsic characteristic of the nature of participants' posts justifies the high quantity of Ph1/A and Ph1/D codes in Table 10. In analysis of CIC MOOC posts, participants also engage with others in forums by making a statement of agreement with other participants' posts (Ph1/B) and corroborating with ideas of others (Ph1/C), for example, "Hello Sidney! [pseudonym] As I reflect, I agree that [the] shoe tower exercise is simple but profound. As you head into your new venture it will help you to innovate and build from small failures and challenges along the way."

In terms of disagreement and negotiation of meaning (phases 2 and 3 of the IAM), participants' posts were mainly concentrated in Ph2/A in which they stated potential disagreement/divergence with the MOOC's rules and/or with the MOOC's activities, as in the example:

> I'm disappointed in this choice of exercise. I work with people who own one pair of shoes—actually flipflops—at a time. The choice of shoe tower reflects a cultural myopia that has me worried about the rest of the course...

This participant was referring to the task presented in week 2 of the CIC MOOC in which students had to build the tallest shoe tower without using any external support. The shoe tower task was designed to foster participants' creativity dealing with limited resources (available number of shoes) and to help them reflect about the strategies used in their creation process. In the data sample, only two posts presented Ph3/A level and only one post presented Ph3/B level, in which the participant intended to clarify meaning and the weight assigned by another participant to the definitions of the word "bad." Participants' posts in this study did not show tendency to disagreement. In fact, in most of the posts they tended to be polite and friendly, which may reduce situations of dissonance and disagreement as the ones suggested in phase 2 of IAM and beyond.

Discussion and Conclusions

Using data from volunteer participants in the CIC MOOC, this study investigated the extent to which students' achievement in MOOCs is associated with the number of posts made and the number of videos watched. Results indicate that participant engagement in forums has a bigger impact on the probability of MOOC completion (32%) when compared to the contribution of videos watched (6%). Considering direction of coefficients, intention to certify had an amplifying effect on students' achievement, acting as a moderator in enhancing students' achievement. These results are aligned with the literature on MOOCs in which forum participation supports students' completion of the course (Breslow et al., 2013; Kizilcec et al., 2013; Waldrop, 2013; Daniel, 2012).

Qualitative analysis revealed that the forum contributions from volunteers in this study are mainly located in phase 1 of Gunawardena's et al. (1997) Interaction Analysis Model. This empirical result adds evidence to the literature of forums (Kanuka & Anderson, 2007, Thomas 2002) that state that most students' posts in forums tend to display information acquisition instead of critical thinking. In this sense, forums in this study worked as a venue in which students increased knowledge about others and about the course content, but fell short in presenting evidence as a venue in which students develop new knowledge.

Given the importance of participants' engagement with forums and videos in MOOCs, implications for practice suggest MOOC designers and instructors should create discussion prompts that foster interactions about deep meaning of concepts or application of concepts. Knowing that participants in MOOCs tend to engage in forums by posting under the format "statement" plus "question," MOOC instructors can capitalize on this common type of post to foster participant replies to posts of others. In doing so, this participant behavior may lead to the creation of a community of learning in which more knowledgeable participants answer the queries of novices or less knowledgeable individuals. On the other hand, if a forum presents only the behavior of participants asking questions but not replying to each other, it may incur the risk of a forum becoming a pile of posts as described by Thomas (2002).

In terms of videos, this study extends the literature showing the impact of videos in the probability of MOOC completion. MOOC designers can use the results of this study as a rationale to suggest the implementation of more interactive videos as described by Glance et al. (2013), intertwining segments of videos with quizzes, and improving the descriptions of videos so that participants know exactly what they can learn by interacting with that specific video. Although it is hard to control participants' engagement with videos in MOOCs by design, providing better guidance of what videos may contribute to participants' learning paths may help them to make better decisions regarding engagement.

In terms of research, although many may intuitively believe that student engagement with forums and with videos seems to be related to achievement, this study advances the field by showing how much these engagement types have the potential to affect student achievement. The combination of statistical methods and qualitative analysis provide to the literature a model of how to analyze student engagement in MOOCs. Results presented here support students' achievement in heterogeneous student populations, as the ones presented in MOOCs. By understanding the potential contribution from students' engagement with forums and with videos in their course achievement, new approaches can be developed to create and sustain learning through personalization. Knowing features that affect achievement and how much achievement is affected, MOOC designers can develop learning paths aimed at maximizing participants' completion of a MOOC.

Limitations and Future Work

The statistical analysis presented in this study makes use of a case study survey and click data which don't afford explanations regarding the causes and effects among the variables. Thus, our results regarding participants' intention to complete the MOOC are contingent on CIC MOOC students' honesty and disposition to volunteer in this study. The sample size of this study was relatively small when considering the large number of students who enrolled in this MOOC. Due to size effects, the findings may not be generalizable to other samples. This could be overcome with the implementation of longitudinal studies in which multiple MOOC cohorts are analyzed under the same statistical model and under the same qualitative framework. Knowing the potential impact on students' achievement as they engage with forums and with videos, in future work it will be interesting to study how the patterns found from the Interaction Analysis Model informs participants' learning outcomes.

References

Anderson, T. (2013). *Promise and/or peril: MOOCs and open and distance learning.* Retrieved from http://www.col.org/SiteCollectionDocuments/MOOCsPromisePeril_Anderson.pdf

Anderson, A., Huttenlocher, D., Kleinberg, J., & Leskovec, J. (2014). Engaging with massive online courses. In C. W. Chung et al. (Ed.), *23rd International Conference on World Wide Web (WWW '14)*, (pp. 687–698). Seoul, Korea

Admiraal, W., Huisman, B., & Van de Ven, M. (2014). Self-and peer assessment in massive open online courses. *International Journal of Higher Education, 3*(3), 119-128.

Belanger, Y., & Thornton, J. (2013, February 5). *Bioelectricity: A quantitative approach. Duke University's first MOOC.* Retrieved from http://dukespace.lib.duke.edu/dspace/bitstream/handle/10161/6216/Duke_Bioelectricity_MOOC_Fall2012.pdf

Breslow, L., Pritchard, D. E., DeBoer, J., Stump, G.S., Ho, A.D., & Seaton, D. T. (2013). Studying learning in the worldwide classroom: Research into edX's first MOOC. *Research & Practice in Assessment, 8*, 13–25

Coetzee, D., Fox, A., Hearst, M. A., & Hartmann, B. (2014). Should your MOOC forum use a reputation system? *In Proceeding of the 17th ACM conference on Computer supported cooperative work & social computing,* 1176-1187.

Daniel, J. (2012). Making sense of MOOCs: Musings in a maze of myth, paradox and possibility. *Journal of Interactive Media in Education*, 3. Retrieved from http://jime.open.ac.uk

Darabi, A., Arrastia, M. C., Nelson, D.W., Cornille, T., & Liang, X. (2011). Cognitive presence in asynchronous online learning: A comparison of four discussion strategies. *Journal of Computer Assisted Learning, 27*(3), 216-227.

Dooley, K. E., & Wickersham, L. E. (2007). Distraction, domination, and disconnection in whole-class, online discussions. *The Quarterly Review of Distance Education*, 8(1), 1–8.

Dubosson, M., & Emad, S. (2015). The Forum Community, the Connectivist Element of an xMOOC. *Universal Journal of Educational Research*, 3(10), 680-690.

Glance, D. G., Forsey, M., & Riley, M. (2013). The pedagogical foundations of massive open online courses. *First Monday, 18*(5).

Guo, P. J., Kim, J., & Rubin, R. (2014). How video production affects student engagement: An empirical study of mooc videos. In *Learning at Scale (L@S)*, 41–50.

Gunawardena, C., Lowe, C., & Anderson, T. (1997). Analysis of a global online debate and the development of an interaction analysis model for examining social construction of knowledge in computer conferencing. *Journal of Educational Computing Research*, 17 (4), 397-431.

Ho, A. D., Reich, J., Nesterko, S., Seaton, D. T., Mullaney, T., Waldo, J., & Chuang, I. (2014). HarvardX and MITx: The first year of open online courses Fall 2012-Summer 2013. Retrieved from http://ssrn.com/abstract=2381263

Jablokow, K., Matson, J., & Velegol, D. (2014). A multidisciplinary MOOC on creativity, innovation, and change: Encouraging experimentation and experiential learning on a grand scale. *Paper presented at the 121 ASEE Annual Conference & Exposition*, Indianapolis, IN. Retrieved from http://www.asee.org

Jordan, K. (2014). Initial trends in enrolment and completion of massive open online courses. *International Review of Research on Open and Distance Learning*, 15(1), 133-160. Retrieved from http://www.irrodl.org/index.php/irrodl/article/view/1651

Kanuka, H., & Anderson, T. (2007). Online social interchange, discord, and knowledge construction, *International Journal of E-Learning & Distance Education, 13*(1), 57–74.

Kizilcec, R. F., & Schneider, E. (2015). Motivation as a lens to understand online learners: Toward data-driven design with the OLEI scale. *ACM Transactions on Computer-Human Interaction* (TOCHI), 22(2), 6.

Kizilcec, R. F., Piech, C., & Schneider, E. (2013). Deconstructing disengagement: analyzing learner subpopulations in massive open online courses. *In Proceeding of the third international conference on Learning Analytics and Knowledge* (pp. 170-179). ACM.

Koller, D. (2012). What we're learning from online education. *TED.* Retrieved from http://www.ted.com/talks/daphne_koller_what_we_re_learning_from_online_education.html

Koller, D., Ng, A., Chuong, D., & Zhenghao, C. (2013). Retention and intention in massive open online courses: In depth. *EDUCAUSE Review Online*, 48(3), 62–63. Retrieved from http://www.educause.edu/ero/article/retention-and-intention-massive-open-online-courses-depth-0

Lee, Y. C., Lin, W. C., Cherng, F. Y., Wang, H. C., Sung, C. Y., and King, J. T. (2015). Using time-anchored peer comments to enhance social interaction in online educational videos. In *ACM CHI (2015),* 689–698

Loizzo, J., Ertmer, P. A., Watson, W. R., & Watson, S. L. (2017). Adults as self-directed and determined to set and achieve personal learning goals in MOOCs: learners' perceptions of MOOC motivation, success, and completion. *Online Learning*, 21(2) doi: 10.24059/olj.v21i2.889

McAuley, A., Stewart, B., Siemens, G., & Cormier, D. (2010). *The MOOC model for digital practice*. elearnspace.org. Retrieved from http://www.elearnspace.org/Articles/MOOC_Final.pdf

Moore, M. G., & Kearsley, G. (2011). *Distance education: A systems view of online learning*. (3rd ed.). Belmont, California: Wadsworth Publishing.

Morris, N.P., & Lambe, J. (2014). Studying a MOOC: a guide. Palgrave MacMillan. Retrieved from https://he.palgrave.com/resources/Product-Page-Downloads/M/Morris-Studying-a-MOOC/Studying-a-MOOC-Neil-Morris-James-Lambe.pdf

Onah, D.F.O., Sinclair, J., & Boyatt, R. (2014). Dropout Rates of Massive Open Online Courses: Behavioural Patterns. *EDULEARN14 Proceedings*, 5825-5834.

O'Toole, R. (2013) Pedagogical strategies and technologies for peer assessment in Massively Open Online Courses (MOOCs). Discussion Paper. University of Warwick, Coventry, UK: University of Warwick. (Unpublished)

Thomas, M. J. (2002). Learning within incoherent structures: The space of online discussion forums. *Journal of Computer Assisted Learning, 18*(3), 351–366.

Triay, J., Sancho-Vinuesa, T., Minguillón, J., & Daza, V. (2016). Analyzing non-linear video usage in an introductory x-MOOC about basic linear algebra. In LASI Spain 2016, 27-28 June 2016, Bilbao, Spain. Retrieved from http://repositorio.grial.eu/handle/grial/624

Walker, B. K. (2007). *Bridging the distance: How social interaction, presence, social presence, and sense of community influence student learning experiences in an online virtual environment* (unpublished doctoral dissertation). University of North Carolina.

Young, J. R. (2012). Providers of Free MOOC's Now Charge Employers for Access to Student Data. *Chronicle of Higher Education*. Retrieved from http://chronicle.com/article/ProvidersofFreeMOOCsNow/136117/.

Waldrop, M. (2013). Campus 2.0. *Nature,* 495(7440), 160–163.

Wang, Y., & Baker, R. (2015). Content or platform: Why do students complete MOOCs? *MERLOT Journal of Online Learning and Teaching*, 11(1), 17-30.

Introduction to Section II

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In addition to the special section featuring research from the American Educational Research Association Online Teaching and Learning SIG , this issue also contains articles from our regular submission process. These papers address vital issues related to online and blended learning environments focusing on modalities, learning processes, motivation, satisfaction, and performance.

In the first of these studies, Andrew Cole and his colleagues from various campuses at the University of Wisconsin investigated the relationship between learner attitudes to instructor feedback, perceptions of teaching presence and their motivation toward online courses. The authors used data from 190 students to perform a hierarchical multiple regression. They found an interesting pattern in which positive ratings of teaching presence were negatively correlated with motivations toward online courses. They also found that the greater degree to which students react in a negative emotional way to instructor feedback, the less motivated they are toward online courses. The authors discuss measurement issues that differentiate these findings from prior research and this study may need replication with another, larger sample. Numerous prior investigations have found positive predictive relationships between the components of teaching presence (instructional design, facilitation of discourse, direct instruction) and other desirable outcomes such as student satisfaction, reported learning, and cognitive presence in online settings. These findings stand in contradiction to this body of research and through the authors speculate on possible explanations we are still left wondering why.

One explanation of these results may be found in the next paper by Rebecca Hoey of Northwestern College. In this study, analyzing 1625 instructor posts collected from 36 online sections of 13 graduate courses the author sought to understand the relationship between the qualities of instructor interaction and student ratings on a battery of assessments. These included perceptions of the quality of the instructor and course, students' perceptions of their learning, and students' actual achievement. Results indicate that the frequency of instructor interaction in discussion had no effect on student outcomes measured. However, instructor contributions that were "instructional" enhance students' perceptions of their learning, and posts that were "conversational" improve students' perceptions of instructor and course quality, as well as direct measures of academic achievement. The authors also found negative relationships on learner ratings and outcomes. Both positive and negative "evaluative" posts were associated with negative relationships with students' ratings of instructors, courses, progress, and overall evaluations. One might conjecture that the teaching presence demonstrated among the faculty in the previous study by Cole and his colleagues contained evaluative discourse associated with negative student perceptions and this may have undermined learner motivation.

The next paper in this section is by Helga Dorner of Central European University in Hungary and Swapna Kumar of the University of Florida in which they studied the Mentored

Innovation Model (MIM), an online collaborative mentoring framework implemented with 159 Hungarian pre-service and in-service teachers. The authors sought to understand the critical conditions that contribute to satisfaction with mentoring and how to improve mentoring for technology integration. Results indicate that communication is central in online collaborative mentoring for all and that mentors' activity was more important for the pre-service group, showing significant impact on pre-service teachers' overall satisfaction, perceived social presence, and communication in online collaborative mentoring. These results are important for the advancement of online teacher education and the integration of online tools by teachers supported through effective mentoring. Researchers in online teacher-education environments should take note.

In the next paper, using data from 167 Master's level students enrolled in 10 courses, Lin Carver, Keya Mukherjee, and Robert Lucio of Saint Leo University analyzed time on task in various activities within an online course and their connection to course grades. They sought to understand the nature of the relationship between the total amount of time graduate students spend within the course itself, course modules, a document repository, and synchronous online tools—and whether the student earned an A grade in the course. A logistic regression showed only time spent in voluntary synchronous online sessions was as a significant predictor of receiving an A in the course. While these results are suggestive, we need to know more about the nature of relationship. Are students scoring an A because they participate in synchronous discussions, or are more diligent, motivated students who might otherwise earn an A also more likely to engage for longer duration in these optional synchronous learning activities? Additional research employing a theoretical framework and with controls for pre-existing differences among subjects will help answer this question.

Synchronous interaction is also the topic of the next paper by Yvonne Earnshaw of Florida State University. While some believe that we will soon arrive at a point in which synchronous technology mediation will eliminate the boundaries of time and space associated with the physical classroom, anyone who has participated in a web-conference is familiar with the frequent technical issues that can inhibit smooth interaction in these settings. In this study, the author conducts a granular analysis of a frequent source of difficulty, turn taking, by students and instructor in the web-conferencing platform used in a graduate-level online course. In this paper Earnshaw seeks to document and classify the kinds of conversational repairs that occur in synchronous online learning contexts. The analysis reveals that the chat portion of the conferencing system serves as a support for audio based turn-taking when technical difficulties arise, and that the instructor plays an important role in facilitating the flow of synchronous discourse when there are such difficulties. These results have practical significance for preparing faculty to teach in online settings. The study suggests that faculty need to master the use of at least two channels of synchronous communication to be effective in this format, that ground rules for synchronous communication may improve efficiency, and that more research in different synchronous contexts is needed.

In the final paper in this section Kristian Spring and Charles Graham of Brigham Young University analyze the most frequently cited themes, research processes, practices, terminology, and foci that have emerged in global research on blended learning. Building on prior studies highlighting similar questions of North American scholars, this work extends this previous line of inquiry. In so doing the authors explore the contexts, methods, and focus of the most impactful BL research conversations taking place globally. The authors find that learner outcomes and instructional design are the most common themes and provide a more nuanced portrayal of these and other results. Findings here provide a foundation for future researchers seeking to design studies that go beyond description and which seek deeper explanation as a research goal.

We hope that these articles and the issue as a whole are helpful to online instructors, instructional designers, administrators, and researchers seeking to understand and improve the quality of online and blended learning. As always, we encourage you to read, share, and cite these articles in your own work.

Introduction to Section II

Student Predisposition to Instructor Feedback and Perceptions of Teaching Presence Predict Motivation Toward Online Courses

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Abstract

Much research into college student motivation focuses on traditional face-to-face (FtF) classroom settings. Building from previous research in Feedback Intervention Theory (Kluger & DeNisi, 1996) and the Community of Inquiry framework (Anderson, Rourke, Garrison, & Archer, 2001; Garrison, Anderson, & Archer, 1999), this study sought to identify predictors of student motivation toward online courses. Results from a hierarchical multiple regression, using data from 190 online undergraduate students, suggest that student predisposition to receiving instructor feedback and student perceptions of teaching presence provide strong prediction of student motivation toward online courses. However, perceptions of teaching presence did not predict motivation in the hypothesized direction. These findings support the notion that the online learning environment offers its own unique set of challenges and opportunities, and warrants continued empirical research beyond comparisons to FtF classroom settings.

Keywords: Instructor feedback, teaching presence, student motivation, online courses, instructor-student communication

Cole, A. W.; Allen, M.; Anderson, C.; Bunton, T.; Cherney, M. R.; Draeger, Jr., R.; Featherston, M.; Fisher, V. C.; Motel, L.; Nicolini, K. M. & Peck, B. (2017). Student predisposition to instructor feedback and perceptions of teaching presence predict motivation toward online courses. *Online Learning, 21*(4), 245-262. doi: [DOI]

Student Predisposition to Instructor Feedback and Perceptions of Teaching Presence Predict Motivation Toward Online Courses

As increasing numbers of students enroll in online courses (Allen & Seaman, 2015; U.S. Department of Education, 2014), much academic discussion contrasts positive and negative aspects of online teaching and learning. New online course delivery methods such as Massively Open Online Courses (MOOCs) appear and generate additional widespread debate before a body of empirical research is conducted (Cole & Timmerman, 2015). In order to maximize positive student outcomes, strategies and philosophies toward course design, and facilitation, must be evaluated and updated with findings gained from empirical testing. Less research focuses on student experiences in online courses than face-to-face (FtF) courses (Otter et al., 2013). Solely critiquing online courses, particularly on how they are perceived to fall short of traditional FtF learning experiences, offers little in the way of promoting positive student outcomes for those students enrolling in online courses. Rather, research focused on identifying specific predictors of positive student affect online is warranted on determining how to maximize student outcomes for those enrolled in online courses.

Without question online teaching and learning represents a change in the instructional context from the traditional FtF classroom. In online courses, mediated communication provides the primary means for student-instructor communication, and reflects a potentially novel computer-mediated student-instructor relationship (Sherblom, 2010). Further, the way in which students perceive current online instructors may well relate to how they perceive online courses. Though student-instructor communication takes place differently online than FtF, perceptions of instructor communication appear related to student outcomes regardless of modality (Cole, 2016; Hazel, Crandall, & Caputo, 2014). Previous research (Cole, Kim, & Priddis, 2015) even suggests that how students perceive the online student-instructor relationship may predict student likelihood to enroll in another online course. The current study examined the predictive influence of students' predispositions to instructor feedback and perceptions of teaching presence, in a current online course, on student motivation toward online courses. The findings from this research provide a basis for future inquiry into online course communication as well as student motivation in online courses.

Online Course Structure

Much as in traditional FtF courses, students beginning online courses must acclimate to the instructor, course content, and other students in the class. However, students in online courses must also adapt to the online course design and interface (e.g., the course management system; CMS). Though the "digital natives" notion toward student technology use and learning lacks full empirical support (Thompson, 2013), generational stereotypes that current college students are intrinsically comfortable, and competent, with using technology in learning continue to circulate throughout colleges and universities. Such stereotypes can serve to underplay the challenges that many students face when taking an online course for the first time. Many students may be uncomfortable with some technology, and also simply prefer the FtF modality when given the option. Several studies suggest that students, in general, appear to prefer FtF communication, and the traditional FtF modality (Allen, Bourhis, Burrell, & Mabry 2002; Cole, 2016; Morreale, Staley, Stavrositu, & Krakowiak, 2015). Even for students comfortable with technology, online courses, and the corresponding computer-mediated student-instructor relationships, may simply not be a first choice in their education.

Online course structures may represent one reason that students may prefer traditional FtF courses. In FtF courses, students and instructors have no option but to synchronously interact with each other beginning on the first day of class. These first day FtF interactions may well set communication expectations for the class for the entire semester (Haleta, 1996). Conversely, in online courses, students are likely to “attend” the first “class meeting,” asynchronously through technology like a CMS, at any point during the first week of classes, and perhaps even later. As long as a course is facilitated 100% online (e.g., not a “hybrid” or “blended” course that also implements FtF interactions in a traditional classroom setting), any synchronous instructor-student communication takes place through a mediated channel (i.e., web conferencing software). As the online course structure requires students and instructors largely to communicate asynchronously, expectations for communication, and therefore the class communication climate, likely develops differently online than FtF (Mandernach, Gonzales, & Garrett, 2006). Further, online course structures that allow students to complete mastery-based tasks at their own pace, with little peer-to-peer interaction (see Reddy et al., 2013) further complicate traditional notions of class meetings, attendance, and communication in online courses.

Not only does the online course structure challenge many students, but many instructors find the course structure challenging as well. Preparing and delivering an online course often takes instructors, especially instructors new to teaching online, longer than preparing a comparable FtF course (Bolliger & Wasilik, 2009). Online instructors often lay out course schedules, complete with learning activities, for the entire semester in advance so that students can view the course structure, expectations, and assignments beginning on the first day of class. As a result, the rigid structure and asynchronous communication often prevents the opportunity to immediately change course direction based on student input (Easton, 2003). Aside from preparation and design issues, many online instructors may struggle in adapting instructional identities, fashioned FtF, to computer-mediated communication and online courses (Anderson et al., 2001; Easton, 2003; Sherblom, 2010).

The challenges faced by students and instructors in online courses described above underscore how simply contrasting positive and negative aspects of online courses with FtF courses does little to assist those currently learning and teaching in the modality. Not only are students and instructors both challenged by the modality, but they might not even conceptualize online course expectations in the same way. Some previous research suggests that students and instructors perceive online courses differently, with students viewing the online course format as more student self-directed and autonomous than their instructors do (Otter et al., 2013). Research that aids in better understanding how students perceive their online instructors (i.e., “teaching presence”) can potentially help address some of the challenges and obstacles associated with online learning from the student perspective.

Teaching Presence

The teaching presence construct arises from the Community of Inquiry framework for online learning (CoI; Anderson et al., 2001; Garrison, Anderson, & Archer, 1999). In the CoI framework, teaching presence represents one dimension of presence, along with cognitive presence and social presence (Anderson et al., 2001; Garrison, Anderson, & Archer, 1999; Garrison, Cleveland-Innes, & Fung, 2010; Vaughan, Cleveland-Innes, & Garrison, 2013). Though the terms “teaching presence” and “social presence” are often used interchangeably, the CoI framework distinguishes *teaching presence* as focused on student perceptions of online instructor communication and course direction. Conversely, *social presence* recognizes a larger social environment present within an online course. Unlike teaching presence, social presence includes how online student communication behaviors contribute to creating a positive learning environment in an online course.

According to Anderson et al. (2001), students perceive teaching presence through course design, which largely takes place before the course begins, and how the instructor guides student discussion on course material throughout the semester. Shea, Li, and Pickett (2006) developed a teaching presence scale based on Anderson et al.'s notion of teaching presence and found two distinct components. The researchers calculated that the two dimensions of "instructional design and organization," and "directed facilitation" (p. 181) accounted for 78% of the variance in the teaching presence construct. Shea et al.'s quantitative findings compliment findings from previous qualitative research by Easton (2003) suggesting that online instructors serve as course designers and learning facilitators. Thus, student motivation toward online courses may be positively influenced by online instructors who can design an environment that clearly and competently communicates course expectations, as well as instructors who can effectively guide and moderate student discussion on the course material. Given the challenges of the online course structure, and the potential for teaching presence to influence student motivation, another area of interest therefore becomes how online instructor feedback can influence student motivation toward online courses.

Student Predisposition to Instructor Feedback

Teaching presence relates to student perceptions of specific instructors and specific courses. Therefore, a student's perception of instructor teaching presence could, and likely would, vary between instructors and courses. Conversely, student predisposition toward instructor feedback represents a more generalized student affective response which likely varies little instructor-to-instructor. Instructor feedback assesses student performance on learning activities, and provides guidance on how students can improve for future performance. Previous research suggests that students vary in receptiveness to corrective instructor feedback, making giving and receiving feedback a challenging process for instructors and students alike (King, Schrodt, & Weisel, 2009; Malachowski, Martin, & Vallade, 2013; Robinson, Pope, & Holyoak, 2013; Smith & King, 2004). Some students may respond to corrective instructor feedback by feeling motivated to improve future performance, while others may discount the feedback through avenues such as questioning the instructor's grading practices (Malachowski et al., 2013), or even perform worse in future performance (King, 2016).

The use of nonverbal behaviors, such as eye contact, is not typically feasible in most online course formats, given the particulars of the communication channel. Though online instructors may often engage in mediated nonverbal immediacy behaviors, such as using text-based "smiley faces," students may never look at the instructor's feedback on a specific assignment, beyond seeing a grade for the assignment in the CMS. As the type of asynchronous computer-mediated communication prevalent in online courses largely lacks the ability to accommodate instructor nonverbal immediacy behaviors in the same way as FtF (Pratt et al., 1999; Sherblom, 2010), students may not perceive instructor attempts at face-threat management in the feedback they receive in online courses. Students could even perceive clear, directive feedback as more face-threatening when received online than FtF, as instructors have less opportunity to visibly and skillfully incorporate face-mitigating techniques (King, Schrodt, & Weisel, 2009; Kerssen-Griep & Witt, 2012; Trees, Kerssen-Griep, & Hess, 2009). Though some research suggests that students appreciate clear and direct instructor communication regardless of course modality (Poulos &

Mahony, 2008; Sheridan & Kelly, 2010), clear instructional feedback may not be enough to motivate students to engage the course material (Bolkan, Goodboy, & Kelsey, 2016). Therefore, further research examining how student predisposition toward instructor feedback could influence student affect toward online courses is necessary.

Instructor corrective feedback provides students with an assessment of the student's current mastery of course competencies, and guidance for improving future performance, but also may represent one of the primary means of instructor-student communication in online courses. As previous research suggests that instructor feedback directly relates to student motivation in a course (Dennen, 2005; Hosler & Arend; 2012), research specifically examining the predictive influence of student predisposition to instructor feedback on motivation toward online courses is warranted. The current research builds from Feedback Intervention Theory (FIT; Kluger & DeNisi, 1996). FIT suggests that corrective feedback may increase or decrease subsequent performance depending on message content and context. Kluger and DeNisi conducted a meta-analysis on feedback interventions (FIs), situations where feedback served to guide future performance. The researchers found general support for a positive relationship between corrective feedback and performance. However, the researchers also found that when feedback messages focused on specific areas where participants fell short of expectations (labeled "feedback-standard gaps"*),* corrective feedback actually decreased later performance. In addition to providing guidance on course content, instructor feedback may serve as a means of developing rapport between students and instructors in online courses (Frisby, Limperos, Record, Downs, & Kerscmar, 2013). As student-instructor communication generally appears to serve a relationship function (Frymier & Houser, 2000; Morgan & Manusov, 2009), findings testing FIT may suggest that how students generally react to corrective instructor feedback may also predict motivation toward online courses.

Student perceptions of, and predispositions to, instructor feedback appear rooted in several different modes through which students process feedback. Further developing FIT for educational applications, King et al., (2009) divided student perceptions of feedback into four categories: retention, confidentiality, sensitivity, and utility. The first category, retention, describes the degree to which students remember the specific content of the instructor's feedback. The second category, confidentiality, describes the degree of privacy maintained for the feedback message between the instructor and student (i.e., whether the feedback was delivered in front of other students). The third category, sensitivity, describes how open students are toward receiving, and accepting, corrective feedback. The final category, utility, describes the degree to which students perceive the feedback as helpful going forward. As King et al.'s four feedback categories were tested in traditional FtF classroom settings, research is necessary to determine whether the same categories carry over to online courses.

As students can perceive instructor feedback as face-threatening (King et al., 2009; Trees et al., 2009), corrective feedback as primary means of instructor-student communication in online courses may present an obstacle to instructor-student relational development (Frymier & Houser, 2000). To that end, the current study examines whether student predisposition to instructor feedback predicts student motivation toward online courses.

Motivation

The current study examines whether student perceptions of teaching presence in current online courses and predisposition to instructor feedback predict student motivation toward online courses. Student motivation, as operationalized in the traditional FtF context, generally consists of two components: trait motivation, and state motivation. Trait motivation represents a general motivation toward learning; while state motivation represents motivation toward a specific course (Brophy, 1983). In one study, Christophel (1990) studied the relationship between instructor verbal and nonverbal immediacy and student motivation toward specific FtF courses (e.g., state motivation). Christophel concluded that, even though students may enter a course with varying levels of trait motivation, instructors' communication behaviors (ex. nonverbal immediacy behaviors) influence students' motivation toward the specific course. These findings were later reinforced through Christophel and Gorham's (1995) study, which found that perceptions of instructors' verbal immediacy strongly influenced students' state motivation. Christophel and Gorham therefore suggest that student trait motivation is viewed largely by students as dependent on the student, however state motivation appears to be viewed by students as largely dependent on the instructor.

Little prior research examines predictors of affective student variables, like motivation, in online courses. The role of motivation, as an affective learning outcome, potentially serves an important role in understanding effectiveness in generating educational outcomes (Allen, Witt, & Wheeless, 2006; Allen, Mabry, Mattrey, Bourhis, Titsworth, & Burrell, 2004). Allen et al.'s (2006) meta-analysis testing a causal model found that higher instructor immediacy predicted affective learning, which predicted higher cognitive learning in FtF courses. Further research in FtF courses on student motivation supports the notion that students' perceptions of the instructor's communication behaviors can influence students' motivation in a course (Christophel & Gorham, 1995; Frymier & Houser, 2000; Martin, Chesebro, & Mottet, 1997). However, research is necessary to identify predictors of affective student outcomes online as well.

Study Hypotheses

Anderson et al., (2001) suggest that how instructors communicate online can influence student motivation. Further, how students perceive the online instructor-student relationship appears to predict whether they would report intention to enroll in another online course (Cole, Kim, & Priddis, 2015). The current study considered student predisposition toward instructor feedback and perceptions of teaching presence as potential predictors of student motivation toward online courses.

The first study hypothesis considers the predictive influence of individual online course experiences on student motivation toward online courses more generally. Previous research suggests that student motivation FtF may be modifiable by instructor communication behaviors (Allen et al., 2006; Christophel, 1990; Christophel & Gorham, 1995). Teaching presence (Anderson et al., 2001; Garrison et al., 1999; Shea et al., 2006) offers an avenue to measure students' perceptions of instructor communication behavior in online courses. Student online courses experiences, and perceptions of online instructors, may carry over motivation toward online courses more generally. Therefore, the first hypothesis predicts that higher levels of student perceived teaching presence in current online courses will predict higher student motivation toward online courses more generally.

H1: Students who perceive higher levels of teaching presence in current online courses will demonstrate higher levels of motivation toward online courses more generally.

The second study hypothesis considers the predictive influence of a more generalized student trait on student motivation toward online courses. In line with FIT (Kluger & DeNisi, 1996), instructor feedback could potentially decrease student motivation depending on how students react to the feedback. Additionally, online courses do not offer the same means for instructors to personally deliver corrective feedback, which may lessen face-threats to students (Kerssen-Griep & Witt, 2012; King et al., 2009; Trees et al., 2009). Therefore, the second hypothesis predicts that students who react negatively to instructor feedback will be less motivated toward online courses.

H2: Students who react negatively to instructor feedback will demonstrate lower levels of motivation toward online courses.

Methods

Participants and Procedures

Following IRB approval, participants for the study were recruited from a large, urban, public university through online undergraduate communication courses. The university offers multiple degree completion programs online, including the communication major. However, students attending the university could enroll in online communication courses even if not participating in online degree programs. The study data were collected utilizing the Qualtrics online survey instrument. The online survey instrument was used so that participants not enrolled in any FtF courses, and who might not ever physically attend campus, could still take part in the research study. Some students received a small amount of extra credit for taking part in the study, dependent on the course instructor who advertised the study. No additional incentives for participation in the research were offered by the researchers.

Given the study design, it was necessary for participants to report on a specific course for the teaching presence measure. Plax, Kearney, McCrosky, and Richmond's (1986) approach where students complete measures based on the most recent class they attended was modified for the online context, so that students reported on the specific online course through which they received the study link. However, it was necessary to ensure students that their answers would not influence their relationships with their instructors, and/or their grades in the course. Students were therefore informed at the beginning of the survey that they would not be identified with their responses, and their current instructors would not have access to their specific responses.

The total number of participants who took part in the study was 190. Females made up the majority of the sample (n = 100). The sample participants included students at all educational levels: freshman (n = 13); sophomore (n = 44); junior (n = 52); seniors (n = 64), with 17 participants not reporting a college year. The majority of the sample (n = 135) reported traditional college ages between 18-25, with 26 students reporting ages between 26-35, 11 students reporting ages between 36-45, and one student reporting an age of 45 or older.

Measures

The online survey consisted of 65 items. The primary constructs of interest for the current study were student predisposition toward instructor feedback, perceptions of teaching presence in a current course, and motivation toward online courses. As described above, participants first reported on perceptions of teaching presence in the specific online course in which they received the online survey link. Participants then reported on general motivation toward online courses. Participants then reported on how they generally feel about receiving feedback from teachers. Finally, participants provided background information for use as covariates in the regression models, including age, sex, employment status, distance from campus, and reasons for taking online courses.

The online survey also included several items to better gain insight into the online students in the sample. The majority of participants had taken two or three online courses (n = 56), with 39 students reporting the current course as the first online course they had taken. The majority of participants were full-time students (n = 146). Roughly 80% of students in the sample reported working while in school, either part-time (n = 92) or full-time (n = 48). Participants also reported reasons for taking online courses. The two most popular reasons for taking an online course were the convenience (n = 58), and ability to fit work schedules (n = 54). Finally, participants were asked how far away (in miles) they lived from campus. Reported distance to campus ranged from zero miles to 188 miles (M = 24.84, Mdn = 15, SD = 32.85). A total of 170 participants completed all of the necessary items to be included in the data for statistical analysis (N = 170).

