Introduction to the Special Issue: Select Papers Presented at the 2018 OLC Accelerate Conference and the 2019 OLC Innovate Conference

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Each year, *Online Learning* publishes a special issue containing selected research articles presented at the past year's Online Learning Consortium (OLC) sponsored conferences.

The fall conference of OLC, Accelerate*,* was held November 14-16, 2018 in Orlando, Florida. Accelerate is devoted to "driving quality online learning, advancing best practice guidance and accelerating innovation in learning for academic leaders, educators, administrators, online learning professionals and organizations around the world." Held each fall, this flagship OLC conference celebrated its 24th year as the premiere conference devoted to online learning.

OLC Innovate, a joint conference by the Online Learning Consortium and MERLOT was held April 3-5, 2019 in Denver, Colorado. In its fourth year, Innovate provides a place to learn about innovative practices and research in higher education online, blended, and digital learning.

The papers contained here present research from selected presentations from both Accelerate 2018 and Innovate 2019. They represent a variety of topics and issues and continue to stretch the boundaries on what we know about online and blended learning.

The first paper in this conference issue, by Vanessa Dennen and Lauren Bagdy, *From Proprietary Textbook to Custom OER Solution: Using Learning Feedback to Guide Design and Development* presents formative evaluation results from a university-funded project investigating the use of an open educational resources (OER) electronic textbook that replaced a proprietary text and provided learning materials at no cost to the undergraduate students enrolled in an educational technology course. Dennen and Bagdy describe their development of this OER solution for the Canvas learning management system. Their initial needs analyses indicated that students felt that free, mobile-accessible and printable course materials were critical and that they preferred less text

and increased use of course relevant, non-text media. Students utilizing the OER solution for class found it useful to help them better prepare for class activities and complete assignments, and that their rate of use was higher with the OER textbook than proprietary texts. This study highlights students' critical need for cost affordable materials and points out their preferred methods for engaging with course content. With student debt rising, research on OER can provide valuable information on resources that can help students with the cost of higher education.

In *Using Debate in an Online Asynchronous Social Policy Course,* Elissa Mitchell describes a preliminary study examining student reactions to how she used debate in her online asynchronous social policy course. Survey results indicated that students felt that using debate helped improve their critical thinking, and increased their collaboration with other students. Debate helped them learn better than lecture or reading alone and more than half of students felt it also helped in other courses or in work. Recommendations are provided by the researchers for other online faculty considering this instructional method.

Learning analytics is a quickly growing topic and Priya Harindranathan and James Folkestad describe their research in *Learning Analytics to Inform the Learning Design: Supporting an Instructor's Inquiry into Student Learning in Unsupervised Technology-Enhanced Platforms.* Examining data for 133 students taking an undergraduate Microbiology course, they investigated what variables extracted from the Canvas quiz-log data were related to students' productive learning behavior and whether these variables (and associated behaviors) were related to improved exam grades. Student learning analytics captured included total time spent, off-task time, proximity of first attempt to quiz due date, number of quiz attempts, and time space of quiz attempts. Results indicated that off-task behavior and closeness to the due date were significantly correlated to the exam score. Implications for intervention and future research are discussed.

In the fourth paper in this set, *The Collaborative Mapping Model: Relationship-Centered Instructional Design for Higher Education,* Jason Drysdale describes the theory behind his developed and pilot tested Collaborative Mapping Model (CMM) of instructional design, developed to conceptualize the collaborative relationship that is critical to effective instructional designer/faculty partnership. Results of the faculty survey indicated that, when working with an instructional designer utilizing the CMM, faculty better understood the relationship of the instructional designer and were positive about the value it provided to their course design process. The Collaborative Mapping Model provides a good framework for institutions that want to address challenges in the instructional design relationship with faculty or who are establishing online faculty development.

The final paper in our conference set is *Impactful Leadership Traits of Virtual Leaders in Higher Education* by Erin Alward and Yvonne Phelps. This phenomenological study examined the concept of virtual team leadership. Ten leaders of virtual teams in online higher education institutions were interviewed regarding their perceptions and experiences on guided trust, activities and tools used for employee engagement, leadership theories and beliefs, and job preparation and training. Results indicated themes related to readiness for virtual leadership: training and development, trust, emotional intelligence, and higher education virtual leadership competencies. In addition, responses indicated themes related to virtual leaders' activities and leadership: communication and team building, technology, employee recognition and leadership style. The authors discuss commonalities with leaders (virtual or not) and provide recommendations for virtual leadership in higher education. More research is needed in this area.