Teaching presence. Teaching presence was measured using Shea et al.'s (2006) 17-item instructor teaching presence scale (TPS). The TPS was developed from Anderson et al.'s (2001) CoI framework, and measures two dimensions: instructional design/organization, and directed facilitation. In Shea et al.'s study, Cronbach's α reliability was reported as 0.97 for instructional design and organization, and 0.93 for directed facilitation. Participants ranked the teaching presence items on a Likert-type scale (*1 = strongly disagree, 5 = strongly agree*).

Motivation. Student motivation toward online courses was measured using Christophel's (1990) 12-item bi-polar Trait/State Motivation Scale (TSMS). The semantic differential type scale asked participants to select (on a scale of 1 to 7) the word that best described their feeling toward online courses (ex. Motivated-Unmotivated). For the three tests of the scale in Christophel's study, reliabilities for trait motivation ranged from 0.91 to 0.93, and reliabilities for state motivation ranged from 0.95 to 0.96. Since the focus in the current study was on student motivation toward online courses, the TSMS was used as a measure of student motivation toward online courses.

Instructor feedback. Student response to instructor feedback was measured using King et al.'s (2009) 27-item Instructional Feedback Orientation Scale (IFOS). The IFOS measures four dimensions of students' predisposition toward instructor feedback: retention, confidentiality, sensitivity, and utility. In King et al.'s validity study of the IFOS, α reliability was reported as 0.69 for retention, 0.74 for confidentiality, 0.86 for sensitivity, and 0.85 for utility. Continued support for the instrument in the FtF context appears in King's (2016) study on student perceptions of instructor feedback on student speeches.

Preliminary Analysis

For each of the scale variables, procedures related to examination of the factor structure of a scale were used to compare the expected correlation matrix, generated on the basis of the theoretical measurement model, to the observed matrix generated by the actual data (Nunnally & Bernstein, 1994; Hunter, 1973; Hunter & Cohen, 1969; Levine & McCroskey, 1990).

A confirmatory factor analysis was calculated on the teaching presence items examining the two dimensions identified by Shea et al. (2006): instructional design/organization, and directed facilitation. In both cases, the fit statistics for the CFA suggested a weak model fit. Therefore, an exploratory factor analysis was calculated using Principal Axis Factoring (PAF) to provide insight into why the CFA models did not fit the data. The use of PAF suggested a clear one-factor solution for teaching presence that accounted for approximately 68% of the variance (EV = 11.56). The current data for the teaching presence construct indicates a best fit using a single factor model for the items, with a high reliability (α = .97, *M* = 71.26, *SD* = 13.86). Contrary to Shea et al.'s two factor representation of instructor teaching presence, the best representation in the current data involves the use of a single factor, or a unidimensional representation of the available data.

A confirmatory factor analysis was calculated on the motivation items. Despite expectations for a single factor solution, fit statistics for the CFA on the motivation items suggested a weak model fit. Again, an exploratory factor analysis was calculated using PAF to determine why the CFA models did not fit the data. The use of PAF suggested two potential factors, however one item cross-loaded weakly onto both factors (i.e., Unchallenged:Challenged). Examination of correlations between items suggested that the item could potentially be negatively impacting the scale, and removal of the item resulted in improved internal reliability (α = .93, *M* = 36.01, *SD* = 13.24). Re-calculating the factor analysis, using PAF, resulted in a clear single factor that accounted for approximately 69% of the variance (*EV* = 6.50).

Finally, a series of confirmatory factor analyses were calculated on the instructor feedback items. Examination of fit statistics suggested that none of the four factors identified by King et al. (2009) (e.g., utility, sensitivity, confidentiality, retention) demonstrated acceptable fit. As with teaching presence and motivation, an exploratory factor analysis was then calculated, using PAF, to better understand why the CFA models did not adequately fit the data. Examination of the scree plot suggested a clear diminishing return after the third factor, however the items in the third factor were relatively weak and/or cross-loaded onto the second factor. With weakly loaded items removed, the PAF on the instructor feedback items found two subscales; one concerned with feedback valence (the degree of positive and negative focus of the feedback, α = .96, *M* = 35.85, *SD* = 6.04) and one concerned with emotionality (the impact of the message on student feelings, α =.93, *M* = 31.74, *SD* = 7.71). Therefore, contrary to previous research utilizing four dimensions, the current data utilizes a two factor representation of student predisposition to instructor feedback.

Statistical Analysis

Correlations were calculated for continuous variables, and appear in Table 1. A hierarchical multiple regression was calculated using the enter method to test the study hypotheses (Table 2). To better isolate the impact of the variables of interest, three models, consisting of two blocks of covariates and a third block of the variables of interest, were calculated. Student demographic covariates (age, sex) were entered in the first block. A second block included covariates relating to students' college careers; specifically, potential antecedents for enrolling in online courses, and previous experience with online courses. Finally, the third block of the hierarchical multiple regression included the constructs of interest: teaching presence, and the two instructor feedback variables (valence and emotionality). Given the number of predictors in the hierarchical multiple regression models, the sample provided appropriate power to identify medium to large effect sizes at α = .01 (Cohen, 1992).

Variables	1	2	3	4	5	6	7
1. Age							
2. College Year	.05						
3. Distance	.30**	-.00					
4. Online Courses	.34**	.40**	.21*				
5. Presence	.06	-.19*	.00	-.01			
6. Motivation	-.28**	.07	-.15	-.15	-.33**		
7. Feedback Valence	.06	-.02	.05	.05	.29**	-.13	
8. Feedback Emotion	.15*	.05	.00	.09	.13	-.29**	.28**

Table 1. Correlation Matrix
*Notes: *p < .05. **p < .01.*

	Model 1			Model 2			Model 3		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
Sex	-0.04	0.18	-.02	0.01	0.18	0.01	0.04	0.16	0.02
Age	-0.42	0.13	-.29**	-0.24	0.16	-0.17	-0.21	0.14	-0.15
Employment				-0.06	0.14	-0.04	-0.12	0.12	-0.08
Student Status				0.37	0.26	0.15	0.10	0.23	0.04
College Year				0.16	0.10	0.16	0.11	0.09	0.11
Distance				0.00	0.00	-0.02	-0.00	0.00	-0.06
Online Courses				-0.14	0.09	-0.15	-0.10	0.08	-0.11
Presence							-0.36	0.08	-0.38**
Feedback V							0.02	0.08	0.02
Feedback E							-0.25	0.08	-0.26**
ΔR^2		0.06			0.09			0.29	
F for change in R^2		5.16**			1.43			11.53**	

Table 2. Hierarchical Regression Analysis Predicting Student Motivation toward Online Courses (N = 170)
Notes: Employment = employment status. Student status = part-time or full-time student. Distance = distance from campus
(in miles). Online courses = number of online courses taken. Presence = Z-standardized teaching presence variable. Feedback V
= Z-standardized feedback valence variable. Feedback E = Z-standardized feedback emotionality variable. **p* < .05. ***p* < .01.

Results

Both study hypotheses were tested through calculating a hierarchical multiple regression consisting of three blocks (Table 2). Controlling for the influence of the covariates in the first two blocks, the hierarchical multiple regression produced a significant model including the feedback variables and teaching presence, $F(10, 105) = 5.74$, $p < .001$, $R^2 = .29$. VIF statistics for the model were all within acceptable ranges, indicating no significant issues with multicollinearity. Hierarchical multiple regression results provided mixed support for the study hypotheses.

First, *H1* predicted that higher levels of teaching presence in current online courses would predict higher student motivation toward online courses more generally. A relationship between perceptions of teaching presence in current courses and motivation toward online courses was identified in the current data. However, contrary to expectations, teaching presence significantly, negatively predicted student motivation toward online courses ($\beta = -.38$, $t\ (105) = -4.63$, $p < .01$, 95% CI [-.52, -.21]). The current data therefore suggests that higher levels of perceived teaching presence in a current online course significantly, negatively predict student motivation toward online courses. Though a significant relationship between teaching presence and student motivation in online courses was identified, the predictive influence did not occur in the hypothesized direction. Therefore, the observation that teaching presence negatively predicted student motivation fails to support *H1*.

Second, *H2* predicted that negative student predispositions to instructor feedback would decrease student motivation toward online courses. Results from the hierarchical multiple regression identified feedback emotionality ($\beta = -.26$, $t\ (105) = -3.13$, $p < .01$, 95% CI [-.41, -.09]) as a negative predictor of student motivation toward online courses. Therefore, the greater degree to which students react negatively emotionally to instructor feedback, the less motivated they appear toward online courses. As negative emotional student predisposition to instructor feedback predicted lower motivation toward online courses, *H2* was supported.

Discussion

The current data suggest that perception of teaching presence and negative student emotional predisposition toward instructor feedback significantly, negatively predicts student motivation toward online courses. Though these findings are described below, it is again worth noting that the primary measures used on the constructs of interest (e.g., teaching presence, motivation, and predisposition to instructor feedback) did not fit neatly into pre-existing conceptualizations of these constructs noted in previous research. Teaching presence (Shea et al., 2006) loaded onto a single factor, rather than two. Motivation (Christophel, 1990) did not load cleanly onto a single factor until an item relating to "challenge" was removed. A number of items on the predisposition to instructor feedback measure did not load, or weakly cross-loaded on multiple factors, causing two factors to neatly emerge rather than the four identified by King et al. (2009). Despite these initial measurement issues, statistical analysis on the current data suggest that student predisposition to receiving instructor feedback and student perceptions of teaching presence provide strong prediction of student motivation toward online courses.

The significant, negative relationship between teaching presence and motivation directly contradicted *H1*. However, understanding of this finding may be found in the different perspectives that students and instructors may bring to online courses (Otter et al., 2013). Given the multitude of challenges involved with online teaching and learning (Bolliger & Wasilik, 2009; Sherblom, 2010), many instructors teaching online may strive to replicate what they do in traditional FtF course settings as closely as possible in their online courses. Attempting to replicate the FtF classroom in the online learning environment thus likely involves using a variety of different communication channels (e.g., audio, video) in hopes to increase the “richness" of the communication experience in the course. According to Media Richness Theory (MRT; Daft & Lengel, 1986; Daft, Lengel, & Trevino, 1987), messages containing complex information are best suited to “rich” mediums, where verbal and nonverbal messages are simultaneously exchanged by communicators, as found FtF. Such an approach toward designing and facilitating an online course likely intuitively makes sense to instructors, as the course material would seem to reflect MRT’s notion of complex information that would warrant a rich medium in order to be effectively sent and received. However, some previous research (Allen et al., 2004) suggests that using as many channels as possible, in attempt to re-create the traditional FtF classroom as closely as possible online, might not increase student satisfaction with the modality. As Feaster (2010) suggests, having multiple channels available can potentially influence an interaction, but ultimately, individuals’ preferences, and actual use of the channels, may determine the result. Rather than focusing on the number of channels used, or the perceived richness of the channels used, in an online course, perhaps the focus should shift toward whether students are satisfied with the communication they receive from the instructor, regardless of the channel(s) used. Given the results of the current study, it is possible that many students taking online courses may *not* desire an online course structure that attempts to replicate the FtF class experience. These students might, therefore, not actually desire more “richness,” and may be perfectly satisfied with less rich communication between students and instructors.

A desire to “opt out” of the traditional FtF class experience, for any number of personal reasons, could form the basis for why some students enroll in an online course in the first place. For these students, any attempts to replicate the FtF class environment could potentially serve to decrease motivation. Relatedly, perceptions of teaching presence may actually be counter-productive to student motivation for students who may not conceptualize the student-instructor relationship the same online as FtF, nor wish a similar student-instructor interpersonal relationship (Frymier & Houser, 2000). In light of previous research on student-instructor power relationships online (Cole et al., 2015) aspects of teaching presence that reflect instructor control over the course may especially decrease student motivation. Therefore, instructor communication behaviors focused on direction and clarity (Poulos & Mahony, 2008; Sheridan & Kelly, 2010), no matter how well intentioned, may ultimately serve to decrease student motivation toward online courses. Students may begin an online course believing that the online course format allows them the autonomy and ability to explore concepts on their own, without the constraints of a FtF class experience (Otter et al., 2013). For these students, online course design structures and communication behaviors put into place by a well-meaning instructor to increase teaching presence could actually result in decreased motivation toward online courses more generally. The persistence of external constraints on their learning online may make them feel less independent and autonomous in online courses than they had hoped. Highly structured online course design and direct, clear online instructor communication may reinforce student perceptions of instructor control, as well as contradict *a priori* expectations of student autonomy online with new perceptions of dependency on the instructor to pass the course. If some students “opt in” to online courses because they actually prefer less “richness,” and perhaps a less distinct student-instructor relationship, it might no longer be particularly surprising that the current results did not suggest a significant difference between the instructor as course designer and the instructor as a guide to discussion on the course content. Likewise, it may no longer be surprising that these students would feel less motivated toward online courses more generally, if their perceptions of what an online course should be are not met in a current online course.

Issues relating to perceptions of student autonomy may be reflected in the student predisposition to instructor feedback results as well. As hypothesized, student predisposition toward instructor feedback significantly, negatively predicted student motivation toward online courses in the current study. As instructor feedback can potentially be face-threatening and de-motivating FtF (Kerssen-Griep & Witt, 2012; Malachowski et al., 2013; Trees et al., 2009), replicating such findings in the less nonverbally rich online course context (Pratt et al., 1999; Sherblom, 2010) should be expected. Again, a specific focus on clarity in communication in the online course context (Poulos & Mahony, 2008; Sheridan & Kelly, 2010), and the likely asynchronous delivery/receipt of online feedback, reduces opportunity for instructors to skillfully manage face-threats (Kerssen-Griep & Witt, 2012; Trees et al., 2009) while delivering online feedback to students. Such findings, though not necessarily surprising, are especially noteworthy given increasing student-instructor communication (including grades and feedback) taking place online through technology like a CMS, even in FtF courses (i.e., "tech enhanced" courses).

Finally, contrary to previous research using King et al.'s (2009) Instructional Feedback Orientation Scale (IFOS), factor analysis of the scale items in the current data identified two distinct subscales with high reliability; the degree of positive and negative focus of the feedback (i.e., valence) and student feelings following the feedback (i.e., emotionality). Only how students generally feel emotionally about instructor feedback significantly predicted motivation toward online courses. However, the significant correlation observed between feedback valence and emotionality warrants further consideration. Feedback emotionality may result as an outcome of feedback valence. Therefore, feedback valence may not directly influence student motivation toward online courses since the emotional state resultant from student appraisals of instructor feedback offers a more direct, predictive influence on a student affect variable like motivation.

Limitations & Future Directions

Results of the current study offer several avenues for future research. However, the current study has several limitations as well. Previous research suggests that increasing student motivation improves educational outcomes related to cognitive learning (Allen et al., 2006). One limitation of the current study involves the lack direct measures involving issues relating to cognitive learning outcomes. Subsequent research should aim to include measures of cognitive learning, as well as direct measures on student performance outcomes such as grades and retention. Though not necessarily a separate outcome, better understanding student motivation online may become an important issue related to both student competence and student retention, both central concerns of educational institutions.

A further limitation of the current study concerns how long-term implications of the teaching presence construct on student motivation toward online courses long-term is inferred rather than examined directly. Measurement across the lifespan of a degree, with multiple instructors and many different courses, implies the influence of programmatic attempts to increase and maintain levels of motivation. Longitudinal research, examining the influence of the predictive variables identified in the current study across all courses, as well as courses in the degree program, could assess the prediction about whether or not perceptions of teaching presence (as well as the quality of student-instructor communication) contributes to degree completion.

Relatedly, as participants self-reported on the class from which they received the study survey for the teaching presence items, the content and course design of the online courses in this study where not held constant. Therefore, there was no variable that could capture the extent to which different types of media (e.g., instructor videos; interactive slides etc.) were utilized in the referenced online course. Future research may wish to attempt a controlled experimental design where the course material and course design is manipulated, in attempt to better capture any potential influences on a construct like teaching presence.

A final, related, limitation of the current study concerns the sample characteristics. The majority of participants represented traditional college ages. However, despite the large number of traditionally aged students, student age significantly predicted motivation toward online courses in the first hierarchical regression model. Perhaps, had nontraditionally aged students been more represented, student age would have maintained its predictive influence on motivation toward online. Future research could benefit from testing prediction on student motivation toward online courses focusing on specific populations of interest to online education, such as new traditionally aged college students (approximately 18-22 years old), new returning students older than 22 years old, and/or students enrolled in their first online courses at any level of their college careers. Examining these specific populations could provide more insight into population specific predictors, which could further inform potential online course, and program, attrition interventions.

Conclusion

The problematic issue identified in the current study, through issues of measurement and hypothesis testing, perhaps lies in the idea that online teaching and learning simply takes what is done in the traditional FtF classroom and translates it to the online learning environment. As student motivation appears linked to student performance (Bolkan et al., 2016) and the number of college students taking at least one online course continues to increase (Allen & Seaman, 2015), the need to better understand how to assist in motivating students in online courses continues to represent a major challenge worthy of continued research. Though many issues existing in FtF courses find a similar underlying set of considerations and applications in online courses, the online learning environment offers its own set of challenges, as well as opportunities. As meta-analyses comparing online and FtF learning established similar levels of cognitive learning and student satisfaction (Allen et al., 2002, Allen et al., 2004), the challenge for online instructors becomes how to best facilitate positive student outcomes. This research furthers that understanding by (1) supporting previous research in FIT (Kluger & DeNisi, 1996) by identifying negative emotional predisposition to instructor feedback as a significant negative predictor of student motivation toward online courses, and; (2) indicating that recognizing high levels of teaching presence in a current online course does not guarantee high student motivation toward online courses more generally.

References

Allen, I. E., & Seaman, J. (2015, February). *Grade level: Tracking online education in the United States.* Retrieved from http://onlinelearningconsortium.org/read/survey-reports-2014/

Allen, M., Bourhis, J., Burrell, N., & Mabry, E. (2002). Comparing student satisfaction with distance education to traditional classrooms in higher education: A meta-analysis. *The American Journal of Distance Education, 16,* 83-97. doi: 10.1207/S15389286AJDE1602_3

Allen, M., Mabry, E., Mattrey, M., Bourhis, J., Titsworth, S., & Burrell, N. (2004). Evaluating the effectiveness of distance learning: A comparison using meta-analysis. *Journal of Communication, 54,* 402-420. doi: 10.1111/j.1460-2466.2004.tb02636.x

Allen, M., Witt, P. L., & Wheeless, L. R. (2006). The role of teacher immediacy as a motivational factor in student learning: Using meta-analysis to test a causal model. *Communication Education, 55,* 21-31. doi: 10.1080/03634520500343368

Anderson, T., Rourke, L., Garrison, D. R., & Archer, W. (2001). Assessing teaching presence in a computer conferencing context. *Journal of Asynchronous Learning Networks, 5*(2), 1-17.

Bolkan, S., Goodboy, A. K., & Kelsey, D. M. (2016). Instructor clarity and student motivation: Academic performance as a product of students' ability and motivation to process instructional material. *Communication Education, 65,* 129-148. doi: 10.1080/03634523.2015.1079329

Bolliger, D. U., & Wasilik, O. (2009). Factors influencing faculty satisfaction with online teaching and learning in higher education. *Distance Education, 30*, 103-116. doi: 10.1080/01587910902845949

Brophy, J. (1983). Conceptualizing student motivation. *Educational Psychologist, 18,* 200-215. doi: 10.1080/00461528309529274

Christophel, D. M. (1990). The relationships among teacher immediacy behaviors, student motivation, and learning. *Communication Education, 39,* 323-340. doi: 10.1080/03634529009378813

Christophel, D. M., & Gorham, J. (1995). A test-retest analysis of student motivation, teacher immediacy, and perceived sources of motivation and demotivation in college classes. *Communication Education, 44,* 292-306. doi: 10.1080/03634529509379020

Cohen, J. (1992). A power primer. *Psychological Bulletin, 112,* 155-159. doi: 10.1037/0033-2909.112.1.155

Cole, A. W. (2016). Testing the impact of student preference for face-to-face communication on online course satisfaction. *Western Journal of Communication, 80,* 619-637. doi:10.1080/10570314.2016.1186824

Cole, A. W., Kim, S. –Y., & Priddis, D. (2015). Examining the relationship between students' perceptions of instructor communication of power online and student online course endorsement. *Pennsylvania Communication Annual, 71,* 11-36.

Cole, A. W., & Timmerman, C. E. (2015). What do current college students think about MOOCs? *MERLOT Journal of Online Learning and Teaching, 11,* 188-201.

Daft, R. L., & Lengel, R. H. (1986). Organizational information requirements: Media richness and structural design. *Management Science, 32,* 554-571. doi:10.1287/mnsc.32.5.554

Daft, R. L., Lengel, R. H., & Trevino, L. K. (1987). Message equivocality, media selection, and manager performance: Implications for information systems. *MIS Quarterly, 11,* 355-366. doi: 10.2307/248682

Dennen, V. P. (2005). From message posting to learning dialogues: Factors affecting learner participation in asynchronous discussion. *Distance Education, 26,* 127-148. doi: 10.1080/01587910500081376

Easton, S. S. (2003). Clarifying the instructor's role in online distance learning. *Communication Education, 52,* 87-105. doi: 10.1080/03634520302470

Feaster, J. (2010). Expanding the impression management model of communication channels: An information control scale. *Journal of Computer-Mediated Communication*, 16, 115–138. doi: 10.1111/j.1083-6101.2010.01535.x

Frisby, B., N., Limperos, A. M., Record, R. A., Downs, E., & Kerscmar, S. E. (2013). Students' perceptions of social presence: Rhetorical and relational goals across three mediated instructional designs. *MERLOT Journal of Online Learning and Teaching, 9,* 468-480.

Frymier, A. B., & Houser, M. L. (2000). The teacher-student relationship as an interpersonal relationship. *Communication Education, 49,* 207-219. doi: 10.1080/03634520009379209

Garrison, D. R., Anderson, T., & Archer, W. (1999). Critical inquiry in a text-based environment: Computer conferencing in higher education. *The Internet and Higher Education, 2,* 87-105. doi: 10.1016/s1096-7516(00)00016-6

Garrison, D. R., Cleveland-Innes, M., & Fung, T. S. (2010). Exploring causal relationships among teaching, cognitive and social presence: Student perceptions of the community of inquiry framework. *Internet and Higher Education, 13,* 31-36. doi: 10.1016/j.iheduc.2009.10.002

Haleta, L. L. (1996). Student perceptions of teachers' use of language: The effects of powerful and powerless language on impression formation and uncertainty. *Communication Education, 45,* 16-28. doi: 10.1080/03634529609379029

Hazel, M., Crandall, H. M., & Caputo, J. S. (2014). The influence of instructor social presence and student academic entitlement on teacher misbehaviors in online courses. *Southern Communication Journal, 79,* 311-326. doi: 10.1080/1041794X.2014.914563

Hosler, K. A., & Arend, B. D. (2012). The importance of course design, feedback, and facilitation: Student perceptions of the relationship between teaching presence and cognitive presence. *Educational Media International, 49,* 217-229. doi: 10.1080/09523987.2012.738014

Hunter, J. E. (1973). Methods of reordering the correlation matrix to facilitate visual inspection and preliminary cluster analysis. *Journal of Educational Measurement, 10*, 51-61. doi: 10.1111/j.1745-3984.1973.tb00782.x

Hunter, J. E., & Cohen, S. H. (1969). PACKAGE: A system of computer routines for the analysis of correlational data. *Educational and Psychological Measurement, 29*, 697-700. doi: 10.1177/001316446902900315

Kerssen-Griep, J., & Witt, P. L. (2012). Instructional feedback II: How do instructor immediacy cues and facework tactics interact to predict student motivation and fairness perceptions? *Communication Studies, 63,* 498-517. doi: 10.1080/10510974.2011.632660

King, P. E. (2016). When do students benefit from performance feedback? A test of feedback intervention theory in speaking improvement. *Communication Quarterly, 64,* 1-15. doi: 10.1080/01463373.2015.1078827

King, P. E., Schrodt, P., & Weisel, J. J. (2009). The instructional feedback orientation scale: Conceptualizing and validating a new measure for assessing perceptions of instructional feedback. *Communication Education, 58,* 235-261. doi: 10.1080/03634520802515705

Kluger, A. N., & DeNisi, A. (1996). The effects of feedback interventions on performance: A historical review, a meta-analysis, and a preliminary feedback intervention theory. *Psychological Bulletin, 119,* 254-284. doi: 10.1037/0033-2909.119.2.254

Levine, T. R., & McCroskey, J. C. (1990). Measuring trait communication apprehension: A test of rival measurement models of the PRCA-24. *Communication Monographs, 57*, 62-72. doi: 10.1080/03637759009376185

Malachowski, C. C., Martin, M. M., & Vallade, J. I. (2013). An examination of students' adaptation, aggression, and apprehension traits with their instructional feedback orientations. *Communication Education, 62,* 127-147. doi: 10.1080/03634523.2012.748208

Mandernach, B. J., Gonzales, R. M., & Garrett, A. L. (2006). An examination of online instructor presence via threaded discussion participation. *MERLOT Journal of Online Learning and Teaching, 4,* 248-260.

Martin, M. M., Chesebro, J. L., & Mottet, T. P. (1997). Students' perceptions of instructors' socio-communicative style and the influence on instructor credibility and situational motivation. *Communication Research Reports, 14,* 431-440. doi: 10.1080/08824099709388686

Morreale, S., Staley, C., Stavrositu, C., & Krakowiak, M. (2015). First-year college students' attitudes toward communication technologies and their perceptions of communication competence in the 21st century. *Communication Education, 64,* 107-131. doi: 10.1080/03634523.2014.978799

Nunnally, J.C., & Bernstein, I. H. (1994). *Psychometric theory* (3rd ed.). New York: McGraw-Hill.

Otter, R. R., Seipel, S. Graeff, T., Alexander, B., Boraiko, C., Gray, J., Petersen, & Sadler, K. (2013). Comparing student and faculty perceptions of online and traditional courses. *Internet and Higher Education, 19,* 27-35. doi: 10.1016/j.iheduc.2013.08.001

Plax, T. G., Kearney, P., McCroskey, J. C., & Richmond, V. P. (1986). Power in the classroom VI: Verbal control strategies, nonverbal immediacy and affective learning. *Communication Education, 35*, 43-55. doi: 10.1080/03634528609388318

Poulos, A., & Mahony, M. J. (2008). Effectiveness of feedback: The students' perspective. *Assessment & Evaluation in Higher Education, 33,* 143-154. doi: 10.1080/02602930601127869

Pratt, L., Wiseman, R. L., Cody, M. J., & Wendt, P. F. (1999). Interrogative strategies and information exchange in computer-mediated communication. *Communication Quarterly, 47,* 46-66. doi: /10.1080/01463379909370123

Reddy, D. M., Pfeiffer, H. M., Fleming, R., Ports, K. A., Pedrick, L. E., Barnack-Tavlaris, J. L., Jirovec, D. L., Helion, A. M., & Swain, R. A. (2013). "U-Pace" instruction: Improving student success by integrating content mastery and amplified assistance. *Journal of Asynchronous Learning Networks, 17,* 147-154.

Robinson, S., Pope, D., & Holyoak, L. (2013). Can we meet their expectations? Experiences and perceptions of feedback in first year undergraduate students. *Assessment & Evaluation in Higher Education, 38,* 260-272. doi: 10.1080/02602938.2011.629291

Shea, P., Li, C. S., & Pickett, A. (2006). A study of teaching presence and student sense of learning community in fully online and web-enhanced college courses. *Internet and Higher Education, 9,* 175-190. doi: 10.1016/j.iheduc.2006.06.005

Sherblom, J. C. (2010). The computer-mediated communication (CMC) classroom: A challenge of medium, presence, interaction, identity, and relationship. *Communication Education, 59,* 497-523. doi: 10.1080/03634523.2010.486440

Sheridan, K., & Kelly, M. A. (2010). The indicators of instructor presence that are important to students in online courses. *MERLOT Journal of Online Learning and Teaching, 6,* 767-779.

Smith, C. D., & King, P. E. (2004). Student feedback sensitivity and the efficacy of feedback interventions in public speaking performance improvement. *Communication Education, 53,* 203-216. doi: 10.1080/0363452042000265152

Thompson, P. (2013). The digital natives as learners: Technology use patterns and approaches to learning. *Computers & Education, 65,* 12-33. doi: 10.1016/j.compedu.2012.12.022

Trees, A. R., Kerssen-Griep, J., & Hess, J. (2009). Earning influence by communicating respect: Facework's contributions to effective instructional feedback. *Communication Education, 58,* 397-416. doi: 10.1080/03634520802613419

U.S. Department of Education. (2014). Enrollment in distance education courses, by state: Fall 2012 (NCES 2014-023). *National Center for Education Statistics*. Retrieved from http://nces.ed.gov/pubs2014/2014023.pdf

Vaughan, N. D., Cleveland-Innes, M., & Garrison, D. R. (2013). *Teaching in blended learning environments: Creating and sustaining communities of inquiry.* Edmonton, AB: AU Press, Athabasca University.

Examining the Characteristics and Content of Instructor Discussion Interaction upon Student Outcomes in an Online Course

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Abstract

Teaching presence facilitates students' social and cognitive presence in online courses. Instructor interaction in discussion forums, a widely adopted instructional strategy, establishes teaching presence but research on the optimal frequency and content of instructor interaction in discussion is underdeveloped. This research evaluated 1625 instructor posts in 36 graduate-level courses in education to determine their impact on students' perceptions of the quality of the instructor and course, students' perceptions of their learning, and students' actual achievement. Findings suggest the frequency of instructor interaction in discussion has no effect on student outcomes, but posts that are instructional improve students' perceptions of their learning, and posts that are conversational improve students' perceptions of instructor and course quality, and their actual academic achievement. Implications for instructors and policymakers are addressed.

Keywords: Online learning, instructional strategy, instructor engagement, Community of Inquiry, teaching presence, discussion, instructor interaction

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Examining the Characteristics and Content of Instructor Discussion Interaction upon Student Outcomes in an Online Course

The literature on distance education is unwavering about two conclusions: adult students should be in control of their own learning (Knowles, 1988; Merriam, Caffarella, & Baumgartner, 2007) but want their instructors to be engaged in their courses (Mazzolini & Maddison, 2007). What is not clear are the types, frequency, and characteristics of instructor engagement that result in the most significant student outcomes (Baran, Correia & Thompson, 2011; Kauffman, 2015; Means, Toyama, Murphy, Bakia & Jones, 2010). This research explored one common type of instructor engagement—interaction in discussion forums—to determine the extent to which frequency and contents of instructor discussion interaction impacted students' academic and satisfaction outcomes. Findings may inform policies regarding instructor engagement in online courses.

Theoretical Framework

In their highly regarded principles for good practice, Chickering and Gamson (1987) lauded the impact of interaction between the faculty and students, reciprocity and cooperation between students, and active learning of the content. Moore and Kearsley (1996) noted that three critical interactions must take place for students learning online: teacher-student interaction, student-student interaction, and student-content interaction. Similarly, Garrison, Anderson, and Archer (2000) suggested an online course becomes a Community of Inquiry (CoI) when students experience teaching presence, social presence, and cognitive presence that foster deep and meaningful learning. Teaching presence is “the design, facilitation, and direction of cognitive and social processes for the purpose of realizing personally meaningful and educationally worthwhile learning outcomes” (Anderson, Rourke, Garrison, & Archer, 2001, p. 5). Teaching presence is observable in content selection and format, facilitation of the designed course, and confirmation of understanding through assessment and feedback (Annand, 2011; Garrison et al., 2000). Social presence occurs when the student is able to “identify with a group, communicate purposefully in a trusting environment, and develop personal and affective relationships progressively by way of projecting their individual personalities” (Garrison, 2011, p. 23). Students experience social presence when they perceive they have projected their true self, socially and emotionally, into the learning environment (Garrison et al., 2000). Cognitive presence is “the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse in a critical community of inquiry” (Garrison, Anderson, & Archer, 2001, p. 11). The philosophical underpinning of the CoI framework aligns with the social-constructivist view that communication interaction of the teacher, student, and content is essential to learning (Akyol & Garrison, 2011).

Activities associated with teaching presence may have the most direct influence on students’ academic achievement (Rockinson-Szapkiw, Wendt, Wighting, & Nisbet, 2016). Instructor activities in an online course account for the most significant impact on student outcomes—higher than student-student interaction and student-content interaction (Marks, Sibley, & Arbaugh, 2005). Teaching presence through course design, content selection, discussion facilitation, direct instruction, communication and feedback directly contribute to students’ perceptions of support, perceptions of learning, and their final grades (Arbaugh, 2014; Whipp & Lorentz, 2009).

Students in an online course attain the highest levels of learning when there is structured interaction (Garrison & Cleveland-Innes, 2005). Teaching presence in the form of facilitating interaction is critical to positive student outcomes (Garrison & Cleveland-Innes, 2004).

> In fulfillment of this component of teaching presence, the teacher regularly reads and comments on student postings…modeling appropriate behaviors, commenting upon and encouraging student responses, drawing in the less active participants, and curtailing the effusive comments of those who tend to dominate the virtual space (Anderson, Rourke, Garrison & Archer, 2001, p. 7).

Instructors must take a leadership role in discussion to guide students to deep learning and knowledge construction (Garrison & Cleveland-Innes, 2005).

Teaching Presence and Online Discussion

The shifting role of the instructor to :guide on the side” should not mean the instructor takes a passive role (Marks et al., 2005). Student-centered, student-driven learning requires that the instructor assume the position of facilitator (Baran et al., 2011). “Facilitation is the facet of teaching presence that ensures that social presence is established among community members and, in turn, that cognitive processes are directed to personally meaningful and educationally worthwhile outcomes” (Vaughan, Cleveland-Innes, & Garrison, 2013).

Facilitation in the form of instructor interaction in discussion forums is a function of teaching presence, and largely acknowledged as an expected practice in teaching online courses (Davidson-Shivers, 2009; Mandernach, Gonzalez, & Garrett, 2006; Nandi, Hamilton, & Harland, 2012). Students desire instructor-led facilitation because the instructor is the content expert, can ensure the discussion stays focused on the content, is qualified to resolve conflict among students, and can motivate students to contribute to the discussion (Hew, 2015; Phirangee, Epp, & Hewitt, 2016; Tello, 2007). Students’ sense of community may be higher in discussions facilitated by their instructor than in discussions facilitated by peers (Phirangee et al., 2016).

While research suggests teaching presence as a construct or group of strategies has a strong influence on students’ outcomes, the literature is varied on the specific effect of instructor interaction in discussion forums on student achievement or satisfaction (Means et al., 2010). Cho and Tobias (2016) researched this problem using three sections of the same course taught by the same instructor. In one section there was no online discussion, in the second section an online discussion was present but only students interacted in the discussion, and in the third section an online discussion was present and both students and the instructor interacted. The researchers found students’ perception of social presence was higher in the two sections where discussion was present, but there was no difference in students’ perceptions of teaching presence or cognitive presence in any of the three sections. As well, they found no difference in students’ satisfaction or their grades among the three sections. Students were engaged in their courses and believed their instructor was present regardless of whether the instructor participated in discussion.

Research conducted by Tello (2007) revealed no relationship between the frequency of instructor interaction in discussion forums and students’ persistence in their online course. In a large study of 40,000 discussion posts and 375 students, Mazzolini and Maddison (2007) found a negative correlation between the frequency of instructor postings and student postings; the more prominent the instructor was in discussion, the less prominent the students were. As well, they found a negative correlation between the length of a discussion thread and instructor interaction; the more engaged the instructor was in discussion, the shorter the discussion threads. Students’ perceptions of the usefulness of discussion forums was not related to the frequency with which their instructor posted, nor was their satisfaction with the course. Despite that, survey data revealed students rated the enthusiasm and expertise of the instructor more highly when the instructor posted at the wrap-up of a discussion, and qualitative findings of the Mazzolini and Maddison study revealed almost half of the students’ comments noted appreciation when their instructor interacted in the course discussion.

Hosler and Arend found that facilitated discourse from an instructor contributed to students’ cognitive presence (2012), but Cranney, Wallace, Alexander, and Alfano (2011) found no relationship between the frequency with which instructors posted discussion and students’ discussion grades. Ertmer and Koehler (2015) found the frequency of students’ postings was not related to the frequency of instructor postings. However, they interpreted the quality of the discussion more highly with an instructor’s presence.

Administrators may grapple with whether policies should be enacted to require specific frequency and timing of instructors' discussion posts (Cranney et al., 2011; Mandernach, Gonzalez, & Garrett, 2006), but research does not appear to support a relationship between the frequency of instructor postings and students' outcomes. The purpose of this study was to test the findings of current literature on frequency of instructor discussion posts on students' outcomes, and to determine whether the content of instructor posts would serve as a more accurate measure of the impact of teaching presence through instructor interaction in discussion forums on students' perceived and actual learning, and students' satisfaction with their online instructor and course. The following research questions were used to guide the study:

1. Is there a relationship between the frequency of instructor discussion posts and
    a. students' perceptions of the quality of their instructor?
    b. students' perceptions of the quality of their course?
    c. students' perceptions of their learning?
    d. students' actual achievement?
2. To what extent is there a relationship between the contents of instructor discussion posts and
    a. students' perceptions of the quality of their instructor?
    b. students' perceptions of the quality of their course?
    c. students' perceptions of learning?
    d. students' actual achievement?

Methods

This quantitative ex-post facto research was conducted using data collected from 36 online sections of 13 graduate courses in education between May of 2015 and July of 2016 at a nonprofit private college in the Midwest. Enrollment during the data collection period comprised 546 students, all licensed teachers pursuing an endorsement or master's degree in education.

The graduate program used template courses developed by content experts, and therefore all sections of a course contained identical content, discussion prompts, and assessments. Courses offered during the summer term consisted of seven modules over seven weeks, and courses offered during the fall and spring terms consisted of eight modules over eight weeks. All courses required students to contribute in discussion forums, though the courses did not require an identical number of discussions.

Fourteen instructors taught courses in the graduate program during the data collection period, and 13 provided consent to allow data from their courses to be used in the study. Though faculty were encouraged to participate in discussion forums, no policy was in place to mandate participation during the data collection period.

Operationalization of Variables

For this research, instructor interaction in discussion was measured with two independent variables: frequency of posts in discussion forums and the contents of instructor posts in discussion forums. Only discussion forums intended for teacher-student and student-student interaction surrounding a targeted discussion question were evaluated; this research was interested in the intentional communication of an instructor in discussion forums to promote deep learning, focus the discussion, encourage student participation, and direct and extend discussion on the content

(Anderson, Rourke, Garrison, & Archer, 2001; Nandi et al., 2012; Vaughan et al., 2013). For that reason, instructor posts to forums for students' initial introductions and students' questions were not considered.

Students' satisfaction and achievement outcomes were the dependent variables of interest. Course evaluation data, including the rating of "excellent teacher" and "excellent course" were used for evidence of students' satisfaction. Student achievement was evidenced by students' rating of "progress on relevant learning objectives" from course evaluation data, and students' actual final course grades.

Data Sources

Course evaluations. All courses in this study were evaluated by students in the final week of their online course using the IDEA Student Ratings of Instruction (SRI) Diagnostic Feedback course evaluation tool. The IDEA measures student perceptions of their progress on relevant learning objectives and observations of teaching methods, while controlling for extraneous factors like students' work habits and motivation (IDEA, nd). The Diagnostic Form contains 19 Likert-style questions in the area of teaching methods, 13 Likert-style questions in the area of learning objectives, 6 Likert-style questions on student and course characteristics, and 2 Likert-style summary items (Li, Benton, Brown, Sullivan, & Ryalls, 2016). The form concludes with an opportunity for students to leave qualitative feedback regarding the instructor or course. Inter-rater reliability testing of the IDEA SRI Diagnostic Feedback form was conducted by Li et al. (2016), and 40 of the 41 questions resulted in reliability coefficients of .80 or above. One question related to discussion groups and teams had a coefficient of .73, but the item was retained because of its importance in measuring collaborative learning. Strong correlation between students' average rating of progress on objectives and instructors' rating of course objectives led researchers to conclude that the tool had sufficient criterion validity.

Students' responses to the online IDEA SRI Diagnostic Feedback form are submitted directly to IDEA; the individual responses cannot be viewed by faculty members or administrators. IDEA analyzes the data to determine a mean score between 1 and 5 for each of the 41 questions on the SRI Diagnostic Form. Controlling for extraneous factors, IDEA also determines a mean score between 1 and 5 in four summative areas: students' perceived progress on relevant learning objectives (progress on relevant objectives), students' rating of the quality of their instructor (excellent teacher), students' rating of the quality of their course (excellent course), and an overall score summarizing students' feedback (summary evaluation). This summative data is provided to the institution in report form. The report includes the discipline average student rating for each area, which indicates the mean score of all student ratings in the IDEA database pertaining to the discipline associated with the course. The report also includes the institution average student rating for each area, which indicates the mean score of all student ratings collected for the institution. Those two mean scores for each area provide context to interpret whether the individual instructor's ratings are similar or dissimilar from the student ratings of other instructors.

A link to the course evaluation was embedded in the final module of each online course in Blackboard during the data collection period. The link was active in the seven days prior to the final day of the course. Students received reminder emails to complete the course evaluation every two days, and the reminder emails also contained a direct link to the course evaluation. No points or incentives were awarded by any instructor to students for the completion of course evaluations during the data collection period.

Discussions. Blackboard Learn was the learning management system (LMS) in place during the timeframe of interest for data collection. The discussion tool was used exclusively for discussion interaction; no intentionally structured discussion interaction occurred outside this tool in this LMS. Discussion questions were developed as discussion forums, and were in place before each course began. Each discussion question required students to post an initial discussion response by Wednesday of the related week, then follow up with two participation posts by Sunday at midnight, for a minimum of three required interactions per discussion question.

Student achievement. Students' assignment grades were recorded by instructors in the grade center in Blackboard for each course in this study at the research site during the research period. Final course grades, expressed as a percentage, were automatically calculated from assignment grades by Blackboard for each student in each course. An average final course grade was calculated for each course by adding the final percentage for each student and dividing by the number of students in the course.

Qualitative Analysis of Instructors' Discussion Interactions

To determine frequency and contents of instructors' discussion interactions, all discussion posts shared by the 13 instructors in the 36 online graduate courses in education between May of 2015 and July of 2016 were copied into an Excel spreadsheet. Each interaction was labeled with the instructor's name to ensure discussion interactions were attributed to the appropriate instructor. The researcher carefully read each instructor discussion interaction to determine the contents of the interaction. Similar interactions were grouped into new tabs within the spreadsheet. The tabs were labeled with a single word that best described the group, and the words were revised as additional pieces of data were added and themes emerged. This process employed an interactive model of qualitative data analysis; the data was reduced and displayed to summarize, organize and assemble the data to identify patterns (Punch, 2009).

The patterns found in the contents of the instructors' discussion posts included interactions that were instructional, encouraging, questioning, conversational, acknowledging, evaluative, and operational. These categories are closely aligned to instructor discussion interactions recognized in the Community of Inquiry literature as indicators of teaching presence by Vaughan, Cleveland-Innes, and Garrison (2013), Nandi, Hamilton, and Harland (2012), Shea, Hayes, and Vickers (2010) and Anderson, et al. (2001).

Instructional. Instructor interaction included posts that provided new information to the discussion, clarified an area of confusion, or shared resources to improve understanding. Archer et al. (2001) suggested instructors interject knowledge from diverse sources and present content. Cleveland et al. (2013) recommended instructors' facilitation include posts that refer students to resources including textbooks, the Internet, and their own personal experience. Nandi et al. (2012) found instructors' discussion posts are commonly used to promote deep learning and provide clarification of students' questions. Shea et al. (2010) observed "direct instruction" as a pattern in instructor interactions, where instructors provided analogies, illustrations, demonstrations, clarifying information, and knowledge from diverse sources.

This example typifies an instructional post from an instructor:

> Kara, you noted you suspect you have some ELL students who are underachieving. I'd encourage you to use assessments specific to language acquisition before agreeing with your colleagues who insinuate a child isn't achieving because of

laziness. It takes an ELL student 3-5 years to become proficient in oral English and 5-7 years to become proficient in academic English (Sparks, 2016). That means a student may be able to converse with you just fine but be challenged to apply his language skills in writing or in academic work. If you have assessment data that gives strong evidence that the child is underperforming, consider the six motivation deficits presented in this RTI Toolkit (Wright, 2012). I would encourage you to work hard to be the person who stops those conversations about lazy kids. In my experience, teachers and the monotonous work they can assign (hello worksheets!) can contribute significantly to lack of motivation. Class, check out the toolkit. How does this fit with what you are learning about ELL students and the stages of language acquisition?

Sparks, S. (2011). Teaching English-language learners: What does the research tell us? Edweek.org 35(30).

Wright, J. (2012). Six reasons why students are unmotivated (and what teachers can do). Paper presented at the Technical Assistance Meeting for CSE Chairpersons, Lake Placid, NY.

Encouraging. Instructor interaction included posts that provided support, affirmed a student's position or actions, and praised a student for their contribution or actions. Archer et al. (2001) and Vaughan et al. (2013) suggested instructors improve cognitive presence with interactions that encourage, acknowledge, and reinforce students' contributions. Shea et al. (2010) observed that instructors exhibited teaching presence with interactions that facilitated discourse by encouraging their online students.

This example typifies an encouraging post from an instructor: "It can be hard to tell someone that you need more from them. As a good leader, you coached her instead of grumbling to your peers about her. Excellent leadership skills."

Questioning. Instructors from this sample shared posts that posed a leading question but offered no information or encouragement, typically shared to stimulate additional discussion. Archer et al. (2001) suggested that an instructor share interaction intended to identify areas of agreement and disagreement, draw in participants and promote discussion. Nandi et al. (2012) found instructors commonly share posts that raise new questions and intervene to direct and extend discussion. Similarly, Vaughan et al. (2013) found instructors can improve cognitive presence with interaction that draws in participants, prompts further discussion, and identifies areas of agreement and disagreement, and Shea et al. (2010) observed that instructors facilitated discourse by identifying areas of agreement and disagreement and prompting discussion to engage students.

This example typifies a questioning post from an instructor: "I am fascinated at your comment that you create different rubrics for each student. What do you base your rubrics on? Standards? Skills? Or from IEP's? Do you have multiple criteria or are they specific to a specific skill?"

Conversational. Instructor discussion in this sample commonly included posts that were conversational in nature, that shared a story or thought not explicitly intended to improve student learning of the content, provided a glimpse at the personality or character of the instructor, or elaborated on a student's thought without providing instruction. Archer et al. (2001) suggested instructor interaction should set the climate for learning and draw in participants. Similarly, Vaughan et al. (2013) found instructors could improve cognitive presence through posts that maintain a comfortable climate for learning and engage participants in the discussion. Nandi et al. (2012) found instructors share participation that extends discussion. Shea et al. (2010) observed instructors' interaction facilitated discourse by setting the climate for learning.

These two examples typify conversational posts from an instructor:

> Differentiating instruction spoke volumes to me as a momma of a child with an IEP!

> Kami, I was excited to see you reference the CITW strategies in this post. Of course our text is just a starting point, but it has good solid strategies. It's somewhat challenging to work through this class in the summer because you can't implement what you are learning, but it is also a good time to reflect on the year and think about what you might do differently next year. I'd really love to hear when you land on a strategy from the text or from a student in this class that makes you say "I need more information on that--I want to see the research, because this one might work when I .... in math/reading/etc." I hope you are getting good take-aways!

Acknowledging. Instructors in this sample shared discussion interaction that recognized a student's contribution to the discussion without offering praise of a specific idea or action. Archer et al. (2001) and Vaughan et al. (2013) noted cognitive presence may be improved by instructor interaction that acknowledges and reinforces the contributions of students. Shea et al. (2010) observed that instructors facilitated discourse by acknowledging and reinforcing student contributions.

This example typifies an acknowledging post from an instructor: "Thanks for sharing your goal. I'm glad the activity and your reflection helped you establish the next step to take."

Negative Evaluative and Positive Evaluative. Some instructors in this sample chose to share posts that corrected or praised the quality of a student's post, the length of a student's post, or a student's use of APA formatting. These posts were not specific to the student's understanding of the content, but rather to their competence in meeting the requirements of the course. The researcher chose to analyze the effect of evaluative posts separately as positive and negative to determine whether either had a different impact on students' satisfaction or achievement. Instructors in this sample were not dissimilar to those studied by other researchers. Anderson et al. (2001) suggested instructors' interaction assess the efficacy of the interaction process. Nandi et al. (2012) found instructor participation was at times used to assert administrative guidelines or provide technical assistance. Shea et al. (2010) observed teaching presence in instructor interactions that provided formative assessment for discussions.

This example typifies a negative evaluative post from an instructor:

> Your posts for this discussion question cause me to believe that you agree with many of the points that Linda Darling-Hammond made in her article "It's Time for a New Accountability in American Education" article. It would have been very powerful if you had supported your comments and experiences with summaries or quotes from the article.

This example typifies a positive evaluative post from an instructor:

[MISSING?]

Operational. Instructors in this sample provided support related to a student's concern about navigation in the learning management system, linking to course content, or accessing materials shared in the content-specific discussion forums. These posts were shared within the content-specific discussion forums, not a forum specific to students' questions. Archer et al. (2001) suggested instructors engage in interaction that responds to students' technical concerns, and Nandi et al. (2012) found instructors commonly share posts that provide technical assistant and provide clarification of students' questions. Shea et al. (2010) observed teaching presence in instructor interaction surrounding the design and operation of the course, including responding to students' technical problems.

This example typifies an operational post from an instructor:

> You will want to change you settings for your Google slide. Open the file, click on share. In the new window, click on sharable Link. In the new window, you need to change the settings to "anyone with the link can view". This will allow us to click on the link and see your show without needing you to give each of us permissions.

Quantitative Analysis of Instructors' Discussion Interactions

Following the categorization of all instructor posts, the number of occurrences of each type of instructor discussion interaction (instructional, encouraging, questioning, conversational, acknowledging, evaluative, and operational) was recorded for each of the 36 courses. An Excel spreadsheet was created to record data on the independent and dependent variables. For every course included in the sample, the following information was recorded: instructor, course ID, course, course enrollment, percent of students who completed the IDEA course evaluation, mean score from the IDEA course evaluation for "progress on relevant learning objectives," "excellent teacher," "excellent course," and "summary evaluation," final course grade, number of weeks the course was in session, number of discussion questions in the course, total number of instructor posts, and frequency of each type of post. The spreadsheet was uploaded into IBM SPSS Statistics 20 for analysis.

Statistical analysis. To determine whether a relationship existed between the overall frequency of instructor discussion interactions and student outcomes, including the students' perception of the quality of the instructor and course, their perception of their progress on the learning outcomes of the course, and their actual academic achievement, a bivariate correlation analysis was conducted. This test was selected to identify the presence of a relationship, and there was no attempt to control or manipulate the variable pairs (Gravetter & Wallnau, 2007). For each pair, frequency of instructor discussion interaction was the independent variable and the type of student outcome was the dependent variable. Significance was determined for pairs with a p value less than or equal to .05.

To determine the effect of any relationships between the contents of instructors' discussion interactions and student outcomes, two statistical tests were conducted. Bivariate correlation analysis was used to determine if a relationship existed between the frequency of each type of instructor discussion interaction—instructional, encouraging, questioning, conversational, acknowledging, evaluative, and operational—and each type of student outcome, including students' perceptions of the quality of the instructor and course, their perception of their progress on the learning outcomes of the course, and their actual academic achievement. Significance was determined for relationships with a p value less than or equal to .05.

Stepwise linear regression analysis was employed to determine whether a prediction model could be established between the frequency of each type of instructor discussion interaction and student outcomes. Stepwise linear regression is a forward selection technique where predictor variables are added to the model one at a time, and only retained if the F statistic p value remains below the specified alpha. As each variable is added, all variables retained in the model are re-evaluated for significance (Beal, nd).

Threats to Validity

Before data could be accurately analyzed, two potential threats to validity were addressed: the number of weeks in each course, and the number of students in each course. Courses offered in this sample operated for 7 or 8 weeks. To account for the risk that the number of weeks influenced the total number of instructor posts, an adjusted total was determined for all 7-week courses in this way:

$$\frac{\text{total number of posts in 7-week course}}{\text{7 weeks}} + \text{total number of posts} = \text{adjusted total}$$

To account for the risk that the total number of students in a course influenced the total number of instructor posts, an average number of posts given per student was calculated for all courses in this way:

$$\frac{\text{adjusted total number of posts}}{\text{total number of students}} = \text{average number of posts given per student}$$

An average number of posts per student was calculated for all categories that defined the contents of posts, including instructional, questioning, encouraging, acknowledging, conversational, negative evaluative, positive evaluative and operational.

Results

Descriptive Statistics

A total of N = 546 students was included in this sample, and n = 259 chose to complete the IDEA SRI Diagnostic Form for a response rate of 47.4%. Class size ranged from 7 to 22 graduate students, with an average of 15.2 students per class. The average course grade in the 36 graduate courses in education ranged from 86.68% to 99.69%, with an average overall course grade of M = 96.1, SD = 2.4.

While discussion was required in every course, the total number of discussion forums per course ranged from 4 to 15, with an average of 11.06 discussions per course. Instructors were not required to interact in the content-specific discussion forums, and interaction in those forums ranged from no posts to 243 posts in a course. There was no relationship between the number of content-specific discussion questions in a course and the adjusted total number of posts shared by an instructor, $r(34) = -0.1$, $p = .562$. Due to the lack of relationship, no further adjustments were made to the average number of posts given per student.

The total number of instructor discussion posts, excluding the initial discussion questions, was 1625. Of those, 607 were instructional, 354 were questioning, 243 were encouraging, 172 were acknowledging, 138 were conversational, 16 were negative evaluative, 54 were positive evaluative, and 41 were operational (See Table 1).

Contents of Instructor Discussion Interaction	Frequency of Instructor Discussion Interactions
Instructional	607
Questioning	354
Encouraging	243
Acknowledging	172
Conversational	138
Negative Evaluative	16
Positive Evaluative	54
Operational	41
Total Instructor Discussion Interactions	1625

Table 1. Compiled Distribution of Instructor Discussion Interaction

RQ1: Is there a relationship between the frequency of instructor discussion posts and students' satisfaction and achievement outcomes?

Using bivariate correlation analysis with a $p < 0.05$ for significance, it was found that there was no relationship between the adjusted total number of instructor posts and students' rating of the quality of their instructor, $r(24) = .202$, $p = .237$. There was no relationship between the adjusted total number of instructor posts and students' rating of the quality of their online course, $r(34) = .248$, $p = .145$. There was no relationship between the adjusted total number of instructor posts and students' perceptions of their progress on relevant course objectives, $r(34) = .294$, $p = .081$. There was no relationship between the adjusted total number of instructor posts and students' summary evaluation of the course, $r(34) = .275$, $p = .105$..

To account for the possible impact of course size on the adjusted total number of posts shared by an instructor, the average number of instructor posts per student was analyzed in comparison with students' course evaluation ratings. There was no relationship between the average number of instructor posts per student and students' rating of the quality of their instructor, $r(34) = .161$, $p = .347$. There was no relationship between the average number of instructor posts per student and students' rating of the quality of their course, $r(34) = .21$, $p = .221$. There was no relationship between the average number of instructor posts per student and students' perception of their progress on relevant course objectives, $r(34) = .286$, $p = .091$. There was no relationship between the average number of instructor posts per student and students' summary evaluation of the course, $r(34) = .245$, $p = .15$.

There was no relationship between the adjusted total number of posts shared by an instructor in a course and the average student grade in the course, $r(34) = .086$, $p = .616$. There was no relationship between the average number of instructor posts per student in a course and the average student grade in the course, $r(34) = .082$, $p = .634$.

RQ2: Is there a relationship between the contents of instructor discussion posts and students' satisfaction and achievement outcomes?

Bivariate correlation analysis with a p < .05 significance level was used to determine whether there was a relationship between the average number of occurrences each student in a course received of each specific type of instructor discussion post and the students' satisfaction and achievement outcomes (Table 2).

	Instructional Posts	Questioning Posts	Encouraging Posts	Acknowledging Posts	Conversational Posts	Negative Evaluative Posts	Positive Evaluative Posts	Operational Posts
Excellent Teacher								
Pearson Correlation	.273	.079	.109	-.086	.428**	-.216	-.292	.075
Significance (2-tailed)	.107	.645	.526	.618	.009	.206	.083	.665
Excellent Course								
Pearson Correlation	.315	.106	.144	.003	.398*	-.133	-.255	.139
Significance (2-tailed)	.061	.537	.403	.985	.016	.438	.133	.420
Progress on Learning Objectives								
Pearson Correlation	.377*	.179	.205	.122	.377*	-.059	-.089	.134
Significance (2-tailed)	.023	.296	.230	.480	.024	.734	.606	.437
Summary Evaluation								
Pearson Correlation	.358*	.140	.168	.028	.413*	-.133	-.212	.133
Significance (2-tailed)	.032	.417	.326	.871	.012	.440	.214	.439
Average Student Grade								
Pearson Correlation	.186	.103	.087	.037	.334*	.061	.048	.066
Significance (2-tailed)	.277	.551	.613	.829	.047	.725	.782	.703

* Correlation is significant at the .05 level (2-tailed)
** Correlation is significant at the .01 level (2-tailed)

Table 2. Relationship Between Contents of Instructor Discussion and Student Outcomes

There was a significant positive relationship between the number of instructional posts an instructor shared per student and the students' perception that they made progress on the relevant learning objectives of the course, r(34) = .377, p = .023. There was a significant positive relationship between the number of instructional posts an instructor shared per student and students' overall summary evaluation of their course, r(34) = .358, p = .032. There was a significant positive relationship between the number of conversational posts an instructor shared per student and the students' perception of the quality of the instructor, r(34) = .428, p = .009, the students' perception of the quality of the course, r(34) = .398, p = .016, the students' perception of their progress on the relevant learning objectives, r(34) = .377, p = .024, the students overall summary of the course, r(34) = .413, p = .012, and the actual average student grade for the course, r(34) = .334, p = .047. No other significant correlations were uncovered.

While there was no relationship between the overall frequency of instructor posts or the average number of posts per student, there were relationships between the frequency of specific types of instructor posts suggesting some types of posts have more value to students than others. Stepwise linear regression analysis was employed to determine whether a prediction model could be established between the frequency of each type of instructor post, adjusted to reflect class sizes for 8-week courses, and the outcomes of excellent teacher, excellent course, overall summary, progress on relevant learning objectives and actual average course grade.

A significant regression equation was found to predict students' rating of 'excellent teacher' based on frequency of an instructor's conversational posts, $(F(1, 34) = 7.604, p = .009)$. The correlation coefficient was .428, indicating that 18.3% of the variance in students' perceptions of the quality of their teacher could be predicted by the frequency with which the instructor shared conversational posts. No other type of discussion post was predictive of students' rating of "excellent teacher."

A significant regression equation was calculated to predict students' ratings of 'excellent course' based on frequency of an instructor's conversational posts, (F(1, 34) = 6.398, p = .016). The correlation coefficient was .398, indicating that 15.8% of the variance in students' perceptions of the quality of their course could be predicted by the frequency with which the instructor shared conversational posts. No other type of discussion post was predictive of students' rating of "excellent course."

Similarly, a significant regression equation was calculated to predict students overall summary rating of their course based on the frequency of an instructor's conversational posts, (F(1, 34) = 7.003, p = .012). The correlation coefficient was .413, indicating that 17.1% of the students' overall summary evaluation of their course could be predicted by the frequency with which the instructor shared conversational posts. No other type of discussion post was predictive of students' summative rating of their course.

A significant regression equation was calculated to predict progress on relevant learning objectives based on the frequency of an instructor's instructional posts and negative evaluative posts, (F(2, 33) = 5.309, p = .01). (The correlation coefficient was .493, indicating that 24.3% of the variance in students' perceptions of their progress on learning objectives could be predicted by the frequency of instructional and negative evaluative posts. It is important to note the coefficient for negative evaluative was -1.478, suggesting the presence of negative evaluative posts by an instructor diminished a students' perception of their progress on relevant learning objectives. No other type of discussion post was predictive of students' perception of their progress on relevant learning objectives.

A significant regression equation was calculated to predict students' actual course grade based on the frequency of an instructor's conversational posts, ($F(1, 34) = 4.259$, $p = .047$). The correlation coefficient was .334, indicating that 11.1% of the variance in students' actual course grade could be predicted by the frequency their instructor shared conversational discussion posts. No other type of discussion post was predictive of students' actual course grade.

Discussion

Research from Mandernach, Dailey-Hebert and Donnelli-Sallee (2007) and Cranney, Wallace, Alexander and Alfano (2011) found instructors spend 6-7 hours each week teaching online, with almost half that time spent in discussion with students. While faculty agree interaction in discussion is a necessary instructional practice (Cranney et al., 2011; Mandernach, Gonzalez & Garrett, 2006), there is little research to support the notion that a specific required number of instructor discussion posts results in optimal student outcomes (Cranney et al., 2011; Mazzolini & Maddison, 2007; Tello, 2007). This research supports the literature; frequency of instructor interaction in discussion forums had no significant impact on students' perceptions of the quality of their teacher, their course, their perception of learning or their actual achievement.

However, the contents of an instructor's discussion post were significantly related to students' satisfaction and achievement outcomes. Findings both support and challenge recommendations made by proponents of the Community of Inquiry framework, who suggest specific types of teaching presence improve students' cognitive and social presence—at least with respect to online interaction between an instructor and adult students in discussion forums. Instructor discussion interaction that encouraged, acknowledged, and reinforced students' contributions (Anderson et al., 2001; Vaughan et al., 2013) provoked no change in students' perceptions of their course, instructor, or learning in this study. Similarly, instructor discussion interaction that attempted to draw in participants, promote discussion, summarize the discussion, and respond to technical concerns had no effect. Instructors who attempt to establish teaching presence by responding frequently to students with posts of acknowledgement, affirmation, praise, and summary should redirect their efforts to other types of discussion interaction and engagement practices.

While Nandi (2012) found instructors commonly use discussion interaction to share administrative guidelines, and Anderson et al. (2001) and Vaughan (2013) recommended using instructor interaction to assess the efficacy of the process of discussion, this research found posts written by instructors that attempted to correct students who fell short of guidelines actually have a negative impact on students' perceptions of their learning. It may be more beneficial to reserve critical evaluation and redirection for feedback directly with the student, not in the public venue of a discussion forum.

One of the types of facilitation in discussion forums that had measurable impact on students' outcomes was the use of instructional posts. Instructional posts align with recommendations made by proponents of CoI to establish teaching presence by presenting content and providing resources to improve learning (Anderson et al., 2001; Shea et al., 2010; Vaughan, 2013). Students rated their perception of their progress on the relevant learning objectives of the course to be higher when their instructor provided instructional posts.

Most surprising, this research found the use of conversational posts by an instructor significantly improved students' perception of the quality of the teacher, the quality of their course, their overall summary of the course and even appeared to have a small impact on students' actual achievement. Conversational posts were those that improved the instructor's social presence, revealing the instructor's personality or character, e.g. "It is wonderful to look within our extended family and find such support. My aunts are twins. I am 56 years old and they are 66 years old. I still find encouragement and support from them." They provided an opportunity for instructors to share stories. "My kiddos did a recipe book, and they could choose which recipe to explain. One child did a recipe on brownies, and they said, 'Add a Tablespoon of brown.' " They demonstrated ways the instructor perceived events, situations or resources.

> I saw this same article recently - another 'teacher friend' posted on Facebook how she really wanted to make sure she paid attention to this. I found it fascinating and was so glad to see so many teachers respond to her post that they had read and were pondering the information.

They went beyond praise or affirmation, but may not have provided instruction.

> Wow! I was impressed with how Jadyn's reading improved just over the course of that lesson. It was neat to see her work with sequencing skills. I wonder how she would do if she didn't have the pictures on those word strips. (That would be a great thing to try!)
>
> I bet she felt like a movie star!

Anderson et al. (2001) noted that "the social aspects of the teacher's messages that directly relate to the content contributions from the student are included in the teaching presence category" (p. 4). Swan and Shih (2005) found students had much higher satisfaction with their instructors when their instructors exhibited the social aspects of teaching presence. Establishing teaching presence by facilitating discourse through instructor interaction in discussion "overlaps with many of the behaviors identified in [the] larger model of social presence as the teacher is an active member of the community of inquiry. However, the teacher's role is more demanding than that of other participants, and carries with it higher levels of responsibility for establishing and maintaining the discourse that creates and sustains social presence" (Anderson et al., 2001, p. 7). Shea, Hayes, Uzuner-Smith, Gozza-Cohen, Vickers, and Bidjerano (2014) found the social dimension of teaching online to be so intertwined with teaching presence they recommended a reconceptualized Community of Inquiry framework that included the construct of social-teaching presence.

The pattern of conversational posts might best align to the recommendation of Anderson et al. (2001) and Vaughan et al. (2013) to focus interaction on creating and maintaining a comfortable climate for learning. Recent literature on the construct of "third space"—the intangible space where teachers and students work together to find common ground (Schiewer, 2009)—may best describe where conversational posts live. The conversational posts shared by instructors in this research were typically related to the content and therefore could not be categorized as "chat," but were not specifically intended for instruction. They fostered the social presence of the instructor as a "real person," not an extension of the computer.

Limitations

This research used end-of-course evaluations to collect data on students' perceptions of the quality of their course and instructor and their perception of learning. The response rate for course evaluations was 47.4%; slightly less than half of the students in graduate courses in education at a private nonprofit college during the period of the study completed a course evaluation. Students who chose not to respond may have held different perceptions that would have changed the findings of the research. All student participants were working adults in a professional field pursuing a master's degree. Results may not be generalizable to other populations, including traditional undergraduate students taking an online course to supplement their program of study, working adults in a degree completion program, nontraditional adult students pursuing degrees in a field other than education, and students at public or private for- profit institution of higher education.

Suggestions for Future Research

This research was conducted with data from online graduate students in education who were working professionals. Future research may test these findings with different types of online learners to determine whether instructional and conversational instructor interaction in discussion is equally effective with other populations. Shea et al. (2010) suggested the majority of teaching presence through instructor interaction occurs outside of discussion forums. Other forms of interaction between the instructor and student, including email, feedback, phone calls, texts, and announcements should be evaluated for their individual and collective impact on student outcomes. Because instructional and conversational posts accounted for less than 25% of the variance in the dependent variables of student satisfaction and achievement, researchers must continue to drill down to determine which nuances of commonly adopted online instructional strategies are most effective.

Conclusion

Instructor interaction in discussion forums is a commonly accepted instructional practice in online courses, but there is some debate as to whether instructor discussion interaction improves student outcomes and whether policies should be enacted to require instructors to participate with prescribed regularity. The findings of this research suggest the type of instructor discussion interaction, not the quantity, improves students' perceptions of the quality of their instructor, the quality of their course, their perception of learning, and their actual achievement. Instructors should direct the time they spend in discussion to posts that focus on instruction and posts that develop students' sense of the instructor as a real person.

References

Akyol, Z., & Garrison, D. R. (2011). Understanding cognitive presence in an online and blended community of inquiry: Assessing outcomes and processes for deep approaches to learning. *British Journal of Educational Technology*,*42*(2), 233-250.

Anderson, T., Rourke, L., Garrison, D. R., and Archer W. (2001). Assessing teaching presence in a computer conferencing context. *Journal of Asynchronous Learning Networks*, *5*(2).

Annand, D. (2011). Social presence within the community of inquiry framework. The *International Review of Research in Open and Distributed Learning*, *12*(5).

Arbaugh, J. B. (2014). System, scholar or students? Which most influences online MBA course effectiveness? *Journal of Computer Assisted Learning*, 30(4), 349-362.

Baran, E., Correia, A., & Thompson, A. (2011). Transforming online teaching practice: critical analysis of the literature on the roles and competencies of online teachers. *Distance Education*,*32*(3), 421-439.

Beal, D. (2005). *SAS code to select the best multiple linear regression for multivariate data using information criteria*. Paper presented at the 13th Annual SouthEast SAS Users Group Conference, Portsmouth, VA. Retrieved from the Institute for Advanced Analytics, North Carolina State University.

Chickering, A & Gamson, Z. (1987). Seven principles for good practice in undergraduate education. *American Association for Higher Education Bulletin*. Retrieved from http://files.eric.ed.gov/fulltext/ED282491.pdf

Cho, M. & Tobias, S. (2016). Should instructors require discussion in online courses? Effects on online discussion on community of inquiry, learner time, satisfaction and achievement. *International Review of Research in Open and Distributed Learning*, *17*(2).

Davidson-Shivers, G. (2009). Frequency and types of instructor-interactions in online instruction. *Journal of Interactive Online Learning, 8*(1). Retrieved from http://www.ncolr.org/jiol/issues/pdf/8.1.2.pdf

Ertmer, P. A., & Koehler, A. A. (2015). Facilitated versus non-facilitated online case discussions: Comparing differences in problem space coverage. *Journal of Computing in Higher Education,27*(2), 69-93.

Garrison, R. (2011). *E-learning in the 21st century: A framework for research and practice*. London, England: Routledge.

Garrison, R., Anderson, T. & Archer, W. (2000). Critical inquiry in a text-based environment: Computer conferencing in higher education. *The Internet and Higher Education, 2*(2-3), 87-105.

Garrison, R., Anderson, T. & Archer, @. (2001). Critical thinking, cognitive presence, and computer conferencing in distance education. *American Journal of Distance Education, (15)*1, 7-23.

Garrison, R. & Cleveland-Innes, M. (2004). Critical factors in student satisfaction and success: Facilitating student role adjustment in online communities of inquiry. Elements of quality online education: Into the mainstream. MA: The Sloan Consortium.

Garrison, R. & Cleveland-Innes, M. (2005). Facilitating cognitive presence in online learning: interaction is not enough. *The American Journal of Distance Education, 19*(3), 133-148.

Gravetter, F. & Wallnau, L. (2007). *Statistics for the behavior sciences, 7th edition*. Belmont, CA: Thomson Higher Education.

Hew, K. (2015). Student perceptions of peer versus instructor facilitation of asynchronous online discussions: further findings from three cases. *Instructional Science: An International Journal of the Learning Sciences, 43*(1), 19-38.

Hosler, K. A., & Arend, B. D. (2012). The importance of course design, feedback, and facilitation: student perceptions of the relationship between teaching presence and cognitive presence. *Educational Media International*,*49*(3), 217-229.

IDEA. (nd). Student ratings of instruction diagnostic feedback. Retrieved from http://ideaedu.org/services/student-ratings-of-instruction/diagnostic-feedback/

Kauffman, H. (2015). A review of predictive factors of student success in and satisfaction with online learning. *Research in Learning Technology, 23*.

Knowles, M. (1988). *The modern practice of adult education: from pedagogy to andragogy*. Englewood Cliffs, NJ: Cambridge Adult Education.

Li, D., Benton, S., Brown, R., Sullivan, P. & Ryalls, K. (2016). Analysis of IDEA student ratings of instruction system 2015 pilot data. Retrieved from http://ideaedu.org/wp-content/uploads/2016/09/Technical-Report-19.pdf

Mandernach, B., Gonzales, R., & Garrett, A. (2006). An examination of online instructor presence via threaded discussion participation. *Journal of Online Learning and Teaching, 2*(4). Retrieved from http://jolt.merlot.org/vol2no4/mandernach.pdf

Mazzolini, M. & Maddison, S. (2007). When to jump in: The role of the instructor in online discussion forums. *Computers & Education, 49*(2), 193-213.

Means, B., Toyama, Y., Murphy, R., Bakia, M. & Jones, K. (2010). Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies. U.S. Department of Education, Office of Planning, Evaluation, and Policy Development. Retrieved from https://www2.ed.gov/rschstat/eval/tech/evidence-based-practices/finalreport.pdf

Merriam, S., Caffarella, R. & Baumgartner, L. (2007). *Learning in adulthood: A comprehensive guide, 3rd Edition*. San Francisco, CA: Jossey-Bass.