The editors of this special issue would like to acknowledge the contributions of the OLC staff and the numerous conference volunteer committee members and support personnel who helped to make OLC Accelerate and OLC Innovate a success. We are also grateful that the Online Learning journal continues to recognize research presented at the conferences and appreciate the guidance and help from journal reviewers and staff including Peter Shea, editor, and Sturdy Knight, managing editor.

We hope you find the articles in this special issue of interest to your work and consider submitting your research for presentation at OLC Accelerate or Innovate. And, consider submitting your original work *Online Learning* in the future!

From Proprietary Textbook to Custom OER Solution: Using Learner Feedback to Guide Design and Development

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Abstract
This study presents the initial needs analysis and formative evaluation of the beta version of an open educational resource (OER) textbook solution. The OER textbook, created by the authors, replaces a proprietary, paper-based textbook and is delivered to students digitally, within a learning management system. Needs analysis findings show that students are concerned about cost and convenience, and are likely to seek course content online before reading material in a traditional course textbook. Many do not purchase assigned textbooks at all. Students also want mobile access to course readings, and for those readings to be brief and targeted, covering just the necessary content for completing coursework. Students provided positive feedback on the OER textbook, indicating that it helped them meet course learning objectives. The online integration of reading and other content materials within the LMS encouraged use. Students reported higher rates of access and appreciation that the course textbook was free. These findings suggest that instructors should consider the cost, format, length, and relevance of assigned readings in courses, whether they are ready to adopt, adapt or create open digital textbooks or continue to use proprietary, paper-based ones.

Keywords: instructional design, needs analysis, online textbook, open educational resources

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From Proprietary Textbook to Custom OER Solution: Using Learner Feedback to Guide Design and Development

Textbooks play an important role in the formal learning process, serving as one form of content delivery for learners. Despite proclamations that physical textbooks will be replaced with digital ones (Lewin, 2009) and recommendations that low-cost alternatives be sought (Rosenfeld & Hegadus, 2006), educational publishers still supply the higher education market with large numbers of physical, proprietary textbooks. In an era when many students are taking online or

blended courses and coursework is submitted online, the physical textbook lacks seamless integration with other course elements.

The cost of textbooks is steadily rising, putting some students in the uncomfortable position of choosing between textbooks and living expenses (DeMartini, Marshall, & Chew, 2018). Open textbooks have been recommended as one means of providing students with low cost educational materials (Hilton III, Robinson, Wiley, & Ackerman, 2014). Open textbooks can be designed to meet specific curricular needs, and such texts have been well-received by students (West, 2019). Most open textbooks are delivered online, although many tend to still follow a linear, book-oriented format. However, proprietary textbooks might just as readily be replaced by either a traditionally designed, linear open textbook or a set of open educational resources (OER) delivered digitally to learners via a learning management system. Content may also be delivered via other open resources, including open video repositories (Miller & CohenMiller, 2019).

In this paper, we report on the learner feedback received during an OER design and development project, focusing on both the initial needs analysis and the formative evaluation of the beta version. The project, funded by a university grant, offered the opportunity to replace a proprietary text and develop learning materials to be offered at no cost to the learners in an undergraduate educational technology course. Through our data collection and analysis, we explore the reasons that guided learners to choose to access and use a proprietary textbook and, later, a custom OER textbook, along with learner preferences about format, media, and content.

Review of Literature

Although there has been some skepticism about OER use regarding quality and ability to support learning outcomes, studies in both K-12 and higher education environments refute that criticism. The quality issue is a red herring, exacerbated by poor understanding of what OER are and how they can be used (Belikov & Bodily, 2016). Both proprietary and open educational resources can be well or poorly designed, and both can be appropriately or inappropriately selected for a class. Students and teachers who have experienced high quality OER have rated them equal to or better than other learning materials (Christina, Stefan, & Georg, 2017). Quality is not just a perception, but also relates to measurable outcomes. For example, in higher education settings, the assignment of open textbooks was correlated with increased textbook access and higher student grades (Feldstein et al., 2012) as well as higher rates of course completion (Fischer, Hilton, Robinson, & Wiley, 2015). Although the overall number of studies on OER use in higher education to date is still small, these studies have consistently supported the idea that OER can support high quality learning experiences (Hilton III, 2016).