Moore, M. & Kearsley, G. (1996). *Distance education: A system's view*. Boston, MA: Wadsworth Publishing Company.

Nandi, D., Hamilton, M., & Harland, J. (2012). Evaluating the quality of interaction in asynchronous discussion forums in fully online courses. *Distance Education, 33*(1), 5-30.

Phirangee, K., Epp, C., & Hewitt, J. (2016). Exploring the relationships between facilitation methods, students' sense of community, and their online behaviors. *Journal of Asynchronous Learning Networks, 20*(2).

Punch, K. (2009). *Introduction to research methods in education*. Thousand Oaks, CA: Sage Publishing, Ltd.

Rockinson-Szapkiw, A., Wendt, J., Wighting, M. & Nisbet, D. (2016). The predictive relationship among the community of inquiry framework, perceived learning and online, and graduate students' course grades in online synchronous and asynchronous courses. *The International Review of Research in Open and Distributed Learning, 17*(3).

Rourke, L. & Kanuka, H. (2009). Learning in communities of inquiry: A review of the literature. *International Journal of E-Learning & Distance Education, 23*(1).

Schiewer, T. (2013). Teacher-student relationships. *Pedagogy, 13*(3), pp. 544-548.

Sebastianelli, R., Swift, C., & Tamimi, N. (2015). Factors affecting perceived learning, satisfaction, and quality in the online MBA: A structural equation modeling approach. *Journal of Education for Business, 90*(6).

Shea, P., Hayes, S. & Vickers, J. (2010). Online instructional effort measured through the lens of teaching presence in the community of inquiry framework: A re-examination of measures and approaches. *International Review of Research in Open and Distance Learning, 11*(3).

Shea, P., Hayes, S., Uzuner-Smith, S., Gozza-Cohen, M., Vickers, J., & Bidjerano, T. (2014). Reconceptualizing the community of inquiry framework: An exploratory analysis. *Internet and Higher Education, 23,* 9-17.

Shea, P., Li, C., & Pickett, P. (2006). A study of teaching presence and student sense of learning community in fully online and web-enhanced college courses. *Internet and Higher Education, 9*.

Swan, K. & Shih, L. (2005). On the nature and development of social presence in online course discussions. *Online Learning Journal, 9*(3).

Tello, S. F. (2007). An analysis of student persistence in online education. *International Journal of Information and Communication Technology Education, 3*(3).

Thoms, B., Garrett, N., Soffer, M., & Ryan, T. (2008). Resurrecting graduate conversation through an online learning community. *International Journal of Information and Communication Technology Education, 4*(3), 59-68.

Vaughan, N. Cleveland-Innes, D. & Garrison, D. (2013). *Teaching in blended learning environments: Creating and sustaining communities of inquiry*. Edmonton, AB: AU Press.

Whipp, J. & Lorentz, R. (2009). Cognitive and social help giving in online teaching: An exploratory study. *Educational Technology Research and Development, 57*(2), 169-192.

Attributes of Pre-Service and Inservice Teacher Satisfaction with Online Collaborative Mentoring

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Abstract

This study examines Hungarian pre-service and inservice teachers' satisfaction (n=154) with the Mentored Innovation Model (MIM), an online collaborative mentoring model focused on technology integration. The Kano model was applied to results from two surveys to identify conditions in the MIM that most contribute to overall satisfaction with online mentoring. Self-efficacy with technology was identified as a must-be attribute. Online communication was a one-dimensional attribute contributing to linear increase of mentees' satisfaction, although preservice and inservice teachers' perceptions about the mentor's activity in the MIM differed. The results reinforce the importance of online communication during online collaborative mentoring.

Keywords: Online collaborative mentoring; teacher education; teacher development; teacher mentoring; Kano model

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Attributes of Pre-service and Inservice Teacher Satisfaction with Online Collaborative Mentoring

Teacher education has a tradition of mentoring and apprenticeship where pre-service teachers observe mentor-teachers, receive feedback and support on initial teaching endeavors, and reflect on their experiences in real classrooms. Mentoring practices that include instructional, technical, and emotional support have been found to be necessary and effective in helping novice teachers learn how to teach and in preparing them for their future classrooms (Feiman-Nemser, 1998). This is also true of pre-service and inservice teachers learning to integrate technology in their teaching, where teacher modelling and collaboration with mentor teachers on the integrative use of technology in teaching and learning processes has been found to be effective (Aust, Newberry, O'Brian, & Thomas, 2005; Bullock, 2004).

While apprenticeship and mentoring in real classrooms is integral to teacher education, mentors who are experts in technology integration are not always available in every school or district where pre-service teachers complete their practica or where inservice teachers attempt to integrate technology. In this context, online technologies present tremendous potential for online mentoring where not only pre-service or inservice teachers but also the mentors can benefit from such interactions. In this paper we explore pre-service and inservice teachers' experiences with the Mentored Innovation Model (MIM), a model used for the online collaborative mentoring of teacher technology integration in Hungary.

The MIM (Dorner & Karpati, 2010; Dorner, 2012) is an online collaborative mentoring approach which focuses on authentic, problem-based classroom application of technology integration and combines multiple strategies for scaffolding pre-service and inservice teachers' technology integration in the teaching and learning process. In this paper, we present a brief overview of the implementation of the model for pre-service and inservice teacher technology integration in Hungary and use the Kano model (Kano, Seraku, Takahashi & Tsuji, 1984) to identify the conditions that contributed to participants' perceived development and satisfaction with their mentoring experience during the implementation.

Review of Related Literature

Mentoring in Teacher Education

To create authentic problem-solving situations where teachers learn "with computers, and not about them" (Kay, 2006, p. 390), researchers have suggested combining technology, pedagogy, and content and the curriculum-wide integration of technology (Kay, 2006; Tondeur, van Braak, Sang, Voogt, Fisser, & Ottenbreit-Leftwich, 2012). It has been found that role modelling, the provision of concrete examples of technology use in the classroom, and collaboration with mentor teachers on the integrative use of technology in teaching and learning processes are successful strategies (Aust et al., 2005; Bullock, 2004).

Mentoring in teacher education has been shown to improve confidence, self-esteem, classroom management skills, the ability to problem-solve and the ability to acclimatize to teaching contexts (Hobson, Ashby, Malderez, & Tomlinson, 2009; Mathur, Gehrke, & Kim, 2013). Most importantly, pre-service teachers have reported increased confidence using technology in their teaching (Koh & Divaharan, 2011), although Doering, Hughes and Huffman (2003) found that pre-service teachers tend to apply technology in a similar way to their mentor teachers. Interactions between pre-service teachers and mentors, levels of guidance by mentors, modelling by mentors, observations by pre-service teachers, discussions about teaching with technology with mentors, and the beliefs of mentors, as well as those of teacher educators, have been found to influence pre-service teacher integration of technology during their practicum (Bai & Ertmer, 2008; Grove, Strudler, & Odell, 2004; Haydn & Barton, 2007; Judge & O'Bannon, 2007). Mentoring programs that provide instructional, subject-specific and technical support but also opportunities for critical reflection as well as collaboration between mentors and mentees have been reported as successful (Feiman-Nemser, 1998). The Mentored Innovation Model (MIM) is one such mentoring program in which mentors and mentees engage in content-specific technology integration in authentic contexts and experiment with strategies of successful technology adoption.

The Mentored Innovation Model

The MIM is an online collaborative mentoring approach consisting of three phases that aim to support pre-service and inservice teachers' technology integration in their teaching practices. It was developed in Hungary based on the European Pedagogical Information and Communications Technology License (EPICT) project and the Calibrate project, a European Union-funded international research and development project that involved schools, educational organizations, and ministries of education from eight member countries. The three phases of the MIM draw from Engeström's (1999) expansive learning cycles in organizational learning, namely, (1) questioning some aspects of accepted practice and existing wisdom, (2) analyzing the situation to find explanatory mechanisms, (3) modelling the idea that offers a solution to the problematic situation, (4) examining the model to see its limitations as well its potentials, (5) implementing the model by means of practical applications, and (6) reflecting on and consolidating the outcomes into a new form of practice (p. 7).

In the initial phase of the MIM implementation, mentees identify pedagogical and methodological problems of technology integration in collaboration with teacher educators, a subject-specific mentor, and educational researchers. In this phase, participants are expected to question and analyze current practices. In the second phase, once mentees have identified a problem that involves technology integration, mentors and peers work together to create a development project plan (for materials, resources, or lesson plans) and a joint research agenda about the targeted content areas. This phase focuses on helping pre-service and inservice teachers discuss, model, and examine new ideas, learning objects, and activity plans, etc., around practical, hands-on issues of applying technology to specific content areas. Throughout this second phase, sustained and on-going professional support is provided by the mentors using online technologies. In the third phase of the MIM, existing learning objects, activities, and lesson plans, etc., are identified and adapted or further developed in collaboration with peers, the teacher educator, and eventually, the subject-specific mentor. The design and application of technology integration strategies, which is likely to happen at the individual teacher's level, is documented by mentees in a reflective manner and co-researched with an educational researcher. This final phase is thus characterized by reflection on and consolidation of the outcomes that are eventually shaped into new forms of technology integration practices.

Mentoring experiences in the MIM are thus designed as online collaborations in which pre-service and inservice teachers solve problems and design materials collaboratively with teacher educators, mentor teachers, and educational researchers while reflecting on how technology can support their pedagogy. The MIM does not advocate for specific technologies, a single pedagogical approach or orientation to technology integration, but focuses on communities as learners. Mentees practice technology adoption and application strategies in online modules consisting of formal pedagogical Information and Communications Technology (ICT) training and share, develop, and critique learning resources in an informal online community of teacher educators, mentor teachers, and educational researchers. The MIM considers the needs of the mentees (e.g. pre-service or inservice teachers) and the technologies that are part of the curriculum, but emphasizes strategies of technology integration that can be transferred to other technologies and teaching environments.

Conditions for Successful Mentoring

The MIM encompasses a complex system of online mentoring that is collaborative, involves multiple stakeholders, and aims for technology integration in teaching. Therefore, we sought to identify the critical conditions that may contribute to mentees' perceived satisfaction in this implementation. As a first step, previous research on critical conditions or factors that contribute to the success of mentoring teachers for technology integration was explored. Technology self-efficacy, perceived satisfaction, online communication, mentor's activity, and social presence were identified as five areas that play a key role in the computer-supported mentoring of pre-service and inservice teacher technology integration in the literature. These areas are described further in the sections below.

Technology Self-efficacy

Research on teachers' self-efficacy has found that it is one of the most relevant factors affecting behavior in using computers and information systems (Wang, Ertmer, & Newby, 2004). Self-efficacy, as defined by Bandura (1986), is a belief in one's own abilities to perform an action or activity necessary to do a task or to achieve a goal. Technology self-efficacy is understood as a teacher's judgment of their capability to use a computer or ICT to perform certain tasks (Wang et al., 2004). In online environments, self-efficacy influences one's ability to acquire skills, their choice of activities, and willingness to continue a course of action (Liaw & Huang, 2013). Similarly, teachers' self-efficacy with technology influences their use of ICT in teaching practice (Balanskat, Blamire, & Kafal, 2007). For teachers, lack of technology self-efficacy can hinder the embrace of technology in school practice, so much so that fear of failure and lack of ICT knowledge are often cited as reasons for technology not being integrated into teaching (Balanskat et al., 2007; Thomson, Schmidt, & Davis, 2003).

Perceived Satisfaction

Perceived satisfaction is described as the aggregation of feelings and attitudes toward the various components impacting a given situation (Shee & Wang, 2008). Research on perceived satisfaction has revealed that it is a complex construct and its substance varies with the nature of the experience or case. Similar to other learning situations, collaborative mentoring processes are largely determined by mentees' perceived satisfaction while being mentored (Lin, Lin, & Laffey, 2008). Online communication and the mentor's role have been both identified as important priorities when reflecting on perceived satisfaction with an online learning situation and with online mentoring, in particular (Bierema & Merriam, 2002; DiRenzo, Linnehan, Shao, & Rosenberg, 2010).

Online Communication and Online Mentor Activity

The importance of interactions and communication in in-person, online, one-to-one and collaborative mentoring has been researched and described at length (Chen, Chen & Tsai, 2009; Ensher, Heun, & Blanchard, 2003; Gareis & Nussbaum-Beach, 2007; Hew & Knapczyk, 2007). Communication has been identified as a critical indicator of success in online mentoring processes, notably, it is perceived as an important "measure" of whether pre-service and inservice teachers view interaction with their mentors as time well spent and as a contribution to their professional development (Gareis & Nussbaum-Beach, 2007). In particular, discussions that move beyond or complement the conventional mentor-to-novice exchange by fostering the network-like, collaborative interactions among teachers were found useful in addressing shared issues of professional practice (Yang & Liu, 2004). Nurturing reflective professional dialogues to support professional development is thus of paramount importance in online mentoring; however, it does not grow spontaneously out of professional relationships. In fact, numerous studies have highlighted inhibiting factors such as the lack of a perceived common purpose among participants, a lack of a culture of shared, critical reflection about practice, and a lack of experience in using technology (Tallent-Runnels, Thomas, Lan, Cooper, Ahern, Shaw, & Liu, 2006).

Hence, skillful online mentors are needed to facilitate sustained and meaningful online communication, which is at the heart of successful mentoring. Online mentors do this through their facilitative role rather than through direct teaching (Hew & Knapczyk, 2007), and by carefully planning mentoring activities, moderating interactions characterized by decreased mentor-dependency and providing guidance on how teachers can assume increased control of their learning (Chen et al., 2009). Also, an effective mentor provides consistent, task-oriented and timely feedback since his/her helpfulness profoundly influences teachers' participation (Hew & Knapczyk, 2007; Yang & Liu, 2004). These findings suggest that teachers' professional growth during online mentoring is influenced by the collaborative communication skillfully facilitated by the online mentors and teachers' self-directed learning, which conditions long-term habits of reflection (Gore, 1987).

Social Presence in Online Teacher Communities

Pre-service teachers often feel isolated during placement in schools as part of their practicum (Hramiak, 2010), and inservice teachers and beginning teachers, in particular, experience isolation and disconnectedness as sources of frustration (Macdonald, 1999). Online technologies and their potential to create space and place to enhance teacher training and professional development through mutual and collaborative support reduce isolation and could, according to Hramiak (2010), contribute to retaining potentially good teachers. Teacher trainees' sense of dispersion during the teaching practicum can be reduced and sense of connectedness enhanced through an online community. Stronger online communities characterized by mutual trust, respect and collaborative support exist when interactions support members to establish their social presence (Garrison, 2009). And, social presence that is defined as "the ability of participants to identify with the community, communicate purposefully in a trusting environment, and develop inter-personal relationships by way of projecting their individual personalities" (Garrison, 2009, p. 352) has been found to positively affect learning and perceived satisfaction (Hostetter & Busch, 2013; Richardson & Swan, 2003). Increasing pre-service teachers' sense of closeness to a community could support them to learn (Caspi & Blau, 2008) and develop openness toward effective technology integration (Beyerbach, Walsh, & Vannatta, 2001). Inservice teachers' disposition toward technology integration is mostly influenced by their peers in the local environment, so much so that how widely and by whom technology is integrated very much reflects the patterns of social relations among teachers within an institution (Zhao & Frank, 2003). Concurrently, a functional online teacher community supported by collaborative mentoring may play an important role in pre-service and inservice teachers' successful technology integration and learning with computers.

Research Questions

The purpose of this study was to identify the critical conditions that impact mentees' perceived satisfaction with collaborative mentoring of technology integration during the implementation of the MIM. In doing so, areas that were identified in previous research as influencing pre-service and inservice teachers' technology integration during online mentoring were considered. In particular, the conditions that contributed to pre-service and inservice teachers' self-perceived development and their satisfaction with implementation of the online collaborative MIM were studied. This research will help to better tailor online collaborative mentoring to participants' needs and channel these experiences directly into technology integration in school practice. The following research questions guided this study:

- What are the critical conditions that contribute to pre-service and inservice teachers' perceived satisfaction in the MIM? How do these conditions relate to each other?
- What is the relative priority of conditions to be improved in the MIM to enhance mentees' experience with mentoring for technology integration?

Methods

Over four years, all three phases of the Mentored Innovation Model model were implemented with Hungarian pre-service (n=116) and inservice (n=43) teachers (Table 1) at a university that provided continuing professional development for inservice teachers and regular coursework for pre-service teachers. Inservice teachers who were previously involved in continuous professional development programs were approached and invited to participate. Preservice teachers who were in their practicum year or did compulsory coursework preceding it were invited to participate. Participation in both cohorts was voluntary. Online mentoring activities took place in Moodle and LeMill to form two online communities. One consisted of pre-service teachers, teacher educators, subject-specific teacher mentors, and educational researchers, with an aim to integrate technology integration with subject-matter and pedagogy before pre-service teachers began their practicum. In the second, inservice teachers voluntarily participated in the MIM that constituted a considerable part of their professional development. Similar to the pre-service teachers, inservice teachers participated in an online community with teacher educators, subject-specific mentors, and educational researchers to share, develop, and critique resources. All mentees explored online repositories such as the European Schoolnet's Learning Resource Exchange for Schools or Sulinet (which is a Hungarian portal with online teaching resources in Hungarian grouped according to subjects) for use in their teaching material design or technology integration. Online mentors who were experienced in online and face-to-face mentoring scaffolded subject-specific online collaborations in small-groups (5–6 members). Along with teacher educators, subject-specific mentors, and educational researchers, pre-service and inservice teachers identified a pedagogical problem related to technology integration; developed a project plan that involved the creation or adaptation of materials; developed a research plan using action research to study the technology integration in classroom context at a later stage, and reflected jointly on the technology-integration strategies. In order to identify the conditions that influence collaborative mentoring of teacher technology integration, it was necessary to first collect data from the project participants about the identified areas in the literature. To this effect, two online questionnaires were used in this study—a technology self-efficacy survey before the mentoring began and a mentoring satisfaction survey at the end of the MIM. All pre-service teachers and inservices teachers in the two MIM online communities at the university were invited to participate in the data collection.

	Inservice teachers (n=43)			
	Gender		Age	
	Female	Male	30-45 years	45-60 years
Number of participants	36	7	24	19
	Pre-service teachers (n=116)			
	Gender		Age	
	Female	Male	22-25 years	26-33 years
Number of participants	88	28	96	20

Table 1. Descriptive Statistics of the Participants

The development of each of these instruments and their implementation is described in the first two sections below. We provide separate reliability values for the pre-service and inservice teacher communities to demonstrate the internal reliability of the scales for both groups. Cronbach's alpha was used to assess internal consistency, to indicate the degree to which a set of items measures a single unidimensional latent construct. A factor analysis was not performed because the intention was not to further check dimensionality. The third section describes how the resulting data from these questionnaires was used to assess the Kano quality attributes or elements by relying on the empirical approach "importance-grid analysis" (IGA) (Vavra, 1997; Matzler & Sauerwein, 2002) that explored the conditions in the MIM that contributed to online collaborative mentoring.

Reliability of Surveys

We used Cronbach's alpha to determine internal consistency of measured items. As the reliability statistics show, both surveys were found internally consistent and reliable (Table 2).

Reliability statistics			
Conditions	Cronbach's alpha_{pre}	Cronbach's alpha_{in}	N of items
Overall perceived satisfaction	.89	.78	8
Mentor's activity	.89	.89	5
Communication in online collaborative mentoring	.65	.82	8
Perceived social presence	.73	.84	4
Computer skills	.89	.96	29
Internet abilities	.79	.93	13

Table 2. Reliability Statistics of the Surveys Used

Technology Self-efficacy Survey

The self-efficacy survey required the teachers to rate their computer use and Internet abilities, and was developed and validated during the European Calibrate project (Karpati & Blamire, 2008). The items in the survey were based on technology literacy standards for teachers from the United Nations Educational, Scientific and Cultural Organization (UNESCO) ICT Competence Framework for Teachers (UNESCO, 2008; 2011), which also incorporates standards from the International Society for Technology in Education (ISTE). The survey mapped pre-service and inservice teachers' perceived technology use and Internet abilities, specifically, their a) perceived fluency in technologies appropriate for the online activities in the MIM and b) perceived ability to transfer these skills to new technologies (online collaborative platforms, synchronous communication tools, etc.) Respondents (N=154) self-rated their skills on a four-point Likert scale (1-4, 1 stands for "without any help" and 4 stands for "I cannot do it") as follows: technology use (Inservice: *M* = 1.67, *SD* = .72; Pre-service: *M* = 1.49, *SD* = .55) and Internet abilities (Inservice: *M* = 1.38, *SD* = .61; Pre-service: *M* = 1.32, *SD* = .59). The results of the survey and descriptive statistics suggested that the respondents had a level of comfort with technology that was appropriate for participation in the MIM, that is, that they would be comfortable with the types of online activities in which pre-service and inservice teachers were expected to engage during the collaborative mentoring process (Dorner & Kumar, 2016).

Mentoring Satisfaction Survey

While the technology self-efficacy survey covered the first area identified in the research, items in the mentoring satisfaction survey focused on the remaining conditions identified in prior research: (a) overall perceived satisfaction, (b) mentor's activity, (c) communication in online collaborative mentoring, and (d) perceived social presence. Satisfaction was explored by relying on the perceived (subjective) values provided by the participating pre-service and inservice teachers (N =154). The items used a four-point Likert scale (from 1 being strongly agree to 4 being strongly disagree).

The first variable group "overall perceived satisfaction" (eight items) (Inservice: *M* = 2.21, *SD* = .46; Pre-service: *M* = 1.85, *SD* = .62) referred to whether participants enjoyed the online mentoring experience, if the benefits gained justified the efforts, whether participants thought the experience was useful, if the content was interesting, whether the online mentor was accessible, and if participants were satisfied with the quality of mentoring and learning that took place. The second variable group "mentor's activity" (five items) (Inservice: *M* = 1.95, *SD* = .60; Pre-service: *M* = 1.92, *SD* = .69) focused on the mentor's role, whether she/he provided help, created a feeling of online community, facilitated discussions that enhanced collaborative learning, and whether her/his feedback contributed to the individual learning process. The third variable group "satisfaction with the online communication" (eight items) (Inservice: *M* = 2.26, *SD* = .58; Pre-service: *M* = 1.89, *SD* = 1.03) concentrated on whether collaboration in the online environment and participation in on-topic and off-topic discussions were a comfortable experience, if participants acknowledged each other's points of view, and whether participants felt comfortable conversing with the mentor in the online environment. The fourth variable group "social presence" (four items) (Inservice: *M* = 2.43, *SD* = 1.02; Pre-service: *M* = 2.05, *SD* = 1.27) referred to whether participants were able to form distinct individual impressions of their peers and the mentor, and whether the mentor acknowledged participants' individual points of view (Dorner & Karpati, 2010).

Data Analysis

Data from the Mentoring Satisfaction Survey were used to assess Kano quality elements that had originally been introduced by Kano et al. (1984) in their methodology and model. This model demonstrates the nonlinear relationship between performance and satisfaction by weighting the importance of conditions and attributes that ultimately constitute priorities for development (Chen & Chuang, 2008; Matzler & Hinterhuber, 1998; Xu, Jiao, Yang, & Helander, 2009). The Kano model classifies attributes into four categories (Xu et al., 2009): (1) must-be or basic quality attributes; (2) one-dimensional or performance attributes; (3) attractive or excitement attributes; and (4) indifferent attributes. Must-be attributes are a must; their absence leads to extreme dissatisfaction. One-dimensional attributes entail those for which better fulfilment leads to linear increase of satisfaction, i.e. the higher this value, the more growth there is in satisfaction (Chen & Chuang, 2008). Attractive attributes are in general unexpected by the participants; their presence may lead to satisfaction (Xu et al., 2009). However, even if the level of attractive attributes is lower, satisfaction does not necessarily decrease. Indifferent attributes are those that the participant is not particularly interested in. Our aim was to explore the relative priority of conditions to be improved in the MIM. In other words, with the Kano model, designers and mentors can explore their mentees' satisfaction with the mentoring experience, establish the relative priority of conditions, and based on the results, initiate the redesign of mentoring processes, if needed.

IGA (Vavra, 1997) was used for the assessment of different conditions, that is, the Kano quality elements. IGA relies on explicit and implicit ratings of attribute importance: explicit ratings of the respondents (e.g. direct rating) and implicit ratings derived by regressing attribute performance against a global measure of performance (e.g. overall satisfaction) (Mikulic & Prebezac, 2011). Respondents' 4-scale direct ratings were converted to a 0-100 scale, which yielded single scores for each variable (dependent and independent). Regression analyses were computed, significant items were selected, and importance values calculated. Importance value is used to specify satisfaction indices that measure the quality of the mentoring process by incorporating the respondents' judgement in a weighted form. Based on the importance values, global indexes were calculated for the conditions. Using these indices, explanatory models that are outputs of categorical regression by optimal scaling were computed. These models elucidate relations between the five conditions. For the analysis of Kano quality elements standardized beta coefficients from multiple regression analyses were used (Mikulic & Prebezac, 2011).

Results

To answer the first research question, we report the explanatory model-building (regression analysis) for how each group self-rated their satisfaction with the MIM separately. The needs, learning experiences, and perceived satisfaction of the pre-service and inservice teachers would have been different, thus the group-specific perspectives were analyzed separately. Results for the two groups were not compared through statistical analysis, because the aim was to explore group-specific perspectives of self-perceived satisfaction using explanatory models that are outputs of categorical regression by optimal scaling. The second research question focuses on the MIM as a model, and explores the relative priority of conditions to be improved in the MIM to enhance mentees' experience with collaborative mentoring for technology integration, thus mentees' (pre-service and inservice teachers') perspectives were aggregated.

Critical Conditions Impacting Pre-service and Inservice Teachers' Satisfaction

Both explanatory models were significant ($N_{pre\text{-}service}$ $F(7, 84) = 12.19$, $p = .000$, $R^2 = .54$, $R^2_{adjusted} = .50$) ($N_{inservice}$ $F(4, 17) = 19.02$, $p = .000$, $R^2 = .82$, $R^2_{adjusted} = .78$). As the analyses indicate, the two communities (pre-service and inservice) shared the perception that communication in the online collaborative mentoring was the condition that impacted their overall satisfaction with the mentoring experience the most. In other words, satisfaction with online communication had the strongest significant impact on overall satisfaction ($N_{pre\text{-}service}$ *Beta* $= .83$, *Importance* $= .40$, $p < .001$) ($N_{inservice}$ *Beta* $= .86$, *importance* $= .94$, $p = .000$).

The mentor's activity, however, was judged differently by the two communities. Pre-service teachers perceived the mentors' activity to be more influential than the inservice teachers ($N_{pre\text{-}service}$ *Beta* $= .20$, *Importance* $= .02$, $p < .001$). In fact, satisfaction with the mentors' performance did not have an impact on inservice teachers' overall satisfaction. Perceived social presence did not have a significant impact on pre-service and inservice teachers' overall satisfaction. Importantly, however, pre-service teachers' satisfaction with the mentor's presence evolved as a central node in the model; it had a significant effect on perceived social presence ($N_{pre\text{-}service}$ *Beta* $= .15$, *Importance* $= .08$, $p < .009$) and communication in the online collaborative mentoring ($N_{pre\text{-}service}$ *Beta* $= .64$, *Importance* $= .12$, $p < .001$). Pre-service teachers perceived each other as real in the mentoring processes and became 'socially' visible to each other in the online collaborations. And yet, these dynamics were primarily orchestrated through the mentors' activity. These results conclusively indicate that mentors occupied a central position in overseeing and managing the online collaborative mentoring processes in the pre-service teacher community, whereas their role proved less important for inservice teachers' overall satisfaction.

Relative Priority of Conditions for Online Collaborative Mentoring

It was aimed to identify the relative priority of conditions to be improved in the MIM by using the Kano quality elements. Data from the Technology Self-Efficacy Survey and the Mentoring Satisfaction Survey were included (Table 3 and Table 4). Communication in online mentoring collaborations was clearly identified as a one-dimensional attribute that leads to linear increase of satisfaction. It follows that pre-service and inservice teachers' overall satisfaction increases with the quality of communication in the online collaborative mentoring. It is thus the strongest predictor and driver of teachers' satisfaction in the MIM.

Pre-service and inservice teachers' self-efficacy for computer skills and Internet abilities were identified as must-be attributes, that is, lack of comfort level with technology negatively impacts overall satisfaction in online collaborative mentoring. Lack of self-efficacy for technology would thus lead to extreme dissatisfaction with teachers' self-perceived learning and would also hinder their ability to engage in virtually mentored technology integration.

Model N= 154	*R*	*R Square*	*Adjusted R square*	*Std. Error of the Estimate*	
1	.79	.62	.56	13.59	
ANOVA	*Sum of Squares*	*Df*	*Mean Square*	*F*	*Significance*
Regression	**10226.00**	**5.00**	**2045.20**	**11.07**	**.000**
Residual	6280.72	34.00	184.73		
Total	16506.72	39.00			
Predictors	***Coefficients Beta***	***Std. Error***	***Coefficients Beta***	***t***	***Significance***
(Constant)	13.61	18.94		.72	.477
Mentor's role	.09	.17	.07	.54	.591
Social presence	.01	.16	.01	.06	.954
Communication in online collaborations	.98	.19	.73	5.09	.000
Internet abilities	14.56	6.04	.35	2.41	.022
Computer skills	15.98	4.90	.46	3.26	.003

Table 3. Barriers of In- and Pre-service Teachers' Satisfaction in Online Collaborative Mentoring

Model N = 159	*R*	*R Square*	*Adjusted R square*	*Std. Error of the Estimate*	
1	.48	.23	.16	11.95	
ANOVA	*Sum of Squares*	*Df*	*Mean Square*	*F*	*Significance*
Regression	2271.23	5.00	454.25	3.18	.014
Residual	7562.72	53.00	142.69		
Total	9833.95	58.00			
Predictors	***Coefficients Beta***	***Std. Error***	***Coefficients Beta***	***t***	***Significance***
(Constant)	17.98	24.91		.72	.474
Mentor's activity	-.17	.14	-.17	-1.24	.221
Social presence	.05	.14	.05	.34	.736
Communication in online collaborations	**.57**	**.17**	**.49**	**3.28**	**.002**
Internet skills	.73	6.36	.02	.11	.909
Computer abilities	5.92	5.66	.18	1.05	.300

Table 4. Drivers of In- and Pre-service Teachers' Satisfaction in Online Collaborative Mentoring

The analysis also revealed that neither mentor activity during online collaborative mentoring nor perceived social presence were statistically significant attributes. This indicates that these conditions, as stand-alone variables, do not affect teachers' overall satisfaction significantly in the MIM. This finding was unexpected as both dimensions were significantly influential and had high importance in the stepwise model building. No attractive or indifferent dimensions were identified.

Discussion

Higher education institutions have a strong tradition of using teaching evaluations with the aim of continuously improving the quality of instruction provided to students (Chien, 2007; El-Sayed & Burke, 2010). The Kano method, one of the many alternatives, is gaining currency in surveying student satisfaction in university programs, notably, to identify elements of a curriculum that impact student satisfaction (Arefi, Heidari, Morkani, & Zandi, 2012; Sung, 2009). Nevertheless, the Kano method, as is the case with much survey research, has its limitations that relate to two issues 1) it operates with self-rated values and 2) prior to data collection, it requires the researcher to define the list of quality attributes to be investigated from existing literature and previous cases (Chan, Rosemann, & Tan, 2014). While acknowledging the method's limitations, it can nevertheless help to determine aspects and attributes of a program that have been previously less documented or simply overlooked. The following sections discuss the findings and their implications for future implementations of the MIM.

The Mentored Innovation Model (MIM) is a three-phase approach to online collaborative mentoring of teacher technology integration that has been implemented in Hungary with both pre-service and inservice teacher communities. This study sought to identify critical conditions that influence online collaborative mentoring in the MIM by a) determining areas highlighted by prior research as critical for online teacher mentoring, b) creating and implementing two surveys that covered those areas from prior literature that are critical for online collaborative mentoring of teachers and c) using the Kano quality elements to identify critical conditions related to teachers' overall satisfaction with online collaborative mentoring in the MIM. The purpose of this research was to identify and eventually improve the conditions in the MIM that most contribute to overall satisfaction with mentoring. Given the complexity and multiple processes that are entailed in the MIM, it was important to determine conditions that contribute to its success so that those conditions might be supported and emphasized in future implementations.

Areas that were identified as influencing online mentoring of pre-service and inservice teacher technology integration in prior literature and that were used in this study were technology self-efficacy, perceived satisfaction, online communication, mentor's activity, and social presence. Perceived technology skills and Internet abilities were identified as must-be attributes in the MIM. Hence, the success of online collaborative mentoring, such as the MIM, largely depends on teachers' perceived comfort level with technology. Both pre-service and inservice teachers need a minimum level of skills using technology and communicating in the online environment in order to fully participate and benefit from online mentoring. Lack of technology self-efficacy can also impede technology integration in classroom practice, the final goal of the MIM (Balanskat et al., 2007; Peralta & Costa, 2007). In this study, self-ratings were used in surveys to assess mentees' technology self-efficacy before beginning the mentoring process. For successful online mentoring in the MIM or in other models, it might be useful to additionally determine whether mentees possess the skills needed or have to be taught those skills in the initial stages of the mentoring process.

The results demonstrated that communication is central in online collaborative mentoring. It directly and significantly impacted pre-service and inservice teachers' overall satisfaction and thus evolved as the strongest driver of their satisfaction in online collaborative mentoring. This finding implies linearity, that is, the more teachers are satisfied with this condition, the higher their overall satisfaction with the mentoring experience. It also reinforces prior research on the crucial nature of communication in online mentoring (Gareis & Nussbaum-Beach, 2007) and emphasizes the need for further research on the types of communication and feedback in the MIM or in other online collaborative mentoring that are perceived as most beneficial by mentees. From a teacher education perspective, the results highlight the value of professional development for online mentors on the ways in which online communication can be used in online collaborative mentoring.

Mentors' activity was profoundly important in the pre-service group; it evolved as an overarching condition that had a direct significant impact on pre-service teachers' overall satisfaction, perceived social presence, and communication in online collaborative mentoring. In contrast, satisfaction with mentor performance did not significantly impact inservice teachers' overall satisfaction in this research. This suggests that inservice teachers might have needed less support or perceived the mentors' role to be less important, and that pre-service teachers experienced a greater need for guidance by a senior expert. It is also possible that inservice teachers, as experienced professionals, regarded each other and their mentors as members of a democratic community where leadership roles are interchangeable, depending on the purposes of the actual problem-solving situation in collaborative mentoring. These results also point to the importance of defining and making transparent the mentor role in online collaborative mentoring. This can be done if the mentors communicate their role and ways in which they will be available to guide mentees, whether those mentees are pre-service or inservice teachers.

Social presence was not identified as a prominent condition in this study. It was neither a driver nor a barrier of teachers' satisfaction. This somewhat contradicts results of prior studies that found that online communities enhance pre-service and inservice teachers' connectedness and reduce their sense of dispersion (Hramiak, 2010; Thurston, 2005). While social presence is important to build collegiality and create comfort during mentoring, the online collaborative mentoring in this study took place in a formal context; therefore it is possible that in order to learn social presence was not as crucial for the participants as their communication with the mentor.

Recommendations for Future Research

This research deals with the application of the Kano quality elements in a specific instructional setting, the MIM, with two mentee communities of exclusively inservice and pre-service teachers. Despite the unique institutional and regional considerations that impede the generalizability of the results to other settings and contexts, this research highlights the possibility of incorporating the Kano quality attributes in future research on online collaborative mentoring models and in program design to identify conditions contributing to participant satisfaction. Given the dynamic relationships among variables that inherently define online collaborative mentoring processes in the mentoring of teacher technology integration, more variables (specific to the instructional design at hand) can be assessed concurrently in future research. It would also be important to study actual technology integration that results from online mentoring of pre-service and inservice teachers or online collaborative mentoring as in the MIM, to validate the success of the model.

The monitoring of mentees' satisfaction should be a fundamental pedagogical strategy in designing online collaborative mentoring scenarios. From the mentees' perspective, successful (online) learning is a transformative process that best proceeds with reflection. Equally important, systematic reflection is also indispensable for mentors; as mentors of online processes, it is their responsibility to revise mechanisms and implement modifications in order to leverage mentees' learning. The Kano categorization of attributes could thus be relevant to practitioners who are involved in these highly reflective processes.

This research indicates that effective online communications and transparency in the role of the mentor should be an integral part of the instructional design of online collaborative mentoring. Further, the instructional design should be informed by a thorough investigation of participants' technology skills and technology self-efficacy, and a needs analysis of the level and types of guidance expected by mentees based on their previous experiences and existing expertise. A comprehensive picture of mentees' anticipations, prior knowledge, and skills will enable course designers and mentors to design online mentoring experiences that meet expectations and respond to mentees' actual needs.

As teacher education programs proceed to include more blended and virtual components in coursework and practica, this research emphasizes not just the need for instructional design of online and blended collaborative experiences and the careful planning of various phases of technology integration in an online community, but for increased attention to online communication. Notwithstanding existing research in other environments, teacher education would benefit from research on the ways in which mentors communicate, guide, and provide feedback in online and blended teacher education environments, and the frequency or media that is used to interact with their mentees with the final goal of technology integration.

References

Arefi, M., Heidari, M., Morkani, G. S., & Zandi, K. (2012). Application of Kano model in higher education quality improvement: Study Master's degree program of educational psychology in state universities of Tehran. *World Applied Sciences Journal, 17*(3), 347-353.

Aust, R., Newberry, B., O'Brien, J., & Thomas, J. (2005). Learning generation: Fostering innovation with tomorrow's teachers and technology. *Journal of Technology and Teacher Education, 13*(2), 167-195.Bai, H., & Ertmer, P. A. (2008). Teacher educators' beliefs and technology uses as predictors of pre-service teachers' beliefs and technology attitudes. *Journal of Technology and Teacher Education, 16*(1), 93-112.

Balanskat, A., Blamire, R., & Kafal, S. (2007). *A review of studies of ICT impact on schools in Europe.* European Schoolnet.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory.* Englewood Cliffs, NJ: Prentice- Hall, Inc.

Beyerbach, B. A., Walsh, C., & Vannatta, R. A. (2001). From teaching technology to using technology to enhance student learning: Preservice teachers' changing perceptions of technology infusion. *Journal of Technology and Teacher Education, 9*(1), 105-127.

Bierema, L. L., & Merriam, S. B. (2002). E-mentoring: using computer mediated communication to enhance the mentoring process. *Innovative Higher Education, 26,* 211-227.

Bullock, D. (2004). Moving from theory to practice; An examination of the factors that preservice teachers encounter as the attempt to gain experience teaching with technology during field placement experiences. *Journal of Technology and Teacher Education, 12*(2), 211-237.

Caspi, A. & Blau, I. (2008). Social presence in online discussion groups: testing three conceptions and their relations to perceived learning, *Social Psychology of Education, 11,* 323-346.

Chan, T., Rosemann, M., & Tan, S.-Y. (2014). Identifying satisfaction factors in tertiary education: The case of an information systems program. In *Proceedings of the 35th International Conference on Information Systems: Building a Better World Through Information Systems,* AISeL, Auckland, New Zealand.

Chen, L.-F. (2012). A novel approach to regression analysis for the classification of quality attributes in the Kano model: an empirical test in the food and beverage industry. *Omega, 40*, 651-659.

Chen, C. C., & Chuang, M.-C. (2008). Integrating the Kano model into a robust design approach to enhance customer satisfaction with product design. *International Journal of Production Economics, 114*, 667-681.

Chen, Y. H., Chen, N. S., & Tsai, C. C. (2009). The use of online synchronous discussion for web-based professional development for teachers. *Computers & Education, 53*(4), 1155-1166.

Chien, E-K. (2007). Using the learning satisfaction improving model to enhance the teaching quality. *Quality Assurance in Education, 15*(2), 192 – 214.

Compeau, D.R., & Higgins, C.A. (1995, June). Computer self-Efficacy: Development of a measure and initial test. *MIS Quarterly, 19*(2), 189-211.

DiRenzo, M., Linnehan, F., Shao, P., & Rosenberg, W. L. (2010). A moderated mediation model of e-mentoring. *Journal of Vocational Behavior, 76*, 292−305.

Doering, A., Hughes, J., & Huffman, D. (2003). Preservice teachers: Are we thinking with technology? *Journal of Research on Technology in Education, 35*(3), 342-361.

Dorner, H. (2012). Effects with online mentoring in CSCL environments: mentor presence and cognitive engagement. *American Journal of Distance Education, 26*(3), 157-171.

Dorner, H., & Karpati, A. (2010). Mentoring for innovation: key factors affecting participant satisfaction in the process of collaborative knowledge construction in teacher training. *Journal of Asynchronous Learning Networks*, *14*(4), 63-77.

Dorner, H., & Kumar, S. (2016). Online Collaborative Mentoring for Technology Integration in Pre-service Teacher Education. *TechTrends, 60,* 48-55.

El-Sayed, M. E. M. & Burke, K. (2010). Transforming teaching evaluation to quality indices. *Quality Approaches in Higher Education, 1*(2), 16-23.

Engeström, Y. (1999). Innovative learning in work teams: Analyzing cycles of knowledge creation in practice. In Y. Engeström, R. Miettinen, & R.-L. Punamäki (Eds.), Perspectives on Activity Theory (pp. 377-404). New York, NY: Cambridge University Press.

Ensher, E. A., Heun, C., & Blanchard, A. (2003). Online mentoring and computer-mediated communication: new directions in research. *Journal of Vocational Behaviour 63(2),* 264-288.

Feiman-Nemser, S. (1998). Teachers as teacher educators. *European Journal of Teacher Education, 21*(1), 63-74.

Gareis, C. R., & Nussbaum-Beach, S. (2007). Electronically mentoring to develop accomplished professional teachers. *Journal of Personnel Evaluation in Education, 20*, 227-246.

Garrison, D. R. (2009). Communities of inquiry in online learning: Social, teaching and cognitive presence. In C. Howard et al. (Eds.), *Encyclopedia of distance and online learning* (2nd ed., pp. 352-355). Hershey, PA: IGI Global.

Gore, J. M. (1987). Reflecting on reflective teaching. *Journal of Teacher Education, 38*(2), 33–39.

Grove, K., Strudler, N., & Odell, S. (2004). Mentoring toward technology use: Cooperating teacher practice in supporting student teachers. *Journal of Research on Technology in Education, 37*(1), 85-110.

Haydn, T. A. & Barton, R. (2007). Common needs and different agendas: How trainee teachers make progress in their ability to use ICT in subject teaching. Some lessons from the UK. *Computers & Education, 49*(4), 1018-1036.

Hew, K. F., & Knapczyk, D. (2007). Analysis of ill-structured problem solving, mentoring functions, and perceptions of practicum teachers and mentors toward online mentoring in a field-based practicum. *Instructional Science, 35,* 1-40.

Hobson, A. J., Ashby, P., Malderez, A., & Tomlinson, P. D. (2009). Mentoring beginning teachers: What we know and what we don't. *Teaching and Teacher Education, 25*, 207-216.

Hostetter, C. & Busch, M. (2013). Community matters: Social presence and learning outcomes. *Journal of the Scholarship of Teaching and Learning, 13*(1), 77-86.

Hramiak, A. (2010). Online learning community development with teachers as a means of enhancing initial teacher training. *Technology, Pedagogy and Education, 19*(1), 47-62.

Judge, S., & O'Bannon, B. (2007). Integrating technology into field-based experiences: A model that fosters change. *Computers in Human Behavior, 23*(1), 286-302.

Kano, N., Seraku, N., Takahashi, F., & Tsuji, S. (1984). Attractive quality and must be quality. *Hinshitsu, The Journal of the Japanese Society for Quality Control*, *14*(2), 39-48.

Kárpáti A., & Blamire R. (2008). *Evaluation and validation of the first European Learning Resource Exchange.* (Final Validation Report of the CALIBRATE project). Retrieved July 25, 2016 from https://ictedupolicy.org/system/files/d4_3_evaluation_reportfinal.pdf

Kay, R. H. (2006). Evaluating strategies used to incorporate technology into preservice education: A review of the literature. *Journal of Research on Technology in Education, 38*(4), 383-408.

Koh, J. H. L. & Divaharan, S. (2011). Developing pre-service teachers' technology integration expertise through the TPACK-developing instructional model. *Journal of Educational Computing Research, 44*(1), 35-58.

Liaw, S-S. & Huang, H-M. (2013). Perceived satisfaction, perceived usefulness and interactive learning environments as predictors to self-regulation in e-learning environments. *Computers & Education, 60,* 14-24.

Lin, Y.-M., Lin, G.-Y., & Laffey, J. M. (2008). Building a social and motivational framework for understanding satisfaction in online learning. *Journal of Educational Computing Research, 38*(1), 1-27.

Macdonald, D. (1999). Teacher attrition: a review of literature. *Teaching and Teacher Education 15*(8), 835–848.

Mathur, S. R., Gehrke, R., & Kim, S. H. (2013). Impact of a teacher mentorship program on mentors' and mentees' perceptions of classroom practices and the mentoring experience, *Assessment for Effective Intervention, 38*(3) 154-162.

Matzler, K., & Hinterhuber, H. H. (1998). How to make product development projects more successful by integrating Kano's model of customer satisfaction into quality function deployment. *Technovation 18*(1), 25–38.

Matzler, K., & Sauerwein, E. (2002). The factor structure of customer satisfaction: an empirical test of the importance grid and the penalty-reward-contrast analysis. *International Journal of Service Industry Management*, *13*(4), 314 – 332.

Mikulic, J. & Prebezac, D. (2011). A critical review of techniques for classifying quality attributes in the Kano model. *Managing Service Quality, 21*(1), 46-66.

Peralta, H. & Costa, F. A. (2007). Teacher's competence and confidence regarding the use of ICT. *Educational Sciences Journal, 3*, 75-84.

Richardson, J. C., & Swan, K. (2003). Examining social presence in online courses in relation to students' perceived leaning and satisfaction. *Journal of Asynchronous Learning Networks*, *7*(1), 68-88.

Shee, D.Y. & Wang, Y.-S. (2008). Multi-criteria evaluation of the web-based e-learning system: A methodology based on learner satisfaction and its applications. *Computers & Education, 50*, 894–905.

Sung, D. (2009). Attractive quality attributes of English Language Teaching at two east Asian universities. *The Journal of Asia TEFL, 6*(4), 131-149.

Tallent-Runnels, M. K., Thomas, J., Lan, W., Cooper, S. Ahern, T. Shaw, S., & Liu X. (2006). Teaching courses online: A review of the research. *Review of Educational Research, 76*(1), 93-135.

Thomson, A. D., Schmidt, D. A., & Davis, N. E. (2003). Technology collaboratives for simultaneous renewal in teacher education. *Educational Technology Research and Developments, 51*(1), 73-89.

Thurston, A. (2005). Building online learning communities. *Technology Pedagogy and Education, 14*(3), 353-369.

Tondeur, J., van Braak, J., Sang, G., Voogt, J, Fisser, P., & Ottenbreit-Leftwich, A. (2012). Preparing pre-service teachers to integrate technology in education: A synthesis of qualitative evidence. *Computers & Education, 59*, 134-144.

United Nations Educational, Scientific and Cultural Organization (2008). *ICT competency standards for teachers. Competency standards modules.* Paris: UNESCO. Retrieved July 6, 2016, from http://unesdoc.unesco.org/images/0015/001562/156207e.pdf

United Nations Educational, Scientific and Cultural Organization (2011). *UNESCO ICT competency framework for teachers.* Paris: UNESCO. Retrieved July 6, 2016, from http://unesdoc.unesco.org/images/0021/002134/213475e.pdf

Vavra, T. G. (1997). *Improving your measurement of customer satisfaction: a guide to creating, conducting, analyzing and reporting customer satisfaction measurement program.* ASQC Quality Press: Milwaukee, WI.

Wang, L., Ertmer, P. A., & Newby, T. J. (2004). Increasing preservice teachers' self-efficacy beliefs for technology integration. *Journal of Research on Technology in Education*, *36*(3), 231-250.

Xu, Q., Jiao, R. J., Yang, X., & Helander, M. (2009). An analytical Kano model for customer need analysis. *Design Studies, 30*, 87-110.

Yang, S.C. & Liu, S.F. (2004). Case study of online workshop for the professional development of teachers. *Computers in Human Behavior, 20*, 733-761.

Zhao, Y., & Frank, K. A. (2003). Factors affecting technology uses in schools: An ecological perspective. *American Educational Research Journal, 40*(4), 807–840.

Relationship Between Grades Earned and Time in Online Courses

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Abstract

Online education is rapidly becoming a significant method of course delivery in higher education. Consequently, instructors analyze student performance in an attempt to better scaffold student learning. Learning analytics can provide insight into online students' course behaviors. Archival data from 167 graduate level education students enrolled in 4 different programs and 9 different online courses were analyzed to determine whether a relationship existed between grades earned and time spent in specific areas within the course: total course time, course modules, document repository, and synchronous online sessions. Time spent in each component did not predict a specific letter grade, but did predict whether or not an A would be achieved. The sample was composed of students from four different graduate education programs: Educational Leadership, Reading, Instructional Design, and Special Education. Variations found among programs did not significantly predict the grade earned in the course. A logistic regression revealed that of all the predictor variables, time spent in synchronous online sessions alone showed as a significant predictor of receiving an A in the course. This is important information for instructors when providing scaffolding for students.

Keywords: student success, synchronous, learning analytics

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Relationship Between Grades Earned and Time in Online Courses

Growth in Online Courses

Online education plays a significant role in higher education, especially among adult learners at the university level (Jo, Kim, & Yoon, 2015). The majority of American college courses have some digital components, ranging from the fully online to Web enhanced. Consequently, digital learning has become an integral part of instructional delivery in much of higher education (Ciabocchi, Ginsberg, & Picciano, 2016).

As of 2016, Allen and Seaman (2016) reported that there were between 5.5 and 7 million higher education students enrolled in at least one online course. This was more than a 100%

increase from the total just six years previously (Allen & Seaman, 2010). Although both graduate and undergraduate courses are offered online, graduate students have found this format to be particularly advantageous because of reduced time constraints allowing adult learners a more flexible schedule (Putman, Ford, & Tancock, 2012).

Studies comparing online learning and face-to-face instruction revealed that research since 1998 had recorded better learning outcomes from online courses than from face-to-face courses (Zhao, Lei, Yan, Lai, & Tan, 2005). Zhao et al.'s findings suggested that the technological advances which enhanced two-way interaction might promote this online advantage. Means, Toyama, Murphy, Bakia, and Jones (2009), in their analysis of 56 rigorous studies of online education, found that learners in online settings significantly outperformed their peers in face-to-face settings in the use of metacognitive strategies. These skills included self-reflection, self-explanation, and self-monitoring.

Expanded technological support and enhanced online learning experiences offered through learning tools within Learning Management Systems (LMS) have significantly improved learning in online courses. Since the late 1990s, approximately 93% of surveyed U.S. higher education institutions (Campus Computing, 2010) report having adopted web-based LMS to deliver online learning courses. In another study, almost 94% of survey participants from 417 colleges and universities stated that "digital curricular resources make learning more efficient and effective for students" (Campus Computing, 2015, para. 1) and 96% of surveyed institutions agreed that "adaptive learning technology has great potential to improve learning outcomes" (Campus Computing, 2015, para. 1).

Student Performance in Online Courses

Even though performance and use of metacognitive strategies are effective in the online environment, online learners tend to face additional challenges. Without the support of a structured classroom environment, online learners frequently face time management issues caused by juggling the demands of course work, employment, and other responsibilities despite the presence of learning and collaborative tools. Consequently, successful completion of online course work can be impacted by learners' time management skills (Joo, Jang, & Lee, 2007). Another component that could affect performance in online learning is the sense of community. Course components such as real-time lectures and group discussions using web conferencing tools might enhance online course experiences. Real time student-to-student and student-to-teacher interactions (Falloon, 2011; Pattillo, 2007) help build an important sense of community (Hrastinski, 2008). The extent to which students are using the various tools provided for them in the online environment can be examined using learner analytics data that are available within the LMS. This information can guide professors to understand typical patterns of student usage and their correlation to student grades. However, the usefulness of learning analytics to an institution depends upon data availability through their LMS and instructors' ability to analyze the data. This analytic information varies and is not necessarily incorporated into a coherent, widely understood plan or strategy for data use and interpretation (West & Heath, 2016).

Analytics: A data mining tool

Learning analytics is a tool embedded in a Learning Management System for "the measurement, collection, analysis, and reporting of data about learners and their contexts, for purposes of understanding and optimizing learning and the environments in which it occurs" (Long & Siemens, 2011, p. 32). This tool, according to Campbell, DeBlois, and Oblinger (2017), produce "actionable intelligence" for use by the institution and is therefore frequently used for enrollment and other administrative purposes; however Macfadyen and Dawson (2012) and Picciano (2012) determined that analytics can provide a detailed understanding of how students spent time in LMS-supported courses related to the usage of the tools and pedagogical strategies employed by the learners and how the data can be used to form conclusions to improve learning. The data provide information about specific variables that enhance educational opportunities, thereby allowing instructors to intervene when students are at risk or to provide additional feedback and instructional content when appropriate (Avella, Kebritchi, Nunn, & Kanai, 2016).

Because online course format can result in isolated learners, research has emphasized the importance of developing peer interaction to facilitate learning (Tinto, 1998). In order to examine peer to peer interaction, Dawson et al. (2008) analyzed the types and frequency of interactive tools used within the LMS. They found that measuring the average time that a learner spends online using an LMS provided merely "a crude indicator of student time investment in learning" (Macfadyen & Dawson, 2012, p. 153). Student engagement has been examined in many studies. Graduate and undergrad students have been found to have differing reactions to the importance of various components within online courses. Schroeder, Baker, Terras, Mahar, and Chiasson (2016) noted that graduate students desired connectivity with their instructors but connectivity with other students was not viewed as important, while undergrad students viewed both as important. Carver et al. (2013) noted that the most important factor in using synchronous sessions for graduate students was not simply adding the sessions to the course, but to specifically use the sessions to support and expand course content. The difference in perspective between graduate and undergraduate students might be a significant contributing factor affecting voluntary attendance at synchronous sessions within this study.

To further analyze what students were doing while logged into LMS-based course sites, data from the LMS tool usage can be analyzed. Macfadyen and Dawson (2012) divided the online tools into four broad categories: Engagement with Learning Community, Working with Content, Assessment, and Administrative Tasks. Their sample of almost 4,000 graduate and undergraduate course sections indicated that students used tools from the Working with Content category than they did in the other categories, which resulted in a significant correlation between student use of tools with the Working with Content category and students' final course grade. However, they also found a significant positive correlation between increased use of tools in the Engagement with Learning Community category and academic success (Macfadyen & Dawson, 2010). They found a significant positive correlation between students' final grade in the course and their use of the tools within the Engagement with Learning Community category. This category included use of the discussion boards and the course email (Macfadyen & Dawson, 2010). Previously, Dawson, McWilliam, and Tan (2008) had only identified a significant positive correlation with first year college science students between final grades and students' use of course content materials. The research questions in our study attempted to determine whether the same conclusion applied to graduate students.

Research has determined that learning analytics can be used to help instructors determine student learning outcomes as well as to determine how to improve student's academic performance (Bhardwaj & Pal, 2011). In an attempt to further analyze what student were doing while logged into LMS-based course sites, the current research study examined data on LMS tool usage. In the current research study, the researchers examined the online course analytics from graduate level courses in the Department of Education at a four-year private university. The areas analyzed included: total time in course, time spent in the content module, the document repository, and the online synchronous sessions. This study examined two of Dawson et al.'s (2008) four areas: Working with Content (content modules and document repository) and Engagement (ClassLive) more extensively to determine the effects of usage of these tools on final course grade. Based on increasing evidence that student engagement with peers in a learning community has a strong positive correlation with learning success, the researchers wanted to specifically examine these two categories. It was hypothesized that there would be a significant correlation between the various LMS elements, amount of time spent within the online course the modules, the document repository, and the synchronous online tool, and whether a graduate student earned an A in the course (Macfadyen & Dawson, 2010).

Research Questions

For this study, the researchers used the following research question to guide the study: What relationship exists between the total amount of time graduate students spend in the various online course elements—total time within course, course modules, document repository, and synchronous online tool—and whether the student earned an A in the course?

H_{01}: In an online course, there will be not be a relationship between total time spent in the course, in the course modules, synchronous online class sessions, or the document repository and the grade earned in the course.

H_{A1}: In an online course, there will be a significant relationship ($p \leq .05$) between total time spent in the course, in the course modules, synchronous online class sessions, or the document repository and the grade earned in the course.

H_{02}: In an online course, there will be not be a relationship between total time spent in the course, the course modules, synchronous online class sessions, or document repository and earning an A in the course.

H_{A2}: In an online course, there will be a significant relationship ($p \leq .05$) between total time in course modules, synchronous online class sessions, or document repository and earning an A in the course.

H_{03}: In an online course, there will not be a significant relationship ($p \leq .05$) between the program and the time spent in the course modules, synchronous online class sessions, or the document repository and the grade earned in the course.

H_{A3}: In an online course, there will be a relationship ($p \leq .05$) between the program and the time spent in the course modules, synchronous online class sessions, or the document repository and the grade earned in the course.

Methods

Learning analytics archival data from students enrolled in courses in four graduate programs in Education: Reading, Exceptional Education, Educational Leadership, and Instructional Design at a small southeastern university were analyzed to determine the relationship between the time students spent in various course elements and their final course grade.

Data from the LMS from 167 Master's level students enrolled in 10 course sections during the fall 2014 and the spring 2015 were analyzed (See Table 1). The sample included 47 students from the Reading program, 59 students were from the Educational Leadership program, 36 students were from the Exceptional Student Education program, and 25 students were from the Instructional Design program. To correct for variation among instructors, the sample included courses taught by seven different graduate education professors. However all of the sections were taught using master course syllabi and master course shells designed to incorporate the same elements. Each course, therefore, included eight common elements: content modules, a document repository for assignments and course related information, weekly discussion boards for student interactions related to the content, and weekly synchronous online class hours. The graduate students earned grades based upon the quality of the discussion postings, while no grade was attached to the modules, document repository, or synchronous components. The researchers acknowledge that online learners are limited in their ability to avail themselves of synchronous sessions because of constraints of time and geographical location; hence no part of the course grade was tied to participation in the synchronous sessions. Additionally, recorded sessions of the live sessions were made available to students immediately after the session for students to access at their convenience.

As these are graduate level courses, the numbers of students earning Cs, Ds, or Fs were negligible. A total of 123 students earned As, 34 students earned Bs, 7 students earned Cs, 2 students earned Ds and 1 students earned an F. The independent variables identified for the analysis were total time spent by students within the course LMS, time spent in the modules within the online classroom, time spent in the document repository area, and time spent in synchronous online sessions. The dependent variable used in the analysis was the course grade earned by the student. The demographic data by program and independent variable are provided in Table 1.

	Educational Leadership (N=123)	**Instructional Design (N=25)**	**Reading (N=47)**	**Special Education (N=36)**	**Total (N=167)**
Total time within the Course	90.1 hours (SD=46.2)	84.8 hours (SD=46.8)	75.8 hours (SD=46.8)	96.7 hours (SD =44.9)	86.7 hours (SD =43.9)
Time spent in Synchronous Online Sessions	2.3 hours (SD = 2.5)	2.0 hours (SD = 1.6)	2.9 hours (SD = 2.4)	2.4 hours (SD = 1.9)	2.5 hours (SD = 2.3)
Time spent in the Modules	35 hours (SD = 17.6)	40.5 hours (SD = 22.5)	35.9 hours (SD = 15.9)	46.6 hours (SD = 24.1)	38.5 hours (SD = 19.9)
Time spent in Document Repository	3.9 hours (SD = 3.8)	3.6 hours (SD = 2.5)	7.7 hours (SD = 3.8)	4.6 hours (SD = 3.3)	5.1 hours (SD = 3.9)
Percent Earning an A	83.1%	72.0%	76.6%	55.6%	73.7%

Table 1. Demographic Information

A one-way ANOVA was used to analyze significant differences in time spent within the portions of the course and the student's final grade. The ANOVA revealed that there was a significant difference based on the total time within the course ($F(2, 164) = 6.93$, $p < .001$), time spent in the synchronous online sessions ($F(2,164) = 7.15$, $p < .001$), and time spent within modules ($F(2,164) = 6.65$, $p = .002$) (Table 2). However, there were not significant differences based on time spend in document sharing, ($F(2,164) = 1.08$, $p =.342$).

Post-hoc analysis showed statistically significant differences between those students earning an A and those earning any other grade. However, no difference was found between students earning B, C, or below. It can be concluded, therefore, that time invested in the LMS did not seem to help distinguish between performances at different grade levels below an A. As a result, the data were merged into two groups: those students earning an A and those students who did not earn an A. T-tests were then used to confirm whether there was a difference between the mean time spent in each area when compared to those students who earned an A and those who did not earn an A. The difference between the mean time spent in the document repository of those earning an A and those not earning an A was not significant.

	Earning an A (N=123)	**Not Earning an A (N=44)**	**P Value**
Total time within the Course	93 hours (SD=46.1)	67.2 hours (SD =30.2)	.001*
Time spent in Synchronous Online Sessions	2.8 hours (SD = 2.3)	1.4 hours (SD = 1.8)	.001*
Time spent in the Modules	41.5 hours (SD = 20.7)	24.7 hours (SD = 14.9)	.002*
Time spent in Document Repository	5.25 hours (SD = 3.8)	4.68 hours (SD = 4.3)	.342

P* denotes probability

Table 2. Results comparing mean times between earning an A and not earning an A

Since the analytics data were analyzed and compared from 4 different programs, the researchers also wanted to determine whether the program (Reading, Exceptional Student Education, Educational Leadership, or Instructional Design) impacted the results. An ANOVA was performed which revealed differences between the program the student was enrolled in, the amount of time spent in the document repository ($F(3,163) = 11.91$, $p < .001$), and time spent in the 8 content modules ($F(3,163) = 3.046$, $p = .030$). Sheffe's post-hoc follow up analysis showed that students in Educational Leadership spent more time in the modules than Reading students, while Reading students spent more time in document sharing than students in all other programs. There seem to be slight differences in the ways each program used the various components of the LMS. Additionally, it was found that grade distribution also differed by program with 83.1% of Educational Leadership students receiving an A, followed by Reading (76.6%), Instructional Design (72.0%), and Special Education (55.6%), $\chi^2(3,167) = 9.01$, $p = .029$. In addition to time spent in modules and student grade distribution, program enrollment was included in further analysis in order to determine the effect of the synchronous online session time and time spent in content modules above and beyond the effect of program type.

A logistic regression was conducted to predict the probability of receiving an A in a Masters level education course (Table 3). In Model 1, program type was entered as a covariate to control for the effect of the program in which students were enrolled in order to get a baseline model. The logistic regression used in Model 2 included the predictor variables of total time in course, synchronous online session time, time spent in course modules, and time spent in the document repository. Finally, Model 3 included both the covariate and predictor variables, which significantly predicted whether students received an A or a different grade in the course, $\chi^2(3,167) = 36.86$, $p < .001$. Of all the predictor variables, only time spent in synchronous online sessions showed as a significant predictor of receiving an A.

	Model 1			**Model 2**			**Model 3**		
Predictor	ß (SE)	Odds Ratio	95% CI	ß (SE)	Odds Ratio	95% CI	ß (SE)	Odds Ratio	95% CI
Intercept	.223 (.34)	1.25		-.495 (.48)			-2.18 (.71)	.114	
Program ID	1.366 (.48)**	3.92	1.52-10.09				2.057 (.58)**	7.83	
Reading	0.721 (.56)	2.06	0.69-6.14				1.204 (.64)	3.33	
Special Ed	0.962 (.48)*	2.62	1.02-6.72				1.724 (.61)*	5.61	
Course Total				.009 (.01)	1.01	0.99-1.03	.005 (.01)	1.01	0.98-1.03
Synchronous online sessions				.296 (.12)*	1.34	1.06-1.70	.339 (.13)*	1.40	1.08-1.82
Module				.015 (.02)	1.02	0.97-1.06	.036 (.03)	1.04	0.99-1.09
Document				-.056 (.05)	0.95	0.85-1.05	-.093 (.07)	0.91	0.80-1.04

*p < .05, **p < .001

Model 1: χ^2 (3,167) = 8.65, $p < .05$, $R^2 = .074$ (Nagelkerke)

Model 2: χ^2 (4,167) = 21.52, $p < .001$, $R^2 = .177$ (Nagelkerke)

Model 3: : χ^2 (7,167) = 36.86, $p < .001$, $R^2 = .289$ (Nagelkerke)

Table 3. Logistic Regression

Conclusion

Time invested in an online course is only one variable that can impact students' success. The results of this study supported Mcfadyen and Dawson's (2010) findings that time spent on the tools within an online course does not necessarily correlate with grades earned. Across all 4 programs, the mean time spent in 8-week graduate courses was 86.7 hours with the majority of this time being spent within the course modules. However, it did not follow that the greater the amount of time spent within the course, the higher the grade earned. The data did not help to distinguish between the students earning a grade of A and those students earning less than an A. Consequently, the null hypothesis was accepted for our first research question.

> H_{01}: In an online course, there will be not be a relationship between total time spent in the course, in the course modules, synchronous online class sessions, or the document repository and the grade earned in the course.

An examination of the analytic data revealed that there was a difference in the amount of time invested by those who earned an A and those who did not earn an A. A statistically significant relationship existed among three of the components we examined. Total time in course, time spent in the content modules, and time within synchronous online sessions all had a significant correlation to earning an A as compared to not earning an A in the course. However, time spent in the document repository was not significant. Consequently, we rejected the second null hypothesis and accepted the alternate second hypothesis.

> H_{A2}: In an online course, there will be a significant relationship ($p \leq .05$) between total time in the course, in the course modules, synchronous online class sessions, or document repository and earning an A in the course.

Although there was a statistically significant relationship, using a logistic regression was particularly informative because it revealed that only time spent in synchronous online sessions appeared to predict whether a student would earn an A in the course. For every 20 minutes spent in a synchronous online session, the likelihood of earning an A increased by 1.4 times. This seems to indicate the value of providing synchronous teacher-student and student-student interaction, which supports Tinto's (1998) observation about the importance of peer-to-peer interaction. It is to be noted that attendance at the synchronous sessions was voluntary and grades were not associated with attendance.

Another observation from the analytics data was a slight difference in students' performances between programs. Out of the four programs, students in the Educational Leadership students were more likely to earn an A, while Special Education students were least likely to earn an A. This information cannot be generalized to determine if the variance is impacted by characteristics of students admitted to the program, or by variables in the construction of the online courses. This type of a study cannot be used to determine causality.

There were also programmatic differences between the means of time spent in each portion of the LMS. The mean differences by program between the time spent in various parts of the LMS might be indicative of variations in the ways that the portions of the courses were constructed by program. However, differences between programs were not as significant as the difference between those students earning an A and those not earning an A.

> H_{A3}: In an online course, there will be a relationship ($p \leq .05$) between the program and the time spent in the course modules, synchronous online class sessions, or the document repository and the grade earned in the course.

The logistic regression provided the most important information. This information could be used to help instructors support student performance. For every 20 minutes (.339 units of an hour) students spent in synchronous online sessions, it increased the likelihood of receiving an A by 1.4 times, regardless of graduate program. Instructors who are aware of this figure would be able to explain the benefits of the synchronous sessions to the students and thereby encourage student participation.

As the LMS analytics become even more sensitive, this increased information would allow researchers and instructors to examine online student behavior even more specifically. Improved analytic information could provide additional data to more proactively support students during online courses, rather than simply analyzing student activity after the course completion.

Limitations and Further Study

The results of the research indicate that student participation in various portions of the LMS as measured by the learning analytics has a significant positive relationship with student achievement in graduate level online courses. The data indicates that an increase in student participation, especially in online synchronous sessions, should translate into an increase in student achievement in graduate online courses. However, the findings of this study have limitations. As is true of any cross-sectional study, the results of this research establish the strength of the relationship between the variables but cannot prove that one variable is the cause of the change in the other variable. Thus, the study is limited by only being able to show an inter-variable, rather than causal, relationship. Additionally, time spent in the course, modules, or synchronous online learning only provide information about amount of time logged into each activity, not what occurred during that time. Further studies should look at other measures of engagement which capture involvement in learning activities, which could help to identify which aspects of student activity during logged in time are most beneficial to students. Finally, additional, confounding variables may impact the relationship among variables under study (Mitchell, 1985).

This study raises further questions about the exact factors that make the synchronous online sessions within the courses so significant. Further study of the components of the synchronous sessions and how they are used within each of the programs would provide instructors with valuable information for better scaffolding the student learning experience. The results of this study cannot be generalized to other populations outside of the online graduate education students. The findings from this study might not be applicable to undergraduate students or those students enrolled in blended courses.

References

Allen, E. & Seaman, J. (2010). *Learning on demand: Online education in the United States 2009*. Needham, MA: Sloan Consortium.

Avella, J. T., Kebritchi, M., Nunn, S. G., & Kanai, T. (2016). Learning analytics methods, benefits, and challenges in higher education: A systematic literature review. Online Learning, 20(4). Retrieved from http://olj.onlinelearningconsortium.org/index.php/olj/article/view/790/201

Bhardwaj, B. K., & Pal, S. (2011). Data mining: A prediction for performance improvement using classification. *International Journal of Computer Science and Information Security, 9*(4), 136-140.

Campus Computing. (2010). The 2010 national survey of information technology in U.S. higher education. Retrieved from http://www.campuscomputing.net/sites/www.campuscomputing.net/files/Green-CampusComputing2010.pdf.

Campus Computing. (2015). The 2015 campus computing survey. Retrieved from http://www.campuscomputing.net/item/2015-campus-computing-survey-0

Carver, L., Todd, C., Hahn, K., & Mukherjee, K. (2013). Students' perceptions of the effect of flipping online classes using a synchronous interactive online tool. Creative Education, 4(7A), 126-129. Retrieved from http://file.scirp.org/pdf/CE_2013071816214937.pdf

Ciabocchi, E., Ginsberg, A., & Picciano, A. (2016). A study of faculty governance leaders' perception of online and blended learning. *Online Learning, 20*(3), 53-73. Retrieved from https://olj.onlinelearningconsortium.org/index.php/olj/article/view/974

Dawson, S., McWilliam, E., & Tan, J. P.-L. (2008). *Teaching Smarter: How mining ICT data can inform and improve learning and teaching practice.* Paper presented at ASCILITE 2008, Melbourne, Australia.

Falloon, G. (2011). Making the connection: Moore's theory of transactional distance and its relevance to the use of a virtual classroom in postgraduate online teacher education. *Journal of Research on Technology in Education*, *43*(3), 187-209.

Hrastinski, S. (2008). Asynchronous and synchronous e-learning. A study of asynchronous and synchronous e-learning methods discovered that each supports different purposes. *Educause Quarterly, 31*(4), 51-55.

Jo, I., Kim, D., & Yoon, M. (2015). Constructing proxy variables to measure adult learners' time management strategies in LMS. *Educational Technology & Society*, 18(3), 214-225.

Joo, Y., Jang, M., & Lee, H. (2007). An in-depth analysis of dropout factors based on cyber university student's dropout experiences. *The Journal of Educational Information Media, 13*(3), 209-234.

Macfadyen, L. P., & Dawson, S. (2010). Mining LMS data to develop an ‘‘early warning system” for educators: A proof of concept. *Computers & Education, 54*(2), 588-599. doi: 10.1016/j.compedu.2009.09.008

Macfadyen, L. P. & Dawson, S. (2012). Numbers are not enough. Why e-Learning analytics failed to inform and institutional strategic plan. *Educational Technology & Society, 15*(3), 149-163.