What, then, are the differences between proprietary and open textbooks? Cost is a major difference. Although open is not the same as free, the two terms are often used synonymously, and open textbooks and other OER typically are free to use (Pomerantz & Peek, 2016). It should be noted that when open textbooks provide often-free content to students, there are costs associated with their development and there may be other costs associated with their use (e.g., e-readers or print-on-demand books). Still, in many cases the use of open textbooks saves students money; one study found that the average proprietary textbook cost was $90.61, with a wide range (Hilton III et al., 2014). Students appreciate and respond favorably to faculty members and courses in which OER are used in lieu of costly textbooks and course materials (Gabrielle & Judy, 2017).

Customizability is another difference between OER and proprietary textbooks. Proprietary textbooks typically have predetermined content. Increasingly academic textbook publishers have offered customized options, in which instructors select content from the publisher's catalog to be provided in compiled format as a course textbook. However, this level of customization is slight and still costly for students. Open resources support the 5 Rs: retain, reuse, revise, remix, redistribute (Wiley, n.d.). In other words, when open resources are adopted for a course, instructors and students are free to use them in a variety of ways, as suits their learning needs. Use, in this sense, does not simply mean being a consumer. Instead, it more broadly encompasses being a collector, co-designer and distributor of learning content. This ability to customize OER is an advantage of OER use for instructors (Belikov & Bodily, 2016), and adaptations may be done to make OER content accessible for learners with disabilities (Rice, 2019). Most instructors simply adopt OER as-is, and provide students with a link to existing resources (Jung, Bauer, & Heaps, 2017).

Project Context

This project, which began as a quest for an open textbook, was started to serve the needs of instructors and students in an educational technology class for preservice teachers. This course is taught in both online and face-to-face modalities, with both versions of the course sharing the same syllabus, learning materials, and course assignments. The online version of the course meets asynchronously, whereas the face-to-face version has a weekly meeting in a computer lab. The face-to-face version makes extensive use of online technologies to help students communicate and collaborate as well as to deliver course materials and provide an administrative backbone for the course.

This project was undertaken with the support of an OER Textbook grant from the Florida State University Library. The goal of this grant program is to help faculty members shift from assigning expensive proprietary textbooks to using high quality open textbooks and open educational resources that will be free to students. This grant provided a small amount of professional development money for the lead author in exchange for committing to transition a high enrollment course from a proprietary textbook to OER. More importantly, the grant provided the impetus for the OER development process. It also gave us access to a support team of librarians who offered training on various concepts related to open textbooks and OER and who were prepared to help us throughout our design and development process. Although we did not rely on the library's OER team heavily – mostly we sought some initial feedback about development platform options – we were glad to have their support.

It would have been acceptable per the terms of the grant to select an existing open textbook, or to adopt and adapt existing OER. However, we decided to start with a blank slate and create a custom solution. In a sense, what we designed and are now using for this class is not, by default, OER. We could have created the course materials with the intent of using them solely in this course, and not sharing them further. However, we had no need to create proprietary resources. To do so neither reflected the spirit of the grant we received from the library, nor represented what we felt was an appropriate way to approach this project. In this course we teach students about OER and how they might be used by teachers. This project provided the perfect opportunity to model what we were teaching to our students, and hopefully inspire them to create and share their own

OER in the future. It should be noted that making our OER textbook truly open was the last step of our project, and was not fully realized at the time that data were collected for this study.

Our decision to design a custom solution rather than to adopt an existing open textbook reflects our past experiences seeking free, online learning resources to use in this course. We had previously looked for open textbooks, setting the scope of that search narrowly and conventionally, hoping to find a PDF version of a textbook that would meet our curricular needs. Failing in that endeavor, we also looked for free, online learning objects that would serve students in meeting the course learning objectives. However, stitching together OER from multiple sources to replace a textbook for a semester-long course sounded like a time-consuming and tedious process. We had a good idea of the type of content coverage that our students needed and we were happy with the existing course design. We wanted our course design to drive the selection or design of learning materials, and not vice versa.

Our decision also reflects our expertise and our prior work developing content-rich materials for this course and similar courses. Both authors are formally trained as instructional designers and have substantial experience designing instructional content for a wide range of media and contexts, including online instruction in the university setting. Thus we felt confident that given time and effort we would be able to accomplish this task, and joined the minority of instructors who have created their own open textbooks (Jung et al., 2017).