Means, B., Toyanna, Y., Murphy, R., Bakia, M., & Jones, K. (2009). Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies. Washington, D.C.: U.S. Department of Education, Office of Planning, Evaluation, and Policy Development.

Mitchell, T. R. (1985). An evaluation of the validity of correlational research conducted in organizations. *Academy of Management Review*, *10*(2), 192–205.

Pattillo, R. E. (2007). Decreasing transactional distance in a web-based course. *Nurse Educator, 32*(3), 109-112.

Picciano, A.G. (2012). The evolution of big data and learning analytics in American higher education. *Journal of Asynchronous Learning Networks, 16* (3), 9-20.

Putman, S., Ford, K., & Tancock, S. (2012). Redefining online discussions: Using participant stances to promote collaboration and cognitive engagement. *International Journal of Teaching & Learning in Higher Education*, 24(2), 151-167.

Schroeder, S., Baker, M. Terras, K., Mahar, P. & Chiasson, K. (2016). Students' desired and experienced levels of connectivity to an asynchronous, online, distance degree program. *Online Learning, 20*(3), 244-264. Retrieved from https://olj.onlinelearningconsortium.org/index.php/olj/article/viewFile/691/233

Simon, M., & Goes, J. (2013). *Dissertation and scholarly research: Recipes for success*. Seattle, WA: Dissertation Success LLC.

Tinto, V. (1998). Learning communities: Building gateways to student success. *The National Teaching and Learning Forum, 7*(4).

West, D. & Heath, D. (2016). Let's talk learning analytics: A framework for implementation in relation to student retention. *Online Learning, 20*(2). Retrieved from http://olj.onlinelearningconsortium.org/index.php/olj/article/view/792/202

Zhao, Y., Lei, J., Yan, B., Lai C., & Tan, H. S. (2005). What makes the difference? A practical analysis of research on the effectiveness of distance education. *Teachers College Record, 107*(8), 1836-1884.

Navigating Turn-Taking and Conversational Repair in an Online Synchronous Course

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Abstract

In face-to-face conversations, speaker transitions (or hand-offs) are typically seamless. In computer-mediated communication settings, speaker hand-offs can be a bit more challenging. This paper presents the results of a study of audio communication problems that occur in an online synchronous course, and how, and by whom, those problems are resolved. Data were collected from chat transcripts and audio transcripts from a graduate level discourse and conversation analysis course that used WebEx, an audio conferencing software application that also has a chat channel. Using a conversation analysis approach, data were analyzed to identify when speaker hand-offs occurred to determine related patterns of confirmation strategies and repair sequences. Findings showed several different approaches to smooth speaker hand-offs. In cases where hand-offs were not smooth, participants attempted corrections by either fixing the problem or by moving on. There were also instances in which parties encountered technical difficulties with the audio or with Internet connectivity. Parties used the chat channel to indicate that they were having trouble. The instructor's role was to troubleshoot, call upon students, and move the discussion along. This study provides some insight on how chat can be used in a discussion-based, online synchronous course to identify technical difficulties when a speaker is called upon and how the difficulty is resolved.

Keywords: synchronous, audio conference, repair, conversation analysis, turn-taking, CMC

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Navigating Turn-Taking and Conversational Repair in an Online Synchronous Course

There has been an increase in the use of synchronous communication and collaboration tools, such as audio conferencing, video conferencing, and synchronous text chat in higher education (Shah-Nelson, 2013). In a platform such as WebEx, an instructor can use the integrated voice tool to talk about a particular topic while displaying a graphic, presentation, or document on the screen. Students can type questions or comments in the chat tool and can take turns talking when called upon.

Audio, video, and text interactions all come with varying degrees of technical issues. When participating in an audio conference, speaker discomfort and uncertainty are not uncommon. The absence of audio feedback from a visible audience can make a speaker wonder: Is anyone else there? Can anyone hear me? Is the audience bored? As much as the technology can facilitate learning, it can also be a distracter (Branon & Essex, 2001). For example, in a study of videoconferencing, Locatis et al. (2003) found that a technological delay affected speakers, resulting in delayed feedback from attendees. Even though the intent had been to mimic a seamless face-to-face environment, some of the participants' attention was diverted toward the technology. In a study about virtual classrooms, Falloon (2011) found that some students may have been distracted because they did not know how their audience perceived them or if they could be heard.

When teaching online via a synchronous medium, one must be prepared to account for qualitative differences in communication and feedback. The technology will have its own effect and presence on the learning context. Ideally, instructors will have anticipated any problems related to the technology and will be prepared with workarounds. When there is a speaker hand-off (also known as a hand-over) or a transition from one speaker to another, the hope is that there will be no disruption in the overall conversation and that a smooth transaction will take place. In the event of a communication breakdown, however, all involved parties will naturally seek a way to resolve the problem.

In this study, I used a conversation analysis approach to analyze the moments when transitions from speaker to speaker occurred in an online synchronous course. Conversation analysis looks at everyday, naturally occurring interactions by analyzing not just the content of the conversation, but how the content is delivered by first transcribing the text and then marking up the text to include the structure and sequential patterns of the conversation, such as turn-taking between participants and repairs that occur in speech. The particular focus of this study is on whether or not the transitions were successful, due to technical problems (audio issues/Internet connectivity) or user errors (forgetting to unmute).

Review of Related Literature

Turn-Taking in Natural Conversations

To have a successful conversation, parties must be able to interact with each other and provide adequate information. They must be able to speak, hear, and understand.

The seminal research conducted by Sacks, Schegloff, and Jefferson (1974) analyzed the sequences between parties in natural conversations and described the interrelationships between the organizational structures. They found that one party talks at a time, the conversation goes back and forth between the parties (turn-taking), parties may be called upon to speak, there tends to be some overlap between parties, turns can be as short as one-word and not have a predetermined length, and nothing, such as the length of the conversation or number of turns, is fixed.

In their research, Sacks et al. (1974) identified three ways in which a change in speaker can be organized: the next speaker can be selected by the previous speaker, a speaker can self-select, or the present speaker can continue speaking. According to the authors, these three options are hierarchically organized: Other-selection goes before self-selection, which goes before continuation.

Turn-Taking in CMC Conversations

Suggs, Dennen, and Myers (2013) found that the turn-taking rules identified by Sacks et al. (1974) still applied to the audio portion of the class, but the rules did not apply to the chat portion of the class. In Computer-Mediated Communication (CMC) that uses the chat feature, turn-taking is vastly different than it is in a face-to-face setting. The medium constrains how the flow of conversation goes (Garcia & Jacobs, 1999; Herring, 1999; Markman, 2010; Schönfeldt & Golato, 2003; Thorne, 2000). In a face-to-face conversation, there is typically one speaker at a time (Sacks, Schegloff, & Jefferson, 1974) with a brief overlap. But in CMC, multiple parties can write and post messages at the same time in the chat window. Participants don't have any control over when a message will post to the chat window (Garcia & Jacobs, 1999). The sequence in which the messages will display depends on how fast the parties are typing and how long the message is. Some parties may choose to type the entire message before pressing the Enter button versus typing a small chunk at a time in order to keep the conversation flowing without too long of a delay. If a party is taking too long to construct a message, the conversation may have already moved on to another topic (Markman, 2005). From a technical standpoint, there may be differences based on when the message was received by the server and the connection speed between the computer and the server (Rintel, Pittam, & Mulholland, 2003).

Turns are constructed in isolation and the turn is only complete when the sender presses the Send or Enter button and the text is visible to the other parties (Markman, 2005). If there are several messages posted at one time, the respondent must determine which of the postings to first respond. Additionally, if a response is too far away from the original message it references, it may get lost in the stream of messages (González-Lloret, 2011). For these reasons, Garcia and Jacobs refer to this form of communication as "quasi-synchronous" (1999).

Using webconferencing software, like WebEx, enables participants to use the audio channel and the chat channel for turn-taking. A speaker can either call upon another party or another party can self-identify using the chat to indicate a desire to speak. The webconferencing software may also provide a way of letting the speaker know that someone else wants to speak. WebEx provides an icon with a hand (mimicking the classroom practice of hand-raising in order to signal a teacher). If a party clicks the icon, it indicates to the current speaker that the party wants to speak.

Repairs in Conversations

There are issues in conversations where the parties cannot hear or understand one another, or a party has difficulty speaking. When these issues or errors are identified and resolved, the process is known as a repair in conversation analysis (Schegloff, Jefferson, & Sacks, 1977). Schegloff, Jefferson, and Sacks (1977) noted that sometimes a repair is found when there is no audible error or mistake. Conversely, audible errors or mistakes do not necessarily lead to repair. Moreover, the repair does not stand by itself. A cause resulting in repair is referred to as a "repairable" or "trouble source" (Schegloff et al., 1977), which is part of a larger repair sequence. First, a repair has to be initiated, perhaps by someone stating, "I can't hear you" (Egbert, 1997). After that has been stated, then a repair sequence takes place in order to resolve the issue. These repairs can seem somewhat seamless to us in the conversation because we have learned, at a very young age, that there are norms or rules for how to engage in a conversation and deal with a communication breakdown.

The conversation analysis literature distinguishes between who initiates the repair and who executes the repair (Levinson, 1983). It is important to note than in a repair sequence, the person who initiates the repair "may not necessarily be the one who produces the repaired item" (Obeng, 1992, p. 63). In addition, when there are more than two people in a conversation, repair can be initiated by more than one speaker (Egbert, 1997).

There are four types of repair sequences. An example of repair in each case is provided below. The transcription markings typically found in conversation analysis studies are included.

1. Self-initiated self-repair: Repair is both initiated and carried out by the speaker of the trouble source.

   N: She was givin' me a:ll the people that were go:ne this yea:r I mean this quarter y'//know (Schegloff et al., 1977, p. 364)

The speaker is speaking to another party and then quickly interrupts the other party to make the repair without prompting from the recipient. Lerner (1996) noted that the self-completed repair is the preferred method in conversations.

2. Other-initiated self-repair: Repair is carried out by speaker of the trouble source but is initiated by the recipient.

   A: Have you ever tried a clinic?
   B: *What*?
   A: Have you ever tried a clinic? (Schegloff et al., 1977, p. 367)

The speaker is not clearly heard by the recipient, as is indicated by the question word. To repair the trouble source, the speaker repeats the same question as before.

3. Self-initiated other-repair: The speaker of a trouble source may try and get the recipient to repair the trouble. For instance, if a name is proving troublesome to remember.

   B: .hhh Well, I'm working through the Amfat Corporation.
   A: The *who*?
   B: Amfah Corporation. T's a holding company (Schegloff et al., 1977, p. 368)

The speaker may not know the name of the company and is expecting the recipient to provide the correct name. Instead, the recipient asks for clarification and the speaker makes the repair.

4. Other-initiated other-repair: The recipient of a trouble source both initiates and carries out the repair. This is closest to what is conventionally called a correction.

   A: Lissena *pig*eons.
   B: Quail, I think (Schegloff et al., 1977, p. 378)

The recipient makes the repair by correcting the error that the speaker made.

Repairs in CMC

Most frequently, repair sequences have been studied in the context of face-to-face or telephone conversations between two people. In face-to-face conversations, we assume that the person we are speaking with can hear us based on visual and auditory cues. In telephone conversations, we can no longer assume this is the case because there are no nonverbal cues to alert us that someone cannot hear us speaking.

Studies of repair in telephone conversations (e.g. Egbert, 2004) more closely mimic audio conferencing interactions, although they also lack the additional text-based communication channel. In an online environment that does not use video, a speaker may have to ask the interlocutors “Can you hear me?” and then wait for a response from them either through the chat or through the audio channel. The silence during the pause does not necessarily mean that the interlocutors did not hear the speaker, but that the interlocutors are typing, waiting, editing, or reading before responding (Garcia & Jacobs, 1999).

Conversation analysis research in a synchronous online environment has primarily looked at conversational repair in chat rooms (González-Lloret, 2011; Markman, 2010; Schönfeldt & Golato, 2003). Schönfelt and Golato (2003) examined a German Web chat and found that participants applied the same behaviors used in oral conversations to the chat. If there was a trouble source, the conversation is stopped to address the trouble source. The same preference for self-repair that is found in oral conversations was found for the chat medium. Markman’s (2006) research also noted the preference for self-repair in chat, most typically for a typo or spelling correction. Additionally, Schönfeldt and Golato (2003) found that the most frequent type of repair was the other-initiated self-repair, followed by self-initiated self-repair.

Purpose of the Study

The purpose of the study is to identify when repair sequences take place and who initiates the repair sequence and through what channel (chat or voice or both). Although there has been extensive research on conversation analysis and repair sequences in traditional single-channel settings (e.g. telephone conversations or face-to-face conversations), this study will apply conversation analysis to a dual-channel setting (audio and chat) to identify technical difficulties in an online class and how those two channels interact together so the conversation can be repaired.

In a review of the literature on conversation analysis studies in online talk, Paulus, Warren, and Lester (2016) found that the majority of the studies were published in language communication journals. Only three out of 89 studies appeared in education journals and 10 out of 89 studies focused on repair. Most of the studies focused on sequence organization, turn-design, or turn-taking. This study intends to use conversation analysis in an online synchronous educational setting.

The research questions guiding the study are:

1. Are speaker hand-offs smooth?
2. When are repair sequences taking place?
3. Who initiates the repair sequence?
4. Who is handling the repairs and through what channel?

Methods

Participants

Participants in this study were the instructor and 16 graduate students (including myself) in a discourse and conversation analysis class at a large, public university in the southeastern United States. There were 14 females (including the instructor) and 3 males. All participants consented to be included in the study. The instructor for the class had some experience teaching in an online synchronous environment and about one-half of the students had prior experience in an online course, mostly in an asynchronous environment.

Course Format

The graduate-level course in discourse and conversation analysis was taught using a blended format, with both face-to-face meetings and online synchronous sessions using WebEx. WebEx is a videoconferencing software application that enables participates to listen and talk to each other, view the moderator's (either the instructor or a student) screen when the moderator is sharing a presentation, and type in a chat tool. To hear the audio, participants can either use their speakers and microphone through their computer or call a given WebEx number and use a passcode.

The course was based around discussions about the readings and mini-experiments that the students conducted to reinforce the readings. This study focuses only on the seven WebEx synchronous class sessions from weeks 2, 3, 5, 7, 8, 10, and 11. Each WebEx session lasted about 90 minutes.

The instructor would begin the class by telling the students to mute their audio (to prevent audio feedback) and then would present an agenda on the WebEx screen. As the instructor discussed a particular topic for the day, students would ask questions or make comments in the chat session. If students wanted to speak, they would identify themselves by "raising" their hand (by clicking a hand icon on the WebEx screen) or typing something in the chat window and then the instructor would call on the individual. At that point, the student would unmute and begin speaking.

Data Collection Methods

Each class session (both face-to-face and online) was recorded. All participants agreed that the sessions could be recorded. Data were collected from the recorded audio, as well as the saved chat transcripts, for each of the seven online WebEx sessions. WebEx saves the public chat transcripts and the audio for playback.

Data Analysis

I used a conversation analysis approach (Goodwin, 1981; ten Have, 1999; Schegloff, 2007; Schegloff et al., 1977; Wooffitt, 2005) to analyze the data. Conversation analysis looks at the structure and sequential patterns of conversation, such as turn-taking between participants, overlapping speech between participants, utterances in speech, pauses during speech, and repairs that occur in speech. In traditional transcriptions, these patterns are not noted. However, they are the foundation for conversation analysis research.

In order to analyze the data, I first read through the chat transcripts of the seven online WebEx sessions to quickly identify when there was an attempt at a speaker hand-off. I looked for words of affirmation from the participants. This could be identified by several "yes" or "I can" responses. I also looked for areas where participants stated an issue with hearing the speaker, such as "I can't hear you" or several "no" responses by various participants. To confirm these exchanges and to locate any additional speaker hand-offs, I then listened to the corresponding audio files to verify that there was a trouble source. Where there was an attempt at a speaker hand-off, I transcribed those sections of the audio. Finally, I matched the audio transcript to the chat transcript to see how the trouble source was repaired (and through which channel) and then indicated if there were pauses in the audio. I used pseudonyms in reporting the data in order to preserve the identities of the students and the instructor.

Results

Throughout the WebEx sessions, speaker hand-offs became a common occurrence. Sometimes those transitions were smooth and other times they were not. There were several instances in which a problem or trouble source took place. In these cases, how the repair was made and by whom varied. In addition, other technical issues occurred throughout the WebEx sessions, such as when parties were having audio or Internet connectivity issues.

Turn-Taking

In this study, there were several different approaches to taking the lead in the conversation. In many of the cases, the called-upon student would enter the conversation asking if he could be heard. The student would then receive confirmation either through the audio channel or the chat or both channels before proceeding. In one instance, there was a slight delay in receiving the chat confirmation. In this case, the speaker had begun speaking after receiving the audio confirmation and did not wait for confirmation in the chat window. In these cases, there were no trouble sources and no need for a repair sequence.

Chat. The called-upon speaker asks if she could be heard. She then receives confirmation through the chat before proceeding (Table 1).

Speaker	Audio Channel	Chat Channel
Instructor	I'm passing the ball over to Shay. Okay, you guys can unmute yourselves when you are ready to talk.	—
Shay	Okay, good morning everybody. So, everybody can hear me?	—
Instructor	—	yes
Naomi	—	yes
Ally	—	yes
Brandi	—	yes
Alexis	—	ya
Katherine	—	Good morning!
Angela	—	yes
Andres	—	Yes

Table 1. Hand-Off with Confirmation Through Chat Channel, from Week 7

In this case, there were no issues with speaker hand-off. The instructor states that she is calling on Shay and Shay confirms she is heard before moving on with her response. Several students and the instructor confirm through the chat channel that they can hear her.

Audio. The called-upon student asks if he could be heard. He then receives audio confirmation before proceeding (Table 2).

Speaker	Audio Channel	Chat Channel
Deanna	Go ahead Andres. Introduce yourself.	—
Andres	Ah. Can the group hear me?	—
Deanna	I can hear you.	—
Andres	(continues speaking)	—

Table 2. Hand-Off with Confirmation Through Audio Channel, from Week 8

In this case, Deanna calls upon Andres. Andres asks for confirmation that he can be heard and receives confirmation from Deanna (the prior speaker) through the audio channel before he continues.

Dual channel. The called-upon student asks if she can be heard. She then receives confirmation through both the chat and the audio channels before proceeding (Table 3).

Speaker	Audio Channel	Chat Channel
Instructor	Okay, Naomi, I see you have your hand up. Why don't you unmute and chime in too.	—
Naomi	Does this work? Can you hear me?	—
Instructor	I can hear you.	—
Deanna	—	yes working!

Table 3. Hand-Off with Confirmation Through Both Channels, from Week 7

The instructor calls upon Naomi to speak. Naomi asks if she can be heard through the audio channel and receives confirmation from the instructor in the audio channel and from another student in the chat channel.

None requested. The speaker assumes that everyone could hear and begins leading the discussion prior to receiving any confirmation through the chat (Table 4).

Speaker	Audio Channel	Chat Channel
Instructor	I’m assuming y’all can hear me just fine because nobody has typed in anything saying where is audio. So, I’m going to move forward (laughs) and uh, as we did last week, raise your hands if you want to speak.	—
Ally	—	Yes, we can hear you
MaryAnne	—	:)
Angela	—	:)
Cheyenne	—	:)

Table 4. Hand-Off with No Confirmation Requested, from Week 3

The instructor begins talking without asking for a confirmation from the other parties. She states that she assumes that she can be heard because nothing in the chat indicates otherwise. She receives confirmation from several students in the chat channel.

Delayed. The called-upon speaker begins to proceed and then asks for confirmation that she can be heard (Table 5).

Speaker	Audio Channel	Chat Channel
Instructor	Did anybody have anything unexpected happen during their call? Okay, MaryAnne.	—
MaryAnne	I had something unexpected with my call to the doctor’s office to schedule an appointment. Can you hear me?	—
Instructor	Yep, we can hear you.	—
Angela	—	yes
Ally	—	yes

Table 5. Hand-Off with Delayed Confirmation Through Audio Channel, from Week 3

In this case, the instructor calls upon MaryAnne, who responds to the question before asking for confirmation if others can hear her. This case is similar to the example in Table 4, because the speaker assumes the other parties can hear her before confirming that they can, in fact, hear her. This example is also similar to the example in Table 3, in which the speaker also receives confirmation in both channels.

Turn-taking in both channels. A speaker identifies herself as being the next speaker in the chat channel and then asks for confirmation in the audio channel (Table 6).

Speaker	Audio Channel	Chat Channel
Deanna	You want to take that Naomi, or anybody?	—
Naomi	—	i can
Naomi	Can everyone hear me?	—
Deanna	You sound great.	—
Naomi	Oh good, it finally works.	—
Katherine	—	yes
Kim	—	yes
Ally	—	yes Naomi

Table 6. Turn-Taking Using Both Channels, from Week 8

In this case, speaker hand-off occurs using both channels, for two distinct purposes. First, Deanna calls upon Naomi. Then, Naomi identifies herself as the next speaker in the chat channel and uses the audio channel to confirm that she can be heard. She receives confirmation in both channels.

Note in each of these cases that the practice of asking "Can you hear me?" is one in which the only possible confirmation is an affirmative one. Confirmation was requested most often when a speaker entered the audio conference for the first time during that session or after a prolonged silence. Thus, it became a regular part of the initiation sequence for most speakers, and the class became used to conversations that were interrupted with checks of audio functionality during major turn-taking moments.

Repairs

There were situations in which a speaker who was not heard would not yield a reply, or at least not until someone experienced an awkward silence. Such silences could result in either self- or other-initiated repairs. There were two main repair scenarios that occurred during the study: fixing the problem and moving on. A hybrid form of attempting or allowing a fix and then moving on also occurred. Below are five examples of when they were used:

Fixing the problem. A speaker identifies that there is an issue and eventually fixes the problem through the audio channel (Table 7).

Speaker	Audio Channel	Chat Channel
Instructor	So, Naomi, you said this happened to you. Do you want to share the experience? You don't have to, I just thought you might want to talk about it.	—

Naomi	—	hope my mic works
Instructor	Just unmute yourself and give it a shot. (8 sec) If you're talking we're not hearing you. (12 sec)	—
Angela	—	I can hear her
Instructor	Nope we still, you can hear her?	—
Naomi	—	just a sec
Angela	—	coz she is sitting right next to me
Wendy	—	I can't hear her
Kim	—	i can't
Andres	—	mine is not working aswell.
Wendy	—	haha
Angela	Okay, so Naomi's going to use my microphone cuz her's is not working.	—
Instructor	That's very kind of you Angela	—
Naomi	Okay, so people can hear me?	—
Instructor	Yes.	—
Naomi	Okay, good [continues talking]	—
Ally	—	yes
Tamara	—	yes
Cheyenne	—	yes…
Wendy	—	Yep

Table 7. Fixing the Problem Using Audio Channel, from Week 7

In this example of an other-initiated self-repair, the instructor called upon a student (Naomi) and then waited for 8 seconds, then another 12 seconds for Naomi to respond. Angela responded that she could hear Naomi (she was in the same room) and was going to let her use her microphone. The entire exchange took nearly a minute before Naomi was able to respond through Angela's microphone.

A speaker can also identify that there is a problem and the problem is resolved through the chat channel (Table 8).

Speaker	Audio Channel	Chat Channel
Alex	—	can you hear me?
Ally	—	no
Naomi	—	no

Brian	—	me either
Cheyenne	—	can't hear you
Lindsay	—	no
Alex	—	ok
Alex	—	let me type

Table 8. Fixing the Problem Using the Chat Channel, from Week 10

In this example of a self-initiated, self-repair, there is no indication that Alex cannot be heard until he asks through the chat channel. We can assume that Alex must have identified that he was not being heard by asking, "Can you hear me" through the audio channel. When he did not receive a response through either channel, he typed the same question in the chat channel. In order to correct the issue, he proceeds by using the chat channel to type his response.

Allowing a fix, then moving on. The speaker allows for a fix but can also move on if there is an indication that the problem cannot be resolved (Table 9).

Speaker	Audio Channel	Chat Channel
Instructor	Let's start with MaryAnne. What do you think MaryAnne? Don't forget to take your phone off mute. (20 sec.) Can anyone hear MaryAnne? I can't you MaryAnne unfortunately.	—
MaryAnne	—	I am speaking but no one can hear
Angela	—	no
Tamara	—	no
Ally	—	no
Deanna	—	no
Cheyenne	—	no
Wendy	—	no
Naomi	—	nope
Lindsay	—	no
Instructor	Okay, we're going to have to figure out your audio at some point MaryAnne, but um in the meantime you can type in the chat. I'm going to call on. I think Deanna had a hand up. Deanna, do you want to reply to this?	—

Table 9. Allowing a Fix, Then Moving On, from Week 2

In this case, the trouble source came from the instructor who indicated she couldn't hear MaryAnne. MaryAnne attempts to initiate the repair by typing that she is speaking. Eventually, the instructor has to complete the repair by calling on another student. The instructor has already waited 20 seconds for MaryAnne to begin speaking and has chosen to not spend more time waiting for MaryAnne to be heard. This case is a self-initiated self-repair because the instructor identifies the trouble source, attempts to correct it, and resolves it. The repair is resolved when the instructor chooses to move on to another student.

Moving on. Another response is not waiting for a confirmation from the other party after a trouble source has been indicated. The result is simply to move on with the conversation (Table 10).

Speaker	Audio Channel	Chat Channel
Deanna	Brian, I remember Gladiator, but I don't remember his introduction. Do you want to tell us about that (3 sec) or write it? Does anybody remember how he identified himself? (9 sec) Well, I'm sorry I can't hear you but I'm going to move on. Please don't take offense. [continues talking]	—
Brian	—	my mic is not working

Table 10. Moving On Without Confirmation from Other Party, from Week 8

Deanna attempts the hand-off to Brian, but moves on with the discussion after not receiving a verbal or typed response from him. In this case, the speaker only waited a few seconds after attempting the speaker hand-off before continuing on with the discussion. She moves on without allowing the other person to identify that there is a problem. This is another case of a self-initiated self-repair because the speaker identifies the trouble source, attempts to correct it, and resolves it. The repair is resolved when the speaker chooses to move on with the discussion.

Troubleshooting, then moving on. A student called upon another student but isn't able to hear her. The instructor and the speaker try to troubleshoot the situation before the speaker moves on without a confirmation from the called-upon speaker (Table 11).

Speaker	Audio Channel	Chat Channel
Deanna	Anybody? Okay, Katherine. You want to unmute yourself Katherine and contribute.	—
Instructor	I'm wondering if Katherine's microphone isn't working again.	—
Deanna	Yeah, I'm wondering.	—

Instructor	We can't hear you Katherine	—
Deanna	[moves on with the discussion]	—
Katherine	—	guess my mic is broken again.

Table 11. Troubleshooting, Then Moving On, from Week 8

Again, the speaker doesn't wait for the other person to identify there is a problem before moving on. It's also interesting to note that the speaker has acquired the behavior of the instructor by telling the speaker to unmute herself before contributing and that the speaker and the instructor are both trying to fix the problem.

Technical Issues

There are also instances in which participants need technical help due to their audio not working or they are experiencing Internet connectivity issues.

Audio issues. In the following example, the instructor is still leading the discussion through the audio channel, but the chat channel is active with participants trying to troubleshoot the audio problems. At one point, the instructor also makes use of the chat channel to troubleshoot the audio (Table 12).

Speaker	Audio Channel	Chat Channel
Instructor	[Leading a discussion]	—
Kim	—	Is anyone speaking?
Naomi	—	Instructor is speaking
Deanna	—	clear here
Ally	—	For those who can't hear: There is a mute button for both the speaker volume and microphone. Make sure the mute box for speaker is not checked.
Lindsay	—	I cannot hear anything yet…
Brian	—	me neither
Instructor	[continues instructing]	you need to join the audio
Naomi	—	Lindsay and Brian need to either call the phone # or join with computer headset
Kim	—	I can hear clearly now!
Brian	—	i can hear you

Table 12. Troubleshooting Audio Issues in the Chat Channel, from Week 2

The previous example is from the first WebEx session during week 2 of the semester. It is possible that participants are still working on the technical aspects of using WebEx. However, issues similar to this occurred throughout the semester in week 5 and week 8, as can be seen in the following examples.

As shown in Table 13, Wendy wants to participate in the audio channel but is unable to do so because her microphone is not working. This example is from week 5 of the semester.

Speaker	Audio Channel	Chat Channel
Wendy	—	My mic has not worked the last two times, so raising my hand is like false advertising… :-(
Kim	—	Oh no Wendy :)

Table 13. Technical Issue with Microphone, from Week 5

Similarly, Brian indicates he also wants to participate in the audio channel, but his microphone is also not working (Table 14).

Speaker	Audio Channel	Chat Channel
Brian	—	if my mic worked, I would raise hand several times already

Table 14. Technical Issue with Microphone, from Week 8

Although Wendy and Brian were having technical difficulties with their microphones, they could have still participated in the discussion through the chat channel as Alex did (Table 8). They may have chosen not to participate through the chat channel because of the length of time it would take to type out their comments.

In another instance, Deanna is losing her audio through the built-in feature in WebEx. Ally recommends that she call in to WebEx (Table 15).

Speaker	Audio Channel	Chat Channel
Deanna	—	keep losing audio
Ally	—	no
Deanna	—	ok now
Tamara	—	no
MaryAnne	—	no
Cheyenne	—	nope
Ally	—	call in Deanna

Table 15. Technical Issue with Losing Audio, from Week 10

Internet. In a synchronous environment, Internet connectivity is critical for being able to participate in the class. In the following example (Table 16), Brian is leading a discussion and then there is silence. The chat channel is used to let him know that he can no longer be heard.

Speaker	Audio Channel	Chat Channel
Brian	[Leading a discussion, then silence]	—
Cheyenne	—	can't hear you…
Deanna	—	lost audio
Angela	—	cant hear either
Brian	HELLO?	—
Angela	—	now I an ehre
Deanna	—	ok
Cheyenne	—	yes… now I can..
Lindsay	—	we can hear u
MaryAnne	—	can hear now
Andres	—	ok
Brian	Hello, can you hear me?	—
Instructor	—	yes
Kim	—	yes
Lindsay	—	yes!
MaryAnne	—	yes
Brian	Good. I just uh lost connection of the Internet so I thought that I'd…I resume. I resume.	—
Deanna	—	yes, can hear you now
Instructor	—	hate when that happens!

Table 16. Technical Issue with Internet Connectivity, from Week 11

Discussion

The purpose of the study was to identify when repair sequences took place and who initiated the repair sequence and through what channel (chat or voice or both). All of these examples illuminate the types of technical and conversational problems that may hinder communication—even if just temporarily—in a synchronous learning session. Each time there was a speaker hand-off, the speaker seemed to anticipate if an issue would occur. The speaker would tell the next speaker to unmute before speaking. This occurrence is unique to the online environment because the medium constrains how the flow of conversation goes (Garcia & Jacobs, 1999; Herring, 1999; Markman, 2010; Schönfeldt & Golato, 2003; Thorne, 2000).

In most instances, speaker hand-offs went smoothly. The instructor informed students that they could use the chat or raise a hand, using the hand icon in WebEx, to speak next. Then the instructor would call upon a specific party or another party would self-identify as the next speaker either through raising a hand or typing in the chat channel. The entering party would ask if the audio was working. After receiving confirmation from others through the audio channel, the chat channel, or both channels, the entering party would continue speaking. The students modeled this same behavior as they were calling upon another party to speak. This confirms research by Hutchby (2001), who refers to specific “norms of behavior,” or essentially how to appropriately participate in the community.

However, there were instances in which the speaker hand-offs encountered a trouble source. The speaker would call upon a specific party and then wait during the silence. As Garcia and Jacobs (1999) noted, the silence during the pause does not necessarily mean that the interlocutors did not hear the speaker, but that the interlocutors are typing, waiting, editing, or reading before responding. There were many instances in which this silence occurred. During this period, the speaker would have to determine whether or not there was an issue with the called-upon speaker’s audio. If there was a trouble source, the conversation stopped to address it. These findings are similar to Schönfelt and Golato (2003). The current speaker could either try to troubleshoot the issue, repeat the request, continue to wait, or move on.

When there were hand-off issues, using the chat channel became a useful way of troubleshooting or indicating that there was an issue. If someone lost audio, the person could still communicate through the chat channel in order to resolve or repair the issue. These findings were similar to Martin, Parker, and Deale (2012) in which the chat channel provided a way for parties to communicate technical difficulties.

The role of the instructor is also important in an online class. Instructors may serve as facilitators, coaches or guides (Bonk, Wisher, & Lee, 2003; Lee, Lee, Liu, Bonk, & Magjuka, 2009; Liu, Bonk, Magjuka, Lee, & Su, 2005). Moreover, they may also serve in a managerial or a technical role (Berge, 1995; Bonk, Kirkley, Hara, & Dennen, 2001). In a face-to-face classroom, instructors have the right to talk at any given time and to any other person. If there is some gap in the conversation, instructors can also fill the silence or interrupt a speaker as needed (Cazden, 2001). This was seen in many of the examples. The instructor’s role was to troubleshoot, call upon students, and move the discussion along. Current speakers could also choose to play this role. In Tables 2, 6, 10 and 11, the speaker took on the role of the instructor by calling upon other speakers. Additionally, the instructor seemed to be more tolerant of waiting and troubleshooting, as opposed to other speakers who moved on without waiting for a response (Tables 10 and 11).

Throughout the semester, the instructor also managed both channels and integrated them into the discussion. Using the text channel and the audio channel are helpful for students to receive immediate feedback (Martin & Parker, 2014). Vu and Fadde (2013) found that students were happy to use the chat channel as a pedagogical method, but the information needed to be addressed right away by the instructor. Pullen (2004) noted that students used the audio channel when they were telling a long story and used the chat channel when they had a brief comment. Therefore, it is important that instructors keep up with the chat channel to validate the significance of communication occurring there (Martin, Parker, & Deale, 2012).

Limitations

A limitation of this research is the inability for researchers to generalize the findings. This course was also a discussion-based graduate level course. Many of the students had taken an online synchronous course before, were familiar with the instructor, and were willing to speak-up or type in the chat when someone else was talking. This may not be the case with a different group of students.

In addition, this study did not analyze data based on what happened after the successful or unsuccessful hand-off. This study focused only on analyzing the structure of the conversation, as opposed to the discourse. However, future studies could address whether or not the hand-off (either successful or unsuccessful) leads to a more engaging discussion.

Implications and Future Research

This study provides some insight on how chat can be used in a discussion-based, online synchronous course to identify technical difficulties when a speaker is called upon and how corrections are made. The instructor and students need to be prepared for someone who is having technical difficulties hearing or speaking. The chat channel can provide an additional layer of support to work through technical issues.

Instructors who teach online synchronous courses need to be comfortable teaching in an environment that uses two different channels (chat and audio) and learn how to manage the two channels together. Instructors also need to be able to read through the chat comments and provide feedback based upon the comments. The chat channel provides an additional level of interaction in the course.

Ideally, the instructor should communicate ground rules at the beginning of the course. Ground rules could include things like hand-raising to identify students who want to speak and when students should place their audio on mute. Perhaps everyone could conduct an audio check at the beginning of the class to ensure that everyone can hear and speak. Instructors could also identify what the purposes are for the audio and chat channels. Having ground rules could preemptively avoid technical difficulties and ensure the course runs smoothly.

Future researchers need to examine additional classes using a variety of factors, including those with different class sizes, different instructors outside of this field, and different levels of instructor familiarity with online environments. More studies using conversation analysis in an online synchronous environment should be conducted to analyze naturally occurring interactions between teacher-student and student-student.

Author Note

Data for this study were collected while the author was a graduate student at Florida State University.

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References

Berge, Z. (1995). Facilitating computer conferencing: Recommendations from the field. *Educational Technology, 35*(1), 22-30.

Bonk, C. J., Kirkley, J. R., Hara, N., & Dennen, V. (2001). Finding the instructor in post-secondary online learning: Pedagogical, social, managerial, and technological locations. In J. Stephenson (Ed.), *Teaching and learning online: Pedagogies for new technologies* (pp. 76-97). London: Kogan Page.

Bonk, C. J., Wisher, R. A., & Lee, J-Y. (2003). Moderating learning-centered e-learning: Problems and solutions, benefits and implications. In T. S. Roberts (Ed.), *Online collaborative learning: Theory and practice* (pp. 54-85). Hershey, PA: Idea Group Publishing. doi:10.4018/978-1-59140-174-2.ch003

Branon, R. F., & Essex, C. (2001). Synchronous and asynchronous communication tools in distance education. *Tech Trends, 45*(1), 36-42.

Cazden, C. B. (2001). *Classroom discourse: The language of teaching and learning*. Portsmouth, NH: Heinemann.

Egbert, M. (1997). Some interactional achievements of other-initiated repair in multiperson conversation. *Journal of Pragmatics, 27*, 611-634.

Egbert, M. (2004). Other-initiated repair and membership categorization: Some conversational events that trigger linguistic and regional membership categorization. *Journal of Pragmatics, 36*(8), 1467-1498.

Falloon, G (2011). Exploring the virtual classroom: What students need to know (and teachers should consider). *Journal of Online Learning and Teaching, 7*(4), 439-451.

Garcia, A. C., & Jacobs, J. B. (1999). The eyes of the beholder: Understanding the turn-taking system in quasi-synchronous computer-mediated communication. *Research on Language and Social Interaction, 32*(4), 337-367. doi:10.1207/S15327973rls3204_2

González-Lloret, M. (2011). Conversation analysis of computer-mediated communication. *CALICO Journal, 28*(2), 308-325.

Goodwin, C. (1981). *Conversational organization: Interaction between speakers and hearers*. New York, NY: Academic Press.

Have, P. ten (1999). *Doing conversation analysis: A practical guide*. London, England: Sage.

Herring, S. C. (1999). Interactional coherence in CMC. *Journal of Computer-Mediated Communication, 4*. doi: 10.1111/j.1083-6101.1999.tb00106.x

Hutchby, I. (2001). *Conversation and technology: From the phone to the Internet*. Cambridge, UK: Polity.

Lee, S.-H., Lee, J., Liu, X., Bonk, C. J., & Magjuka, R. J. (2009). A review of case-based learning practices in an online MBA program: A program-level case study. *Educational Technology & Society, 12*(3), 178-190.

Lerner, G. H. (1996). Finding “face” in the preference structures of talk-interaction. *Social Psychology Quarterly, 59*(4), 303-321.

Levinson, S. C. (1983). *Pragmatics*. Cambridge, UK: Cambridge University Press.

Liu, X., Bonk, C. J., Magjuka, R. J., Lee, S-h., & Su, B. (2005). Exploring four dimensions of online instructor roles: A program level case study. *Journal of Asynchronous Learning Networks, 9*(4), 29-48.

Locatis, C., Fontelo, P., Sneiderman, C., Ackerman, M., Uijtdehaage, S., Candler, C., . . . Dennis, S. (2003). Webcasting videoconferences over IP: A synchronous communication experiment. *Journal of the American Medical Informatics Association, 10*, 150-153. doi:10.1197/jamia.M1170

Markman, K. M. (2005). To send or not to send: Turn construction in computer-mediated chat. In C. Sunakawa, T. Ikeda, S. Finch & M. Shetty (Eds.), *Proceedings of the Twelfth Annual Symposium About Language and Society-Austin, 48* (pp. 115-124). Austin, TX: Texas Linguistic Forum.

Markman, K. M. (2006). Computer-mediated conversation: The organization of talk in chat-based virtual team meetings (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3244348)

Markman, K. M. (2010). Learning to work virtually: Conversational repair as a resource for norm development in computer-mediated team meetings. In J. Park and E. Abels (Eds.), In *Interpersonal relations and social patterns in communication technologies: Discourse norms, language structures and cultural variables* (pp. 220-236). Hershey, PA: IGI Global. doi:10.4018/978-1-61520-827-2.ch012

Martin, F., & Parker, M. A. (2014). Use of synchronous virtual classrooms: Why, who, and how? *Journal of Online Learning and Teaching, 10*(2), 192-210.

Martin, F., Parker, M. A., & Deale, D. F. (2012). Examining interactivity in synchronous virtual classrooms. *The International Review of Research in Open and Distributed Learning, 13*(3), 228-261.

Obeng, S. G. (1992). A phonetic description of some repair sequences in Akan conversation. *Text, 12*(1). 59-80.

Paulus, T., Warren, A., & Lester, J. N. (2016). Applying conversation analysis methods to online talk: A literature review. *Discourse, Context & Media, 12*, 1-10. doi:10.1016/j.dcm.2016.04.001

Pullen, J. M. (2004). Synchronous internet distance education: Wave of the future or wishful thinking? *Proceedings from the E-technologies in Engineering Education Conference 2002*. Davos, Switzerland.

Rintel, E. S., Pittam, J., & Mulholland, J. (2003). Time will tell: Ambiguous non-responses on Internet Relay Chat. *Electronic Journal of Communication, 13*(1). Retrieved from http://www.cios.org/EJCPUBLIC/013/1/01312.HTML

Sacks, H., Schegloff, E. A., & Jefferson, G. (1974). A simplest systematics for the organization of turn-taking for conversation. *Language, 50*(4), 696-735. doi:10.2307/412243

Schegloff, E. A. (2007). *Sequence organization in interaction: A primer in conversation analysis*. Cambridge, UK: Cambridge University Press.

Schegloff, E. A., Jefferson, G., & Sacks, H. (1977). The preference for self-correction in the organization of repair in conversation. *Language, 53*(2), 361-382. doi:10.2307/413107

Schönfeldt, J., & Golato, A. (2003). Repair in chats: A conversation analysis approach. *Research on Language and Social Interaction, 36*(3), 241-284.

Shah-Nelson, C. (2013). Synchronous tools in support of teaching and learning. In Y. Kats (Ed.), *Learning management systems and instructional design: Best practices in online education* (pp. 172-191). Hershey, PA: IGI Global.

Suggs, C. L., Dennen, V. P., & Myers, J. B. (2013). Juggling channels and turn-taking in a dual channel synchronous course: A conversation analysis approach. In S. Wang & H. Yang (Eds.), *Cases on Formal, Non-Formal, and Informal Online Learning: Opportunities and Practices* (pp. 305-322). Hershey, PA: IGI Global. doi:10.4018/978-1-4666-1936-4.ch016

Thorne, S. (2000). Beyond bounded activity systems: Heterogeneous cultures in instructional uses of persistent conversation. In S. Herring & T. Erickson (Eds.), *Proceedings of the Thirty-Third Annual Hawaii International Conference on System Sciences*. Los Alamitos: IEEE Computer Society.

Vu, P., & Fadde, P. J. (2013). When to talk, when to chat: Student interactions in live virtual classrooms. *Journal of Interactive Online Learning, 12*(2), 41-52.

Wooffitt, R. (2005). *Conversation analysis and discourse analysis: A comparative and critical introduction*. London, England: Sage.

Thematic Patterns in International Blended Learning Literature, Research, Practices, and Terminology

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Abstract

The goal of this research was to discover and compare themes of the top blended learning (BL) articles from seven different regions of the world. Top cited articles in BL from these regions show strong similarities in research processes, practice, terminology, and focus. Small differences are apparent among the regions and top articles in general, but similar patterns demonstrate that themes might promote collaboration and exchange between regions and that the most cited articles from around the world could fit well within the topical, research, and publication practices of the field. Our results suggest that although different regions must have their own nuances and needs, they have much in common, with considerable potential to learn from one another and collaborate on shared interests.

Keywords: Blended learning; hybrid learning; international; literature review; themes

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Thematic Patterns in International Blended Learning Literature, Research, Practices, and Terminology

Previous research has studied the trends in top-cited blended learning (BL) research overall (Halverson, Graham, Spring, & Drysdale, 2012; Halverson, Graham, Spring, Drysdale, & Henrie, 2014). That these top-cited articles were predominantly drawn from North American publications generated questions about BL research in other regions which had not garnered enough citations to qualify for the top lists. We sought to compare regions on a more even base by applying the analysis methods of our earlier research to top-cited articles each from seven regions of the world as well as top-cited research spanning multiple regions.

Recently authors Spring and Graham (2016) located the 10 most-cited BL articles from each worldwide region and analyzed the citation and publication patterns around the globe, as well as citing between top articles in order to compile a broad overview of connections between research in the worldwide BL community. The current research extends the analysis using similar methods to Halverson et al. (2014) and Drysdale et al. (2013). This study examines and documents the themes of those top-cited international articles in an effort to better understand the research community's interests and concerns.

Review of Related Literature

We have defined *blended learning* broadly as the combination of face-to-face and computer-mediated instruction (Graham, 2006). Marked disagreement on the precise definition of BL exists within the field (Bernard, Borokhovski, Schmid, Tamim, & Abrami, 2014; Oliver & Trigwell, 2005). Discrepancies across definitions involve the amount of seat time, the proportion of online learning to face-to-face instruction, and the quality of the educational experience (Graham, 2013). A broad definition can be useful as it allows space for adaptation to individual needs and contexts (Graham, 2013; Norberg, Dziuban, & Moskal, 2011). We selected a broad definition to avoid limiting the "great potentials of the concept" (p. 443) and to remain as open as possible to different conceptions of blending around the world (Alammary, Sherad, & Carbone, 2014, p. 443).

The term *blended learning* has been used inside and outside of North America for over a decade. Studies in many international locations have been conducted over this time, but so far none has attempted to compare worldwide regions to determine if there are substantive differences in the research being explored in different regions. In the following paragraphs we highlight some of the research that has addressed the global trend of blended learning.

Collis and van der Wende (2002) surveyed educators in Europe, Australia, and the USA about *informational communications technology* (ICT). Though not specifically focused on BL, they identified blended learning as an important emerging trend. Only 3.5% of total respondents were from the USA with the remainder of the responses coming from Europe and Australia. This early research considered information from seven countries in three regions, and findings suggested a strong emerging interest in BL across these regions. Additional evidence that blended learning was an emerging worldwide trend was found in the largest section of the Handbook of Blended Learning (Bonk & Graham, 2006), which contained twelve cases of blended learning from around the world, plus an additional three chapters that focused on multinational blended learning perspectives. In the same handbook, Bonk, Kim, and Zeng (2006) researched the present and future of e-learning. More than 60% of post-secondary institutions were using BL, but in fewer than 20% of their courses. Over 70% anticipated blending more than 40% of their courses by 2013. The corporate sphere had similar responses: 86% were blending already, and around 60% anticipated blending 40% of courses by 2013. Bonk et al. (2006) considered these results to suggest that BL would be a lasting trend, which has so far been accurate. This research cast a wide net to grasp the current situation and make future predictions for BL; these were positive, but generally limited to North America.

A Delphi study including experts from around the world (North America, Asia Pacific, Europe and beyond) considered how BL could support collaborative learning (So & Bonk, 2010). These experts generally agreed that BL "offers unique opportunities for international collaboration" (So & Bonk, 2010, p. 197). They also suggested that new adopters will need examples of international collaboration to effectively navigate this and other complexities of BL (So & Bonk 2010). Though it is encouraging that experts are positive about international collaboration, this and other research omits both specific examples of BL collaboration and explanations as to why it is possible and advantageous.

In 2011 Barbour et al. asked researchers in more than 60 countries about their experiences in K-12 online and BL, creating country profiles for nations in six world regions. While these country profiles are thorough and informative, they do not allow comparison between nations or regions and prevent formation of a wide view of BL around the world.

Much in-depth research has been done on individual cases of BL worldwide (Boitshwarelo, 2009; Hoic-Bozic, Mornar, & Boticki, 2009; Llambi et al., 2011). Also a few examples of research have concentrated on a larger region. Tham and Tham (2013) analyzed BL in China, Japan, South Korea, and Singapore to reveal issues important to instructors and students in Asia— including culture, pedagogy, and design. More recently researchers have collected case studies from the Asia-Pacific region to facilitate sharing and support BL within and beyond the region (Lim & Wang, 2016). Similarly, Unwin (2005) presented principles for using ICT to train teachers in Africa. This research covers discrete contexts and does not seek to draw conclusions about what might be shared among regions.

Spring and Graham (2016) discovered a large discrepancy in the numbers of citations from different regions, with a strong bias toward North America. Because of this, international perspectives on BL outside of North America may not be fully represented in the existing citation pattern and thematic trends research. We felt that it is important to listen to and learn from the BL research happening in diverse contexts around the world. This research seeks to look at and compare BL research in seven worldwide regions by locating and comparing trends across the top-cited BL research in each individual region.

Research Questions

In order to compare BL research across regions, we asked the following research questions:

1. In each region, what methods of data analysis are described in the most cited articles?
2. In each region, what types of learners and levels of blending are described in the most -cited articles?
3. What terms are used for *blended learning* in the most-cited articles over time and across regions?
4. What themes are addressed in the most-cited articles? Does this differ across regions?
5. How do regions compare with one another and with the top-cited articles in the field in terms of data analysis, learner type, level of blending, terms, and themes?

Methods

Searching and Selection Procedure

The most-cited articles examined in this study were initially identified by Spring and Graham (2016) as the most-cited research articles, according to Google Scholar, focused on BL from each identified region. We included articles published by academic journals in English that were within our broad conception of the BL community, with BL as a central tenant of their research identified by the terms *blended* and/or *hybrid.* We searched for a broad set of terms in several databases in order to locate as many relevant articles as possible. Later we narrowed our returns with more specific inclusion criteria.

Source of publications.

The Education Resource Information Center (ERIC) was our primary database because it covers a large variety of topics on education literature. ERIC provides access to more than 1.4 million records beginning in 1996 (ERIC, 2014). For a more complete perspective we also included Academic Search Premier, Business Source Premier, CINAHL (Cumulative Index to Nursing and Allied Health Literature), and Education Full Text (H.W. Wilson). We chose these databases because of the large number of returns they provided in our initial search of all EBSCO databases, and because they provided a more varied sample of topics, including use of BL in business, health, and other disciplines outside of education (Halverson et al., 2012).

Search terms. Because BL is discussed in many works and is conceptualized in various ways, we ran an initially wide search of related terms. With the ERIC thesaurus capabilities, we searched for descriptors in general educational technology and distance education. We included specific BL phrases in the primary list to search titles, abstracts, keywords, and descriptors in Academic Search Premier, Business Source Premier, CINAHL, Education Full Text (H.W. Wilson), and ERIC:

> "blend* learn*," "blend* environment*," "blend* approach*," "blend* method*," "blend* course*," "blend* class*," "blend instruction," "blend program*," "hybrid learn*," "hybrid course*," "hybrid class*," "hybrid instruction*."

We narrowed our returns from the search for BL terms by adding regional terms. As shown in Figure 1, we divided the globe into seven regions: Africa, Asia, Europe, Latin America, the Middle East, North America, and Oceania. We began separating regions based on the United Nations' composition of regions (indices and data) and further delineated some based on cultural and linguistic boundaries. For example, we placed Mexico in Latin America, though it is usually a part of North America, because it is on the border of the regions and is a Spanish-speaking nation. We divided Western Asia from the rest of Asia and referred to it as the "Middle East," as we felt it was culturally and linguistically unique enough to be examined separately. The final delineations we followed for each region are shown in Figure 1.

We conducted individual searches for each region except North America, employing country names included in that region in addition to the name of the continent and/or region. In some situations, we added or removed short form names (e.g., searching for both *Democratic Republic of the Congo* and *Congo*). We searched for these terms within the full text to encompass any author affiliations (e.g., university) or the research location, and connected a publication with a region based on either criterion. We narrowed each search with blended terms: blend*, hybrid*, or (*online* AND *face-to-face*) to limit the returns to those most likely to be relevant. We also referred to the list of highly cited articles from Halverson et al. (2012) to ensure that none of those articles was overlooked. That list also provided the 10 most-cited articles for North America.

We searched for each relevant publication in Google Scholar to determine the number of citations it had as of June 18-21, 2013. Because of the large number of articles, the search spanned several days. Though some publications might have gained a few citations during that short period, we feel any such changes would be negligible when examining larger patterns. We updated the most-cited lists and citation counts using Google Scholar on March 10, 2016 and ranked publications by citation count to determine the 10 most-cited BL research articles. While it is not possible for Google Scholar (or any other current system) to produce completely accurate citation counts, we believe it has best suited our needs. We chose Google Scholar because the citation counts and the methods for compiling them are freely accessible, allowing for greater transparency and accuracy (Harzing, 2016; Publisher Support).

We included only English language articles in this research because the researchers are fluent only in English and were not able to confidently identify or analyze works in other languages. We acknowledge, unfortunately, excluding a section of the BL community because of our linguistic limitations. English is, however, the most common language of academic publishing (Blecher, 2007) and research citations (Breeze, 2015). We anticipate that our research could help highlight studies that, although written in English, are acknowledged less because they focus outside of the Anglophone center (Curry & Lillis, 2010; Lillis & Curry, 2010). We included only articles using the terms *blended* or *hybrid* because we were focused on the specific BL community, which we define as existing around these terms. Even authors who discuss important issues with the term *blended* (e.g., Oliver & Trigwell, 2005) use the term in some situations presumably because it is still used by others in the conversation (e.g., Holley & Oliver, 2010). We included work by authors who considered their work part of the BL field (by using the words *blended* or *hybrid)* and made BL (by the basic, broad definition of combining face-to-face and online learning) a central fixture of their work. Our criteria were created to draw some lines around what we see as the BL field, while remaining as inclusive as possible.

Our final list of top articles included 76 publications: 10 each from Asia, Africa, Europe, the Middle East, North America, and Oceania; six from Latin America (the total number of retrieved publications that fit the inclusion criteria); and 10 spanning multiple regions. We were surprised that we were not able to find more than six BL publications from Latin America. While it is possible that there is simply little BL or little BL research happening in the region, we did come across many publications in languages besides English (e.g., Spanish) when searching for Latin American publications. This suggests that authors in that region might have more opportunities to publish in a local language like Spanish or Portuguese and therefore publish less in English.

Figure 1. Map of the seven regions with which top articles were affiliated

Manuscript Coding

We began coding by using a priori categories to determine methods of data analysis (Question 1), types of learners, levels of blending (Question 2), and terms (Question 3) among the most-cited articles. Finally, we used open coding to identify themes in research questions and purposes (Question 4).

Thematic coding. We coded each top article using established codes for context, level of blend, and terminology (Table 1). Context coding categories originated from Graham (2006), and level of blend categories were taken from Halverson et al. (2012); these codes produce an overview of BL practice across regions. Terminology codes acknowledge use of the terms *blended* or *hybrid*, allowing us to examine accepted terms for BL worldwide. Each publication fit into only one code for each category. For example, a publication that would fit in the *blended* code but for a mention of *hybrid* would not be coded *blended* or *hybrid*, but only *blended+*.

Context	Level of Blend	Terminology
K-12	Activity	*Blended*
Higher ed	Course	*Hybrid*
Corporate	Program	*Blended+**
Multiple	Institution	*Both*
	Multiple	

Note: **Blended+* denotes a publication that primarily uses the term *blended* but also acknowledges the term *hybrid*. The reverse was also an option, but did not describe any of the top articles.

Table 1. A Priori Codes on the Context of Each Top Publication

We also coded each manuscript based on a priori codes from Drysdale, Graham, Spring, and Halverson (2013) and Halverson et al. (2014, Table 2). To verify reliability of the codes and agreement between coders two trained researchers independently coded 30% of the manuscripts. We selected Cohen's kappa because it considers chance agreement (Cohen, 1960). After training with an initial 20% and attaining a Cohen's kappa score of .69 (substantial), the coders achieved a final score on 10% of the manuscripts of .88 (almost perfect) through discussion and clarification of the codes before independent coding and comparison. The overall kappa achieved was .75 (substantial; Landis & Koch, 1977). Further coding was completed by one of the trained coders once we were confident that the codes were sufficiently objective and the coder could organize the manuscripts appropriately. Another coder was available for verification if questions arose.

Code	Description	Methods
Inferential	Goes beyond initial data to make generalizations beyond the available population	ANOVA, Chi-Square, T-tests, P-value, factory analysis
Descriptive	Identifies themes/patterns with descriptive statistics	Means, medians, standard deviations, codes
Qualitative	Focuses on interpretation of data	Case study, quotations, interviews, focus groups, open-ended surveys
Non-empirical	Forms an argument without empirical data	Literature review, model, theoretical discussion, position, explanation
Gold Star	Combines empirical and non-empirical methods to build and test a theory.	

Table 2. A Priori Codes on Data Analysis Methods

Open coding. We extracted and identified themes in the research questions or purpose statements from each article, loosely following coding schemes from Drysdale et al. (2013) and Halverson et al. (2014). To establish trustworthiness, an independent coder reviewed each placement and suggested adjustments.

Limitations

The main limitation of this research is that we included only articles published in English—an unfortunate result of our linguistic weakness. Also, we covered only a small portion of the totality of articles on BL published around the world. We chose those that were the most-cited, considering those to be the most impactful, but future research could look more broadly at all of the articles in the field or all of the articles on BL in a given region or country for a more complete examination. While we believe that our coding methods were sufficiently rigorous, additional coders can always add further reliability.

Results and Discussion

This research presents a snapshot of BL contexts and themes worldwide.

Methodological Patterns

We coded every article for data analysis methods (Figure 2), placing it in as many analysis methods categories as necessary; thus, the total is above 100%. Descriptive data analysis (60.5%) was the most common type applied in the most-cited articles, though usually in conjunction with other forms of analysis like inferential (18.4%) and qualitative (17.1%). Only 10.5% of the top articles used descriptive methods alone. Non-empirical analysis was found in 19.7% of the top articles; it was the least likely of the methods to be combined with others—which occurred in only seven manuscripts (9.2%). These seven manuscripts constitute our "gold star" category: articles employing both empirical and non-empirical methods and therefore building theory as well as testing it.

We found a healthy mix of data analysis methods among the regions. The Middle East outnumbered other regions in inferential methods (25.8%) and descriptive (18.2%) studies—the highest percentages for both methods—though those methods were implemented considerably worldwide. Top articles from Europe presented the most theoretical analyses (20.0%), possibly because these articles are generally older and more highly cited than those from other regions, and theoretical articles may prove more relevant than others with the passage of time. Fewer articles from Asia focused on theory (13.3%), but a higher proportion combined theory with empirical data to qualify for the "gold star category" (three articles, 25.0% of the gold stars); no North American or Latin American articles met the "gold star" criterion. Rigorous research methods had been used in the most-cited articles regardless of region, and while regions presented preferences for certain methods, none clearly avoided any particular form of analysis. This suggests that no region should have particular issue with the research methods of any other when evaluating top cited research.

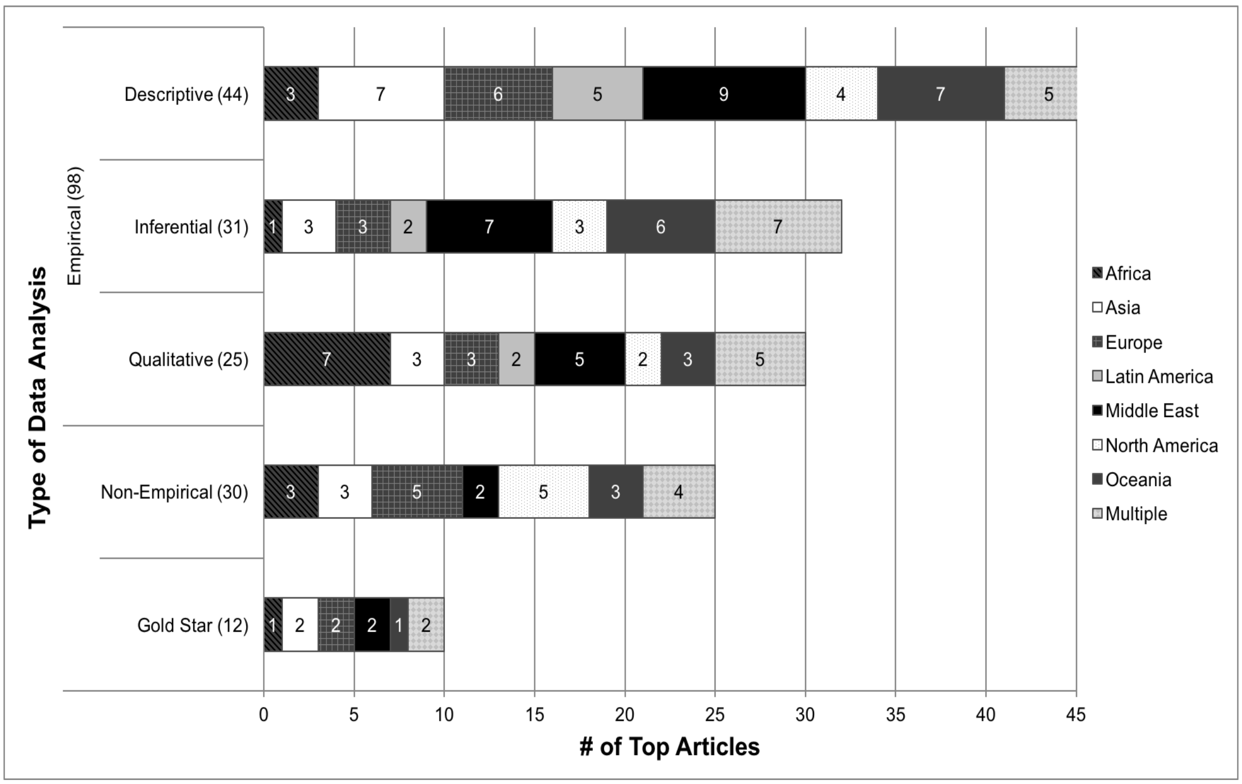

Figure 2. Data analysis methods applied by top-cited blended learning articles differentiated by region. For Latin America N=6; for all other regions N=10.

Learner Type

We saw a focus on higher education (Figure 3), which, reflecting earlier findings, was dominated by North America (Halverson et al., 2012). The fact that our criteria specified research articles—which are often produced by professors and graduate students who have experience with and access to secondary students—likely influenced this. We noted some promising interest in corporate blending in half of the regions, as well as K-12 in three regions. As the top-cited articles in the regions share a common interest in higher education with a smattering of activity in other contexts, learner types should not be a hindrance to international transfer or collaboration in the community.

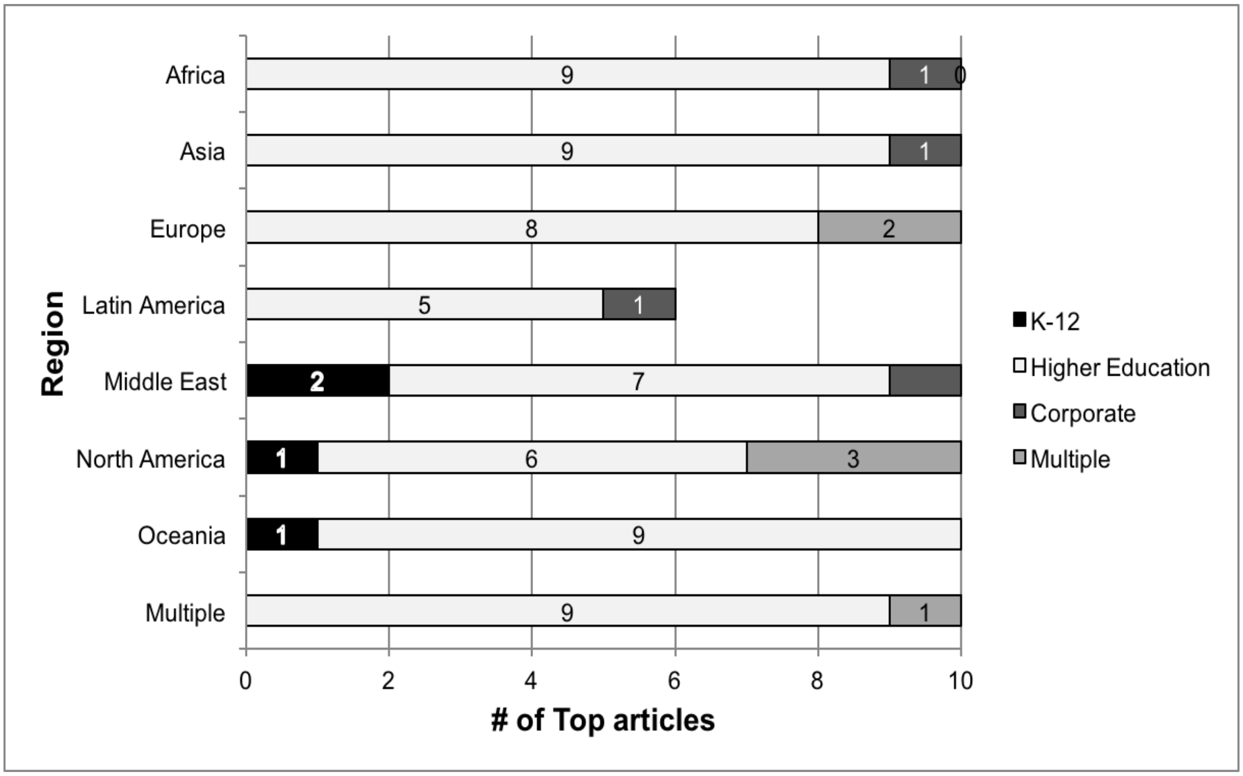

Figure 3. A comparison of regions (y-axis) based on the type of learners featured in each top article

Level of Blend

The majority of articles in almost every region treated course-level blending (Figure 4). We found a strong focus on multiple levels in North America, likely due to several papers focused on the practicalities of blending in general. We saw, however, a much stronger mix in this area than in learner type. Africa presented the most diverse landscape, including all four levels, while Oceania and Asia presented three levels each. Africa may include so much diversity because of its more recent development of BL compared to more established regions, which might allow for greater flexibility and exploration. In this regard, all regions focused mostly on courses and should not be inhibited from sharing or cooperating because of the level of blending practiced or researched.

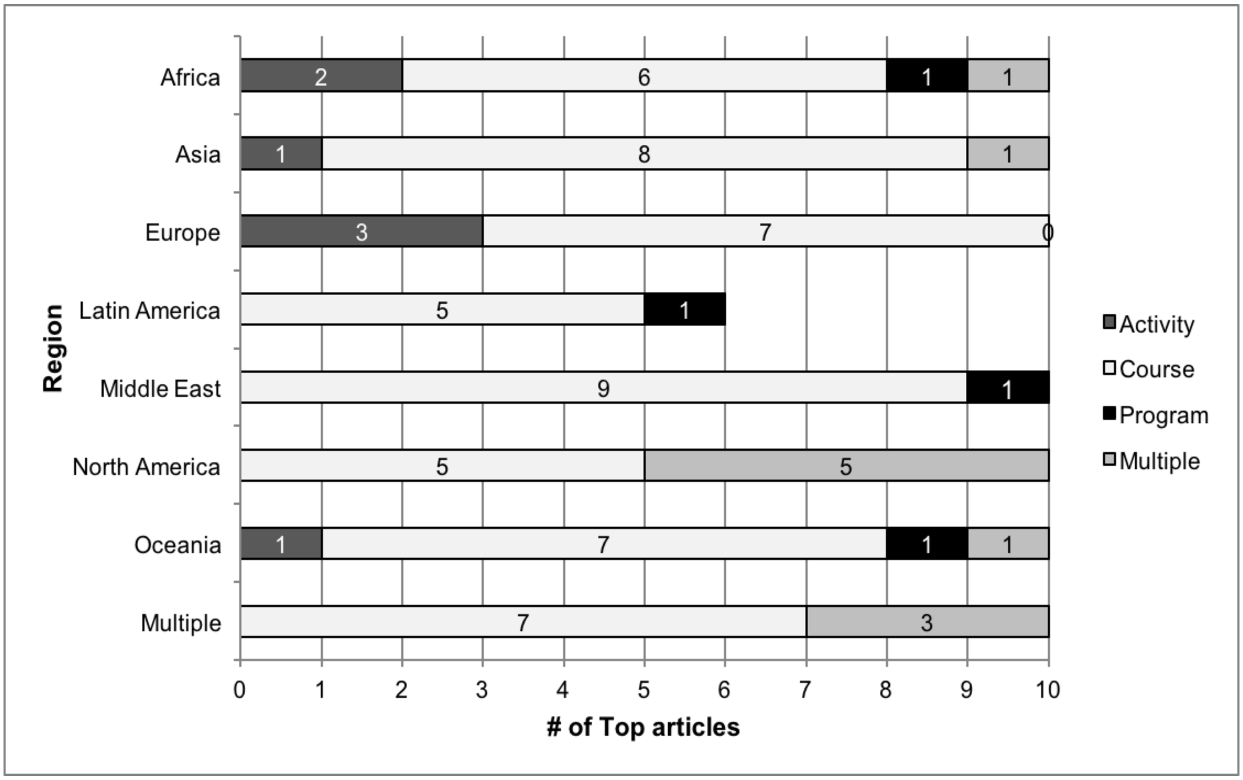

Figure 4. A comparison of regions (y-axis) based on the levels of blending featured in top articles

Terms for Blending

The definition and appropriate term for *blended* learning are still regularly debated (Oliver & Trigwell, 2005; Graham, 2013). The fact that regions differ in the way they understand (a) what blended learning is or (b) what combining online and face-to-face instruction should be called could be a major issue preventing connections between regions. In our searches for the most-cited articles, we were at first limited to the terms that we knew, but we compared the terms in the articles to search for differences among regions. Every region has strongly favored blended, especially as time has passed. Blended is currently the most prevalent term, and has been for several years (Figure 5). The earliest top-cited article (from 2002) used only *hybrid*. Blended became most popular in 2003 and has dominated the field since. More recently, emphasizing *blended* while acknowledging *hybrid* as another name for the same construct has gained acceptance; hybrid is rarely used alone. In more recent years the term hybrid has been used less and less. This decrease could relate to the wide use of the word *hybrid* in other fields.

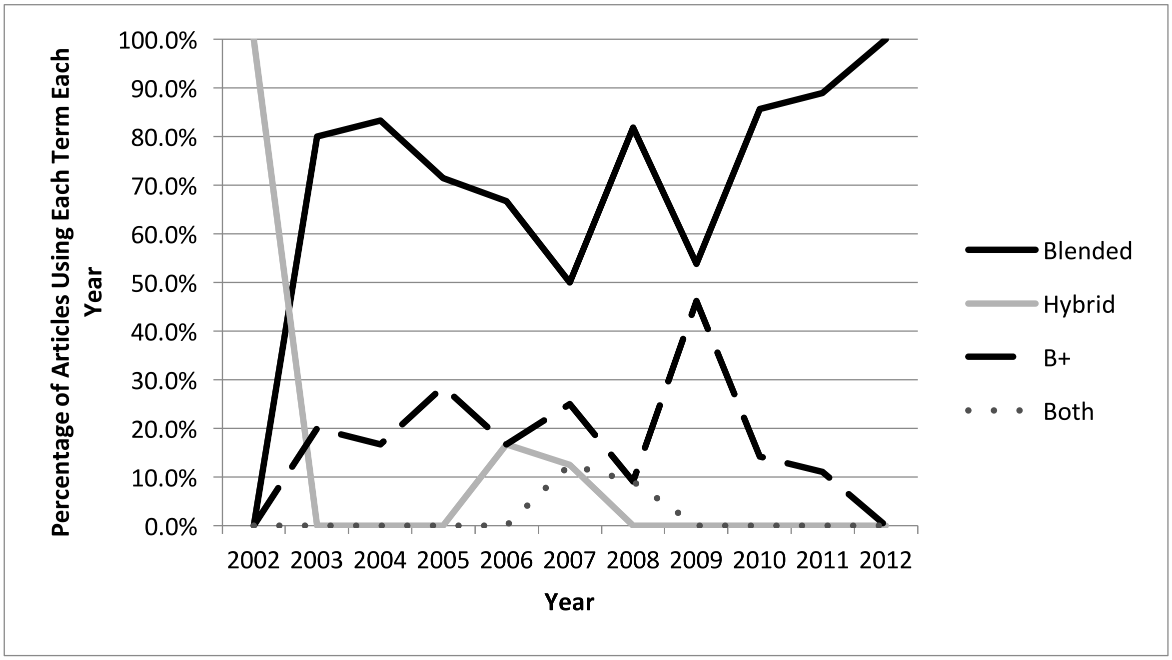

Figure 5. Comparison of blended/hybrid learning terms over time (x-axis). Each term is represented according to the percentage of articles using it each year (y-axis).
Note: **Blended+* denotes a publication that primarily uses the term *blended* but also acknowledges the term *hybrid*. The reverse was also an option, but did not describe any of the top articles.