We did not start this process with a clear sense of form and features in mind, but we were cognizant that these elements potentially mattered as much as content. Based on prior comments from students about readings in this and other classes, we suspected that they would want electronic resources, and might opt to do readings on mobile devices. Readablity, effectiveness, accessibility, efficiency and navigation have all been identified as important design factors in mobile reading applications (Matraf & Hussain, 2018), which are generally perceived as less useful and usable than traditional books (Hancock, Schmidt-Daly, Fanfarelli, Wolfe, & Szalma, 2016). At a more macro-level, we considered that university students benefit from the ability to take and find notes and search for words (Jardina & Chaparro, 2015). In sum, while we felt confident about the content that our OER textbook must include, we knew that to successfully accomplish this design task we would have to investigate how our learners used, perceived, and wanted to use textbooks.

Method

Research Questions

This study is situated in a real-world design case, and represents an initial needs analysis followed by a round of formative feedback on the design of an OER textbook. The research questions that guided this study are:

(1) What factors influence undergraduate students' decisions to obtain and use a course textbook?

(2) What features do university undergraduate students want in a textbook?

(3) When presented with a custom OER textbook, how do undergraduate students use and perceive it?

Participants

Participants in this study were students enrolled in an undergraduate educational technology course for preservice teachers at a large public university. Participation was voluntary and consisted of completing an online survey. Students were recruited during two semesters. During the first semester, the survey was completed by 55 of 56 students enrolled in four course sections (response rate = 98.0%). During the second semester, the survey was completed by 89 of 93 students in five course sections (response rate = 95.7%). Although demographic data were not collected, we know from past studies that 70-90% of the students who enroll in this class are freshmen and sophomores, and 60-80% of the students in most course sections are female. The classes surveyed in this study were representative of typical classes.

Data Collection

Surveys were the primary data collection method. The surveys were approved by the university's Institutional Review Board. Both surveys were developed collaboratively by the researchers to ask questions about the potential (survey 1) or beta (survey 2) course materials, and were reviewed by a colleague to ensure clarity.

Survey links were provided within the learning management system and students were asked to use the surveys to provide feedback about course textbooks and learning materials. Surveys were deployed at the end of the term. Depending on available time, students were either provided time to complete the surveys during class or were asked to do the survey on their own time.

During the first semester, data collection occurred via an 8-item survey, with 6 closed items and 2 open-response items. This survey served as the initial needs analysis. The questions focused on how students had interacted with the proprietary textbook that had been assigned that term, and asked students about features and design considerations they would desire in a custom-designed textbook.

During the second semester, an 8-question survey was used. Again, we kept the survey brief in order to secure student participation. There were five closed and three open-ended questions, and the open-ended questions could be answered in a sentence or two. The purpose of this survey was twofold. First, we sought to learn about how students used and perceived the OER materials we had created. Second, we wanted to know what else we might design into the next version of the materials.

Data Analysis

Closed survey items were analyzed using frequency distributions, which is appropriate for ordinal data. Open-ended questions were analyzed thematically, with a goal of generating a count of the most frequent themes and to identify both typical and illustrative quotes. During this analysis, both researchers independently reviewed the open responses to identify themes. Then they compared the results of their independent reviews, with the intent of negotiating differences. No major differences were noted during this negotiation.

Results

The findings are organized to reflect our timeline of activities. We begin by describing the starting point, the proprietary course textbook. Next we share findings from the initial needs analysis survey. Then we describe the OER solution that we designed, and finally we present the findings from the second student survey, which provides formative feedback after the beta version of the OER course materials were deployed.

Pre-OER Solution: The Proprietary Course Textbook

The proprietary course textbook was published by a major textbook publishing company. Rather than a traditional bound book, this edition of the textbook was sold as an unbound version. Although the pages had drilled loose-leaf holes, students were required to purchase a binder or folder to keep track of the pages. This format also limited the resale and used book purchasing opportunities for the textbook.

The textbook included a code to access supporting online media (videos, quizzes, etc.), and instructor materials were also available. While there was a less expensive eBook version of the textbook, it did not include access to the additional online content. Accessing the online content was a cumbersome process. Students needed to use the access code to create a new account with a username and password. This account was separate from the one students used to access the university's learning management system (LMS) and computing resources.