Research Questions

Open coding of research questions generated nine primary categories, several of them divided into subcategories (Table 3). Each article supplied one or more research questions or statements expressing purpose and was placed into as many categories as appropriate; therefore, the number of articles totals more than 76, and the percentages total over 100.

Topic	#	%	Subtopics
Learner outcomes	32	42.1%	Cognitive, affective, behavioral
Instructional design	24	31.6%	Models and theories, measurement, best practices, and implementation
Disposition	21	26.4%	Student/faculty perceptions, experience, intention, preferences
Exploration	16	21.1%	Single case, position, discipline specific, literature review, multiple case
Technology	16	21.1%	Tools, disposition, access
Interaction	8	10.5%	Student-student, multiple
Regional	8	10.5%	-
Comparison	6	7.9%	Blended/online, Blended/F2F, Blended/F2F/online
Other	4	5.3%	future, open educational resources, professional development

Table 3. Primary Topics Addressed by Research Questions and Purpose Statements of the Top Articles

Learner outcomes. Learner outcomes, the most common category, was found in 42.1% of the top articles (Table 4). It was also the most prevalent category in Drysdale et al. (2013; 51.7%), a study of graduate BL research, and was the fourth-ranked category in Halverson et al., a study of top-cited BL research (2014; 28.2%). Halverson et al. suggested this difference in ranking may be due to differences between data collected by graduate students, who often focus narrowly, and top cited articles, which focus more broadly. The top-cited international BL research in the current study encompasses a wider range of contexts—from the burgeoning to the more established. While novice researchers explore individual cases, more established researchers are building on earlier exploration to examine the field with more breadth.

Focus on learner outcomes is understandable, as a growing field like BL must prove itself useful through "superior learning outcomes" (Means, Murphy, Bakia, & Jones, 2009, p. 9). We divided the questions about learner outcomes into cognitive, affective, and behavioral categories. Like Halverson et al. (2014) and Drysdale et al. (2013), cognitive outcomes, which they referred to as *performance outcomes*, was the most common topic. Because cognitive outcomes are highly regarded and are the simplest to measure, they are useful for an expanding field like BL. Affective outcomes, which Halverson et al. (2014) and Drysdale et al. (2013) divided further, came next in all three data sets, though earlier percentages were higher than those of this study. Student and faculty satisfaction and experience has been an important consideration in distance and blended education (Allen, Bourhis, & Burrell, 2010; So & Brush, 2008) for both institutions and instructors (Porter, Graham, Spring, & Welch, 2014). While our top articles addressed each of the major learning outcome domains (Bloom, Krathwohl, & Masia, 1956), the clear preference was for cognitive and affective outcomes. The most-cited articles in each region agree with one another, with the top-cited articles overall, and with up-and-coming research in North America about the importance of learner outcomes. This is a point of consensus for the BL community.

Subtopic	#	%	Example research question
Cognitive	20	26.3%	El-Deghaidy & Nouby (2008): "What is the effectiveness of a BeLCA on PSTs' achievement levels in a science teaching?" (p. 991)
Affective	8	10.5%	DeGeorge-Walker & Keeffe (2010): "The design is then evaluated using a mixed methodology in which the students' voices illuminate their experiences of blended learning unit design with regards to engagement, learning and self-determination" (p. 1).
Behavioral	4	5.3%	Peixoto, Peixoto, & Alves (2012): "This study aimed to investigate the learning habits and strategies of undergraduate and post-graduate students matriculated in hybrid courses in the area of healthcare at a Brazilian university" (p. 551).

Table 4. Subtopics of the Primary Topic Learner Outcomes: 32 manuscripts, 42.1% of total

Instructional Design. The second most researched topic, instructional design, was addressed in 31.6% of the top articles (Table 5). This finding is understandable for a field like BL which involves consistent development and exploration of new designs. The most common subtopic, found in 14.5% of the top BL articles worldwide, was models and theories (see Graham, 2013); manuscripts were coded this way only if we could identify the model or theory to which they referred. Of the 11 manuscripts discussing BL models and/or theories in research questions or purposes, no theory was represented multiple times. Europe supplied the most articles discussing a model or theory (36.4%), possibly because articles from Europe tend to be older and more highly cited, and theory articles are more likely to be relevant for many years.

The third ranked subtopic, *best practices,* appeared in 5.3% of the articles. Best practices are of particular interest to a developing field like BL as institutions and individuals navigate the adoption process. Discussion of best practices was fairly even across the regions, but the scope of the contexts varied. Unwin (2005) presented best practices for BL in Africa generally, while others, like Mortera-Gutierrez (2006), Precel, Eshet-Alkalai and Alberton (2009), and Sife, Lwoga, and Sanga (2007) gleaned their best practice recommendations after examining specific countries or institutions. While *best practices* are of interest, there is divergence on the methods for discovering them.

Consideration of BL *implementation* was also 5.3% in the top articles, which is consistent with the findings of Halverson et al. (2014; 5.9%) and Drysdale et al. (2013; 3.5%). Some works, such as Porter et al. (2014), which consider the shift from early BL adoption to institutional implementation, have begun to fill this gap.

Subtopic	#	%	Example research question
Model/theory	11	14.5%	Akyol & Garrison (2011): “The main research question is whether online and blended collaborative communities of inquiry can create cognitive presence that supports higher-order learning processes and outcomes” (p. 234).
Measurement	5	6.6%	Ozkan & Koseler (2009): “The purpose of this research is to develop a comprehensive e-learning assessment model using existing literature as a base, incorporating concepts from both information systems and education disciplines” (p. 1285).
Best practices	4	5.3%	Unwin (2004): “This paper . . . outlines a possible framework for the successful implementation of teacher training programmes that make advantageous use of appropriate ICTs. It argues that six fundamental principles of good practice must be addressed for such programmes to be effective” (p. 113).
Implementation	4	5.3%	Ocak (2011): “The purpose of this study, therefore, was to investigate impediments faculty members face while teaching blended courses” (p. 689).

Table 5. Subtopics of the Primary Topic Instructional Design: 24 Manuscripts, 31.6% of Total

Dispositions. Of the most cited BL articles worldwide, 27.6% discussed dispositions: perceptions, experiences, intensions, and preferences (Table 6). A majority focused on students, with only 3.9% researching faculty perceptions. This is consistent with Halverson et al. (2014) and Drysdale et al. (2013). Faculty, understandably focused on their students, conduct a majority of this research. However, institutions seeking to implement BL on a larger scale are more successful when supporting and recognizing faculty needs (Porter et al., 2014). Almost half the manuscripts that inquired about student or faculty perceptions were from the Middle East, which suggests a strong interest there from which researchers in other regions with an interest in perceptions could benefit.

Subtopic	#	%	Example research question
Student perceptions	14	18.4%	Precel, Eshet-Alkalai, & Alberton (2009): "The present evaluation study focuses on students' perceptions of pedagogical and design issues related to a new model for blended learning" (p. 1).
Faculty perceptions	3	3.9%	Oh & Park (2009): "What are the faculty attitudes toward and perceptions of blended instruction?" (p. 328)
Experiences	2	2.6%	Ellis, Goodyear, O'Hara et. al (2007): "How do students experience the combination of face-to-face and online discussions? Do all students experience them in ways that support their learning?" (p. 84)
Intentions	1	1.3%	Ellis, Goodyear, Prosser et. al (2006): "A combination of open-ended questionnaires and semi-structured interviews was used to investigate students' conceptions of what they were learning, their intentions and their approaches to learning through discussion" (p. 244).
Preferences	1	1.3%	Pearson & Trinidad (2005): "In this paper, we report on the design and development of the Online Learning Environment Survey (OLES), an instrument which can be used to gather and represent data on students' 'actual' (experienced) and 'preferred' (ideal) learning environments" (p. 396).

Table 6. Subtopics of the Primary Topic Disposition: 21 Manuscripts, 27.6% of Total

Exploration. Among the top articles, 19.7% were exploratory: describing individual or multiple cases of BL, taking a position on BL, focusing on a specific discipline, or reviewing the literature (Table 7). Single case descriptive was the largest subcategory (9.2%) of the total manuscripts. Exploratory articles made up almost one-third of those found from Latin America (30.0%) and North America (30.8%), though Latin American articles focused on single cases while North American articles focused elsewhere. Top Latin American articles may focus on single cases because they tend to have been published more recently, and that type of research provides a strong exploratory foundation. As research progresses over time, as it has in North America, it might make more sense to focus on other types of exploration, like comparing several cases or blending within a specific discipline.

This category was not present in Drysdale et al. (2013), likely because graduate committees require specific research questions, but was even larger than this study in Halverson et al. (2014; 29.4%), likely because such descriptive pieces apply widely and garner many citations. Their exploratory category did not include single or multiple descriptive cases, likely because these are most useful in the very early stages of a field's development and citations drop off quickly as more overarching pieces become available.

This is one area where regions differ, splitting into two groups. Africa, Asia, Europe and Latin America supplied at least one single case descriptive each, while the other regions had none in their most-cited lists. Articles from North America, Oceania, and articles concerning multiple regions each supplied research about multiple cases or a literature review, while the other regions did not. Research in the regions focusing recently on individual cases might use top-cited articles from other regions as examples of how to progress to comparing multiple cases, to using a wider context to understand more about their region as a whole, or to viewing multiple regions from a new perspective.

Subtopic	#	%	Example research question
Single case	7	9.2%	Boitshwarelo (2009): "The specific aim of this paper is to give an account of a case study that used a blended learning approach in the context of science teacher professional development" (p. 4).
Position	4	5.3%	Bhattacharya & Sharma (2007): "The purpose of this paper is to make a strong case for investing in information and communication technologies (ICT) for building up of quality human resource capital for economic upliftment of India" (p. 543).
Multiple case	2	2.6%	Picciano & Seaman (2007): "The purpose of this study was to explore the nature of online learning in K–12 schools and to establish base data for more extensive future studies" (p. 13).
Discipline-specific	2	2.6%	Ruiz, Mintzer & Leipzig (2006): "The authors provide an introduction to e-learning and its role in medical education by outlining key terms, the components of e-learning" (p. 207).
Literature review	1	1.3%	Bliuc, Goodyear, & Ellis (2007): "The discussion of studies below is used to provide a representative summary of categories of research into blended learning, for the purpose of moving the field forward" (p. 232).

Table 7. Subtopics of the Primary Topic Exploration: 16 Manuscripts, 21.1% of Total

Technology. Technology (Table 8) was covered in almost one in five of the top BL articles worldwide (21.1%). The largest subcategory was tools, which is comparable to the "types of" subtopic that Halverson et al. (2014) and Drysdale et al. (2013) employed. The 17.1% here was higher than the percentage in the aforementioned projects (3.5% and 2.9% respectively). While most regions supplied a top-cited article discussing tools, Africa and Asia had the most, as well as the largest variety. Top African papers studied chats, social media, and podcasts, while Asian articles looked at forums and blogs, short message service (SMS), and social media. The tools most commonly discussed were SMS and social media, featured in publications from both Asia and Africa. Research covered a wide range of technological types and complexity, including USB-delivered content (Garrote, Pettersson, & Christie, 2011) in Latin America; live chats in South Africa (Cox, Carr, & Hall, 2004); and video in Turkey (Kırkgöz, 2011).

Discussion of tools is one aspect on which the regions seem to differ. While each region showed an interest in tools, the specific tools discussed were different ones. This is likely connected to the available and popular technology in each locale. Rather than a weakness in collaboration, this could be a strength. Many tools are available, and as a wide variety is being tested around the world, those interested in learning from research in a region that has more experience using a particular tool would find it efficient to become familiar with use of the tool before adopting it.

Subtopic	#	%	Example research question
Tools	13	17.1%	Ng'ambi & Lombe (2012): "The study reported in this paper aimed at developing a framework for integrating podcasts into the curriculum" (p. 182).
Disposition	2	2.6%	Garrote, Petersson, & Christie (2011): "The purpose of this study is to investigate the attitudes of third world engineering educators towards the LUME method and the use of OER in order to determine if the LUME method can contribute to making computer aided education more accessible worldwide" (p. 623).
Access	1	1.3%	Prinsloo & VanRooyen (2007): "How many students have access to computers? What type of computers? What computer skills do students have? How many students have access to the Internet?" (p. 54)

Table 8. Subtopics of the Primary Topic Technology: 16 Manuscripts, 21.1% of Total

Interaction. We found that 10.5% of the manuscripts discussed interaction (Table 9). As in the 4.7% found by Halverson et al. (2014), the emphasis was on student-student interaction (6.6%). The majority of these articles originated in Africa. Drysdale et al. (2013) also found several instances of research on student-instructor interaction with 8.3%, although this study found none. Our findings agreed with both previous projects; all lacked focus on student-content interaction, though we analyzed one article that included it lightly (Bernard et al., 2009). Interaction is an important possible benefit of BL (Bernard et al., 2009; Dziuban, Moskal, & Hartman, 2005), and we were surprised by the limited focus on all forms of it in this and in previous projects.

Subtopic	#	%	Example research question
Student-student	6	7.9%	Hall & Davison (2007): "To what extent can blog technology serve as a means of encouraging interaction between students in a module cohort? What are the consequences of this interaction in terms of peer learning and peer support?"(p. 165)
Multiple	2	2.6%	Bernard, Abrami, & Brorokhovski et al. (2009): "What are the effects of the three kinds of interaction (SS [student-student], ST [student-teacher], and SC [student-content]) on achievement?" (p. 1249)

Table 9. Subtopics of the Primary Topic Interaction: 8 Manuscripts, 10.5% of Total

Comparison. Only 9.2% of the top articles focused on comparison (Table 10), a much lower percentage than found by either Drysdale et al. (2013; 21.5%) or Halverson et al. (2012; 17.6%). Across all regions, only North America supplied more than one paper with a comparative focus.

Subtopic	#	%	Example research question
Blended/F2F	3	3.9%	Chandra & Lloyd (2008): "This paper maps the achievements in Year 10 Science of two cohorts of students over two years where students in the first year studied in a traditional environment while students in the second took part in a blended or e-learning environment" (p. 1087).
Blended/F2F/ online	2	2.6%	Brown & Liedholm (2002): "Do students enrolled in online courses learn more or less than students taught face to face?" (p. 444)
Blended/online	1	1.3%	Akyol & Garrison (2011): "The main research question is whether online and blended collaborative communities of inquiry can create cognitive presence that supports higher-order learning processes and outcomes" (p. 234).

Table 10. Subtopics of the Primary Topic Comparison: 6 Manuscripts, 7.9% of Total

Regional issues. One of the motivations for this research was the limited interest in international issues (Table 11) found by Drysdale et al. (2013; 1.0%) and Halverson et al. (2014; 2.4%). The current research sought regional issues and exceeded earlier percentages at 9.2%; this is still a small proportion of articles, considering the diversity of contexts. Our result may be partially due to difficulties in identifying unique attributes of one's own experience. Also, authors might identify with the particular qualities of their own institutions rather than with their countries or regions. Most researchers do not seem to be particularly focused on their region, which suggests that they may be open to sharing information with other researchers regardless of the context they study.

Unique topics. We found two unique topics: future predictions (2.6%) and professional development (1.3%) (Table 11). Future directions did not appear in Drysdale et al. (2013), likely because of the nature of graduate research, but was found in 10.6% of the articles analyzed in Halverson et al. (2014). Professional development was discussed more often, but was still reported infrequently by Drysdale et al. (7.3%), though more than by Halverson et al. (3.5%). Professional development is important for many faculty members wishing to adopt BL and improve their skills (Porter et al., 2014), and we were surprised to find it so rarely examined.

Subtopic	#	%	Example research question
Regional	8	10.5%	Bozalek & Biersteker (2010): "This article examines the value of Participatory Learning and Action (PLA) techniques for the education and training of health and human service professionals given the legacy of apartheid and the deepening poverty and inequality of contemporary South Africa" (p. 551-2).
Future predictions	1	1.3%	Kim & Bonk (2006): "In particular, the study makes predictions regarding the changing roles of online instructors, student expectations and needs related to online learning, pedagogical innovation, and projected technology use in online teaching and learning" (p. 23).
Professional development	1	1.3%	Botishwarelo (2009): "The specific aim of this paper is to give an account of a case study that used a blended learning approach in the context of science teacher professional development" (p. 4).

Table 11. Subtopics of the Primary Topic "Other": 11 Manuscripts,14.5% of Total

The topics of research questions are spread fairly evenly across the regions (Figure 6). Only Oceania and the Middle East focused more than 40.0% of questions in a single category—learning outcomes (43.8%) and disposition (42.1%), respectively. These may be areas of strength within these regions from which researchers in other places might benefit. R*egional issues* were dominated by only one region—Africa (57.1%). This was a very small category, but might have been a focus in Africa because that area may face more challenges with technology and educational development than many other regions. The research question data are similar to data on learner type, context, and terms. There are only small regional differences, as noted in our discussion of each topic. This finding suggests that researchers worldwide are interested in the same general issues as one another and as the top researchers in the community despite their distinct locations.

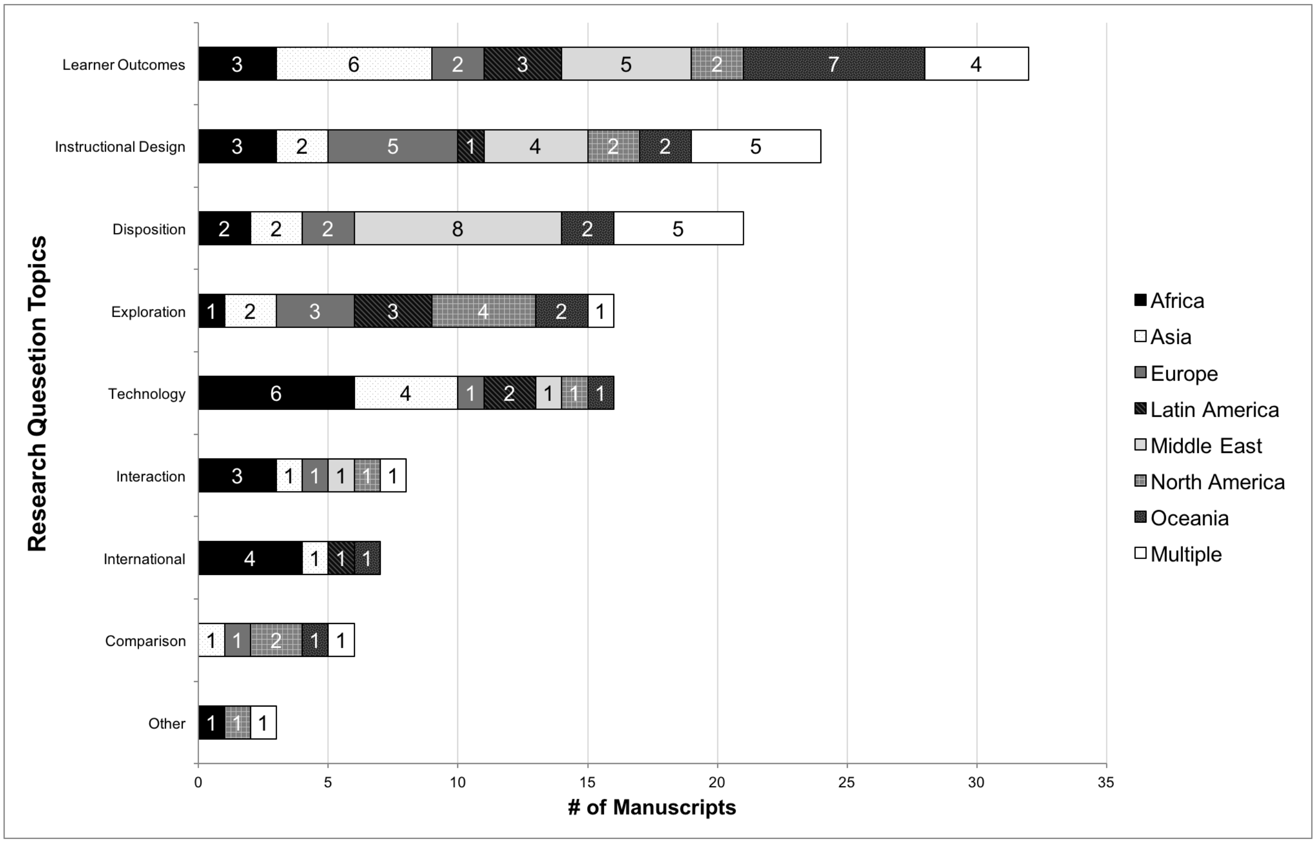

Figure 6. Major topics of research questions by region. For Latin America N=6; for all other regions N=10.

Conclusions

We classify this project as *explore* research that can serve as a basis for later *explain* and *design* research studies; specifically, the purpose of this research was to "define and categorize" (Graham, Henrie, & Gibbons, 2014, p. 16) the most-cited BL research from around the world. Our purpose was to explore the contexts, methods, and focus of the most impactful BL conversations taking place globally. The goal of this research was to begin to answer questions about commonality among regions and commonality of regions with the community as a whole raised by disparate citation patterns. Do the regions of the world have more in common with North America than they do with other regions regardless of proximity? To do this we analyzed data analysis methods, learner types, levels of blending, terms, and themes of the 10 most-cited articles in each of the seven regions of the world and compared them to one another and to the top-cited articles overall.

Though we can only present a snapshot of the field, we believe approximate findings are a valuable starting point. Although Spring and Graham (2016) found a large divergence in citation patterns among regions and a low level of collaboration involving multiple regions, we found strong similarities in BL research processes, practice, terminology, and focus. These similarities suggest that different interests and concerns in each region need not hinder connection and transfer among researchers worldwide. Considering the top-cited articles, these characteristics are more alike than unlike among regions. Small differences were found in examining the top articles in each region and the top articles in general as analyzed by Halverson et al. (2012), but they follow basically similar patterns, indicating that the most-cited articles from around the world could fit well within the topical, research, and publication practices of the field at large. Our results suggest that although different regions must have some of their own nuances and needs, they have much in common and considerable potential to learn from one another and even collaborate on shared interests. This review of the most-cited publications can serve as a step in such directions by demonstrating how much the different regions have in common and presenting the most influential BL articles throughout the world. We recommend that as a community BL scholars and practitioners make an effort to connect with others in the field, regardless of location, and use the research that is published worldwide to improve their study and practice of BL. Researchers of BL share many interests and contexts and likely can learn much from each other across geographical regions.

Future research might include a more in-depth analysis of each region, ideally in a way that would allow for further comparison between regions. It might also look at insights to be gained from discussions with involved researchers about the current state of the field around the world. Additionally, more research is needed concerning the themes of BL publications in languages besides English, with the potential to delve further into more linguistically diverse areas of the community to present a more complete picture.

References

2012 World Open Educational Resources Congress. (2012). 2012 Paris OER Declaration. (pp. 1–2). Paris. Retrieved from http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/CI/CI/pdf/Events/Paris OER Declaration_01.pdf

Akyol, Z., & Garrison, D. R. (2011). Understanding cognitive presence in an online and blended community of inquiry: Assessing outcomes and processes for deep approaches to learning. *British Journal of Educational Technology, 42*(2), 233–250.

Allen, I. E., & Seaman, J. (2014). Opening the curriculum: Open educational resources in U.S. higher education (pp. 1–49). Babson Survey Research Group and Pearson. Retrieved from http://www.onlinelearningsurvey.com/reports/openingthecurriculum2014.pdf.

Allen, M., Bourhis, J., & Burrell, N. (2010). Comparing student satisfaction with distance education to traditional classrooms in higher education: A meta-analysis. *American Journal of Distance Education*, 16(2), 83–97.

Barbour, M., Brown, R., Waters, L. H., Hoey, R., Hunt, J. L., Kennedy, K., . . . Trimm, T. (2011). *Online and blended learning: A survey of policy and practice of K-12 schools around the world*. *Regional Association for K-12 Online Learning* (1–128). Vienna, VA.

Belcher, D. D. (2007). Seeking acceptance in an English-only research world. *Journal of Second Language Writing*, *16*(1), 1-22. http://doi.org/10.1016/j.jslw.2006.12.001

Bernard, R. M., Abrami, P. C., Borokhovski, E., Wade, C. A., Tamim, R. M., Surkes, M. A., & Bethel, E. C. (2009). A meta-analysis of three types of interaction treatments in distance education. *Review of Educational Research*, 79(3), 1243–1289.

Bhattacharya, I., & Sharma, K. (2007). India in the knowledge economy–An electronic paradigm. *International Journal of Educational Management*, *21*(6), 543–568. doi:10.1108/09513540710780055

Bliuc, A.-M., Goodyear, P., & Ellis, R. A. (2007). Research focus and methodological choices in studies into students' experiences of blended learning in higher education. *The Internet and Higher Education*, *10*(4), 231–244. doi:10.1016/j.iheduc.2007.08.001

Bloom, B., Krathwohl, D., & Masia, B. (1956). Taxonomy of educational objectives: The classification of educational goals (II). New York, NY: David McKay Co.

Boitshwarelo, B. (2009). Exploring blended learning for science teacher professional development in an African context. *International Review of Research in Open and Distance Learning*, *10*(4), 1–19.

Bonk, C. J., & Graham, C. R. (Eds.). (2006). *Handbook of blended learning: Global perspectives, local designs*. San Francisco, CA: Pfeiffer Publishing.

Bonk, C. J., Kim, K.-J., & Zeng, T. (2006). Future directions of blended learning in higher education and workplace learning settings. In C. J. Bonk & C. R. Graham (Eds.), *The handbook of blended learning: Global perspectives, local designs* (pp. 550–567). San Francisco, CA: Pfeiffer Publishing.

Bozalek, V., & Biersteker, L. (2010). Exploring power and privilege using participatory learning and action techniques. *Social Work Education*, *29*(5), 551–572. doi:10.1080/02615470903193785

Breeze, R. (2015). Citing outside the community? An investigation of the language of bibliography in top journals. In Alastrué, R. P. & Pérez-Llantada, C. (Eds.), *English as a Scientific and Research Language: Debates and Discourses English in Europe*, 37-58. Berlin: Walter de Gruyter.

Brown, B. W., & Liedholm, C. E. (2002). Can web courses replace the classroom in principles of microeconomics? *The American Economic Review*, *92*(2), 444–448. doi: 10.1257/000282802320191778

Chandra, V., & Lloyd, M. (2008). The methodological nettle: ICT and student achievement. *British Journal of Educational Technology*, *39*(6), 1087–1098. doi:10.1111/j.1467-8535.2007.00790.x

Cohen, J. (1960). A coefficient of agreement for nominal scales. *Educational and Psychological Measurement*, 20(1), 37–46.

Collis, B., & van der Wende, M. (2002). Models of technology and change in higher education: An international comparative survey on the current and future use of ICT in higher education. Enschede, Netherlands: Center for Higher Education Policy Studies, University of Twente.

Cox, G., Carr, T., & Hall, M. (2004). Evaluating the use of synchronous communication in two blended courses. *Journal of Computer Assisted Learning*, *20*(3), 183–193.

Curry, M. J., & Lillis, T. M. (2010). Academic research networks: Accessing resources for English-medium publishing. *English for Specific Purposes*, *29*(4), 281–295. http://doi.org/10.1016/j.esp.2010.06.002

DeGeorge-Walker, L., & Keeffe, M. (2010). Self-determined blended learning: A case study of blended learning design. *Higher Education Research & Development*, *29*(1), 1–13. doi:10.1080/07294360903277380

Drysdale, J. S., Graham, C. R., Spring, K. J., & Halverson, L. R. (2013). Analysis of research trends in dissertations and theses studying blended learning. *Internet and Higher Education*, *17*(1), 90–100.

Dziuban, C., Moskal, P., & Hartman, J. (2005). Higher education, blended learning and the generations: Knowledge is power: no more. In J. Bourne & J. C. Moore (Eds.), Elements of quality online education: Engaging communities (pp. 85–100). Needham, MA: Sloan-C.

EL-Deghaidy, H., & Nouby, A. (2008). Effectiveness of a blended e-learning cooperative approach in an Egyptian teacher education programme. *Computers & Education*, *51*(3), 988–1006. doi:10.1016/j.compedu.2007.10.001

Ellis, R., Goodyear, P., O'Hara, A., & Prosser, M. (2007). The university student experience of face-to-face and online discussions: Coherence, reflection and meaning. *Alt-J: Research in Learning Technology*, *15*(1), 83–97. doi:10.1080/09687760601130057

Ellis, R., Goodyear, P., Prosser, M., & O'Hara, A. (2006). How and what university students learn through online and face-to-face discussion: Conceptions, intentions and approaches. *Journal of Computer Assisted Learning*, *22*(4), 244–256. Retrieved from http://onlinelibrary.wiley.com/doi/10.1111/j.1365-2729.2006.00173.x/full

Garrote, R., Pettersson, T., & Christie, M. (2011). Live USB mediated education: A method to facilitate computer-supported education. *Australasian Journal of Educational Technology*, *27*(4), 619–632.

Graham, C. R. (2006). Blended learning systems: Definition, current trends, and future directions. In C. J. Bonk & C. R. Graham (Eds.), *Handbook of blended learning: Global perspectives, local designs* (pp. 3–21). San Francisco, CA: Pfeiffer Publishing.

Graham, C. R., Henrie, C. R., & Gibbons, A. S. (2014). Developing models and theory for blended learning research. *Blended learning: Research perspectives*, *2*, 13-33.

Hall, H., & Davison, B. (2007). Social software as support in hybrid learning environments: The value of the blog as a tool for reflective learning and peer support. *Library & Information Science Research*, *29*(2), 163–187. doi:10.1016/j.lisr.2007.04.007

Halverson, L. R., Graham, C. R., Spring, K. J., & Drysdale, J. S. (2012). An analysis of high impact scholarship and publication trends in blended learning. *Distance Education*, *33*(3), 381–413.

Halverson, L. R., Graham, C. R., Spring, K. J., Drysdale, J. S., & Henrie, C. R. (2014). A thematic analysis of the most highly cited scholarship in the first decade of blended learning research. *The Internet and Higher Education*, *20*, 20–34.

Harzing, A.-W. Google Scholar as a new data source for citation analysis. Harzing.com. Anne-Wil Harzing, 6 Feb. 2016. Web. 29 Nov. 2016.

Hoic-Bozic, N., Mornar, V., & Boticki, I. (2009). A blended learning approach to course design and implementation. *IEEE Transactions on Education*, *52*(1), 19–30. doi:10.1109/TE.2007.914945

Holley, D., & Oliver, M. (2010). Student engagement and blended learning: Portraits of risk. *Computers & Education*, *54*(3), 693–700. http://doi.org/10.1016/j.compedu.2009.08.035

Kim, K.-J., & Bonk, C. J. (2006). The future of online teaching and learning in higher education: The survey says . . . . *Educause Quarterly*, (2006), 22–30.

Lillis, T., & Curry, M. J. (2010). *Academic writing in a global context: The politics and practices of publishing in English.* Abingdon, VA: Routledge.

Lim, C. P., & Wang, L. (Eds.). (2016). *Blended Learning for Quality Higher Education: Selected Cases on Implementation from Asia-Pacific*. Bangkok: UNESCO.

Llambi, L., Esteves, E., Martinex, E., Forster, T., Garcia, S., Miranda, N., … Margolis, A. (2011). Teaching tobacco cessation skills to Uruguayan physicians using information and communication. *Journal of Continuing Education in the Health Professions*, *31*(1), 43–48. doi:10.1002/chp

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2010, September). Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies (pp. v–53). U.S. Department of Education, Washington D.C. Retrieved from https://www2.ed.gov/rschstat/eval/tech/evidence-based-practices/finalreport.pdf.

Mortera-Gutiérrez, F. (2006). Faculty best practices using blended learning in e-learning and face-to-face instruction. *International Journal on E-Learning*, 5(3), 313–337.

Ng'ambi, D., Lombe, A., & Ng, D. (2012). Using podcasting to facilitate student learning: A constructivist perspective. *Educational Technology & Society, 15*(4), 181–192.

Ocak, M. A. (2011). Why are faculty members not teaching blended courses? Insights from faculty members. *Computers & Education*, *56*(3), 689–699. doi:10.1016/j.compedu.2010.10.011

Oh, E., & Park, S. (2009). How are universities involved in blended instruction? *Educational Technology & Society*, *12*(3), 327– 342.

Oliver, M., & Trigwell, K. (2005). Can "blended learning" be redeemed? *E-Learning*, *2*(1), 17–26. doi:10.2304/elea.2005.2.1.2

Ozkan, S., & Koseler, R. (2009). Multi-dimensional students' evaluation of e-learning systems in the higher education context: An empirical investigation. *Computers & Education*, *53*(4), 1285–1296. doi:10.1016/j.compedu.2009.06.011

Pearson, J., & Trinidad, S. (2005). OLES: An instrument for refining the design of e-learning environments. *Journal of Computer Assisted Learning*, *21*(6), 396–404. doi:10.1111/j.1365-2729.2005.00146.x

Peixoto, H. M., Peixoto, M. M., & Alves, E. D. (2012). Learning strategies used by undergraduate and postgraduate students in hybrid courses in the area of health. *Revista Latino-Americana de Enfermagem*, *20*(3), 551–8. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/22991118

Picciano, A. G., & Seaman, J. (2007). K-12 online learning: A survey of U.S. school district administrators. *Journal of Asynchronous Learning Networks*, *11*(3), 11–37.

Porter, W. W., Graham, C. R., Spring, K. A., & Welch, K. R. (2014). Blended learning in higher education: Institutional adoption and implementation. *Computers & Education*, 75, 185–195.

Precel, K., Eshet-Alkalai, Y., & Alberton, Y. (2009). Pedagogical and design aspects of a blended learning course. *International Review of Research in Open and Distance Learning*, 10(2), 1–16.

Prinsloo, P., & VanRooyen, A. A. (2007). Exploring a blended learning approach to improving student success in the teaching of second year accounting. *Meditari Accountancy Research*, *15*(1), 51–69. doi:10.1108/10222529200700004

"Publisher Support." *Google Scholar*. Google, n.d. Web. 29 Nov. 2016.

Ruiz, J. G., Mintzer, M. J., & Leipzig, R. M. (2006). The impact of E-learning in medical education. *Academic Medicine: Journal of the Association of American Medical Colleges*, *81*(3), 207–12. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/16501260

Sife, A. S., Lwoga, E. T., & Sanga, C. (2007). New technologies for teaching and learning: Challenges for higher learning institutions in developing countries. *International Journal of Education and Development Using Information and Communication Technology*, 3(2), 57–67.

Spring, K. J., Graham, C. R., & Hadlock, C. A. (2016). The current landscape of international blended learning. *International Journal of Technology Enhanced Learning*, 8(1), 84-102.

Spring, K. J., & Graham, C. R. (2016). Blended learning citation patterns and publication across seven worldwide regions. *Australasian Journal of Educational Technology*, *33*(2), 24–50. http://doi.org/10.14742/ajet.2632

Tham, R., & Tham, L. (2013). Challenges facing blended learning in higher education in Asia. *International Journal on E-Learning. 12*, 209–219.

UNESCO. (2002). Forum on the impact of open courseware for higher education in developing countries: Final report. Retrieved from http://unesdoc.unesco.org/images/0012/001285/128515e.pdf

Unwin, T. (2004). Towards a framework for the use of ICT in teacher training in Africa. *Open Learning*, 20(2), 1–26.