The textbook consisted of 10 chapters, and the average chapter was 37 pages long (range = 28-54 pages). Each chapter was further chunked into 3-7 sections. Within each section were multiple sub-sections or features. The pages within these sections were text-heavy, often with few or no supporting visuals. The chapters ended with a topical summary and content-related activities. Although the above description is based on a specific textbook, this textbook is not particularly unique in its form and content. It is the third textbook that we have used in this course during the last decade, or fifth if one is counting updated editions.

Three challenges that we consistently faced with textbooks we adopted were course alignment, quality, and outdated content. We never found a textbook that fit our course design well, and although it is not uncommon for instructors to design a course around a textbook (Allen & Tanner, 2007), we were committed to our course design as the driving curricular force. Although the overall content quality was high, students frequently found both typographic and factual errors in the textbooks. We are entirely sympathetic about the occasional tenacious typo that persists despite copy editing, but the number of errors felt problematic given the high price tag of the textbook. Finally, because the course topic is a dynamic one, sections of the textbooks became quickly outdated. These last two issues were ones that we knew we could fix if we had the ability to revise our course textbook, but they are beyond instructor control when proprietary textbooks are used.

Survey 1: Initial Needs Analysis

The first survey was introduced to students as the opportunity to provide feedback that would help future learners in this course. We explained that we were planning to replace the current textbook with a custom solution, and that there were many possibilities. As students who were completing the course and who had a good sense of course content and requirements, we valued their input about what form and function was desirable in a text for this course. We also wanted to know how they had used the assigned proprietary text. Our own observations as part of the

instructional team suggested that students did not necessarily own or read the textbook, and knowing if that was an accurate perception and what the reasons were would be helpful when designing the new text.

Prior textbook use. When asked if they purchased the course textbook, which had just increased in price to over $100 for a new copy that term, 32 (61.5%) of the students said they had. Another 2 (3.8%) had found another way to obtain the text, and a third (18; 34.6%) simply managed without the text all term. However, purchasing or obtaining the text is not synonymous with using the text. Only 10 (19.0%) students reported that they used the textbook during the course.

When asked on an open-ended question why they did not use the textbook, the most popular responses were that students did not feel the need to use the textbook in order to complete assignments (16 students), and that the necessary content for completing assignments was covered in class (10), was available online (4), or was contained in podcasts (3). These podcasts were created by the supervising faculty member to supplement the textbook in content areas with weak coverage. Additionally, 5 students commented that money had been a factor in not using the textbook. Other comments suggested that the textbook was too long, and too heavy and inconvenient for students to carry around with them. These quotes illustrate some of the student sentiments about needing the text:

- The book did not seem like a complete necessity when I first began taking this course because at times there were pdf files of the textbook given to the class if it was necessary for an assignment. Also most of the information pertaining to this class can be found online.
- Everything that we did in the class was gone over during the lecture. The textbook obtained some useful things but most of the stuff we were learning about referred back to online credible websites that we were able to navigate through as a class/individually
- The expenses related with the textbook were excessive and I figured since I barely used my text book for [another course] last year, that I could make do without it.

In these comments students suggest that instructors were finding ways to compensate for students not purchasing or obtaining the book, whether that be providing the necessary content in lectures, or giving students PDFs of the most critical pages of the book. The latter was not an officially sanctioned instructor action, but based on student comments at least one instructor must have provided readings to students in this manner.

Of the 10 students who used the textbook consistently, 6 stated that they needed the readings to complete some of the course assignments. The assignment prompts referred to specific chapters in the textbook, so the discrepancy between the students who said they did not need it and those who reported needing it reflects students' personal feelings about whether the text was needed, and not whether it was incorporated in the course design. Still, even these students were skeptical about the cost-benefit, with one stating: "Occasionally we would have assignments with questions where the information would be found reading the text, however the amount of times we did this did not make up for the cost of the textbook"

Platform and format. Multiple platform and format options were possibilities for the new course materials. Because we were creating the materials ourselves, we knew we would have the ability to offer digital files to our students, but we could also facilitate a paper-based copy if desired. The majority of students (42; 81.0%) indicated a preference for doing readings online.

Still, 1 student wanted to be able to print, and 9 (17.3%) said they would purchase a low-cost, bound version of the text. This suggests that paper is not entirely passé in the eyes of learners, and some learners are still willing to pay a nominal cost to have print reading materials. Mobile options were deemed important by 39 (75.0%) of the students. Even with a preference for reading online, the ability to print was still valued by two-thirds (34; 66.7%) of the students.

Students expanded on the importance of mobile access in an open-ended question. One student confessed, "Most students will look at the textbook on their phone during class to check to see if there is anything that they might have missed or so that they can engage in class discussion so making sure that the textbook is available through a mobile device is important for this class." Another student explained, "It's extremely important to me that it is accessible on a mobile device because I don't prefer lugging my laptop around campus all day. It's also good if it is easy to navigate, an index with links to the chapters, etc." The combination of mobile access and well-chunked, navigable content appear to be related, and logically the two themes fit together.

We were not sure at the onset if we were creating an open textbook that was fairly traditional in terms of form (i.e., a linear, word-processed document in PDF or similar format that could easily be read online, downloaded for offline use, and printed) or if we were incorporating audio-visual media and interactions. We asked students to share their preferences (see Table 1; students could select multiple answers). Videos were the most popular content format that students wanted, followed by reading material. One-quarter of the students did not select reading material as a preferred content medium for the class, and 35 (67.3%) indicated it was important to at least incorporate some sort of audio-visual media elements.

Table 1.
Desired content formats

Answer	%	Count
Videos	84.6%	44
Reading material	75.0%	39
Podcasts	59.6%	31
Integrated practice activities	50.0%	26

The students' desire to reduce reading and increase other media, including practice activities (which half of the students were interested in) came across clearly in student comments, such as this one: "Have it be interactive!! The textbooks associated with [this class and another] have chapters that are WAY TOO LONG WITH WAY TOO MANY WORDS!!" In general, students suggested the desire to move away from a traditional, text-dense textbook, with comments like "Have more images or interactive things and less text to make it seem less like a text book," and "The best textbooks are those that are succinct and communicate information in as few words as possible." These comments were in response to an open-ended question at the end of the survey asking for students to share any additional information that they deemed relevant to the project.

We also were exploring delivery platforms with different features at the time of this survey, and asked students if the ability to take notes was important. The majority (38; 73.0%) said that they wanted such a feature, with two students further commenting that they would like to be able

to share their notes with each other. This comment likely arose because the students had experienced Diigo (http://diigo.com), a social bookmarking tool that facilitated collaborative annotations, during the course.

Cost and access. We asked students how important it was that course materials be free of cost. Almost all of them (50; 96.1%) said free was important. We also recognized that even if we were not profiting from the materials that we designed and developed, if students accessed a print-on-demand version of a text or if we embedded the course materials and interaction in a platform like Tophat Classroom (http://tophat.com), there would be an associated cost to students. We estimated that the cost would be $30 or less per student, and asked about that price point. All but one student (51; 98.1%) responded that the $30 or less price point was important to them. Students additionally indicated, although to a lesser degree (38; 73.0%) that they would want to have continuing access to the course materials after the class ended.

The OER Textbook Solution

The OER textbook solution was designed based on the student feedback in survey 1. We prioritized the students' desire for course materials that were free, mobile-accessible, and printable. We also noted the students' preference for limited written text and focused content. We did not eradicate text, but found that we were able to really hone in on the important details and chunk text in different ways than the textbook had. For the beta version, the course materials were developed in the Canvas LMS, which was a familiar learning environment for the students. Not only did this mean that the content would be offered for free, but we could also build learning interactions and take advantage of the mobile app.

Most of the content was developed by the authors of this article. Other contributors included course instructors who created content in specific areas of expertise, and practicing teachers who provided examples of their classroom technology practices. Rather than long, laborious chapters, we created brief, targeted readings ranging from around 300 to 1000 words apiece. When topics were connected, hyperlinks were used. Hyperlinks were embedded in the prose or listed at the end of a brief essay as a related topic, depending on what was contextually appropriate. Additionally, we included images, videos, podcasts, and external links.

In the end, what we created somewhat challenges the concept of "textbook" since it is neither fully text nor in a book format (to learn more about the design process and final product, see Dennen & Bagdy, in press). It might be considered a set of open learning materials. However, we will continue to refer to it as the OER textbook for simplicity throughout this article.

Survey 2

The second survey was deployed at the end of the beta testing term. The 82 students who completed this survey had access to the OER textbook in digital format in the Canvas LMS for the entire semester. It was presented as their primary source of course materials. Students were informed that their survey feedback would be used in a formative sense, to help improve the course materials.

Textbook access. We started the survey by asking students what they typically do when assigned a course textbook. We wanted to know what their baseline habits were for a course. The majority (49; 55.1%) reported that they purchase a used text. Only 8 (9.0%) preferred to purchase new texts, and 22 (24.7% sought to borrow the textbook. Under an "other" response option, 4 students said they rent textbooks and 2 reported ignoring the need for a textbook.

Students were presented with readings and other course materials interspersed across course modules. Relevant content appeared in a folder labeled by week, along with links to assignments and course interactions (e.g., discussions and blogs). This presentation of content marked a major change from past terms when students had to locate readings as assigned within a linear, paper-based or electronic book. When asked which format they preferred, 68 (76.4%) indicated that this interspersed approach was better. Similarly, when asked if they preferred the online format or print-based readings, 75 (85.2%) of the students chose the online version.

We asked the students how they accessed the OER textbook, 71 (80.0%) reported using a laptop or desktop computer. Despite the enthusiasm for mobile access expressed by the students in Survey 1, only 4 (4.5%) students reported using a mobile phone and 1 used a tablet. There were 13 (14.6%) students who reported that they did not do any readings for the course. Student comments echoed some similar themes to Survey 1; some felt that the readings were necessary in order to be prepared for class and complete the coursework and read because it was required, and others felt that they could pass the class without doing the readings. The one theme from Survey 1 that did not appear in the comments for Survey 2 was cost.

Students left several positive comments about the OER textbook. Some further commented on the ability to do the readings quickly and easily ("they were fairly short reads which I was able to complete before class, since I get here early" and "they were quick and easy") and several other brief comments referred to the readings being free, short, and relevant. Two students mentioned the convenience of the format and platform, stating "I usually get on canvas everyday anyway so while I'm on canvas the day before class I pull them up and read them" and "I really liked having PDF versions of texts accessible through Canvas. Without being weighed down by a physical textbook, I was able to access my readings from anywhere at anytime. It was very helpful to be able to transition between the texts and internet for context and additional resources." Still, one student didn't even realize that there were readings or was a textbook, writing "I kinda forgot. And the course really did not require the readings because there were no texts."

OER textbook content and usefulness. Length of readings and the desire to do minimal reading had been a theme in Survey 1, and the OER Textbook offered brief, streamlined reading materials – just what was deemed necessary for students to complete their assignments. When asked about the length of the readings, 68 (76.4%) students said they were just right. None felt they were too brief, and only 7 (7.9%) thought they were too long. The remainder did not do the readings.

Overall, students reported that the OER textbook was useful for helping them complete the course and achieve the course objectives (See Table 2). Given that 13 students reported not doing the readings and recorded "disagree" responses to these items, only 4 to 12 students did the readings and found them to not be useful for each of the different purposes. The lowest rated item was improving technology design skills, which could reflect student uncertainty about what the item meant. The OER textbook contained information about technology design issues, but did not contain software tutorials. On an open-ended item, some students mentioned that they would have liked such tutorials in the textbook.

Table 2.
Usefulness of OER Textbook for achieving course objectives

Item	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
Prepare for in class activities (*n*=89)	35 39.3%	33 37.1%	13 14.6%	4 4.5%	4 4.5%
Complete class assignments (*n*=89)	40 44.9%	28 31.5%	12 13.5%	6 6.7%	3 3.4%
Understand how teachers use technology (*n*=89)	46 51.7%	26 29.2%	11 12.4%	2 2.3%	4 4.5%
Improve your technology design skills (*n*=88)	35 39.8%	28 31.8%	14 15.9%	5 5.7%	6 6.8%

The survey concluded with an open question asking students to share anything else they would like us to know about the course or the OER textbook. This item garnered various comments about the instructors, course structure, and workload. The few additional comments about the OER Textbook recommended that we "keep it free!" and noted that "It was nice to not have to buy the textbook." Additionally, students wrote that "the learning resources were very beneficial" and "helpful."

Discussion

Textbook Access and Use

In response to our first study question about factors influencing students' decisions to access and use a course textbook, both surveys confirmed that cost, perceived need, and convenience were major issues. Cost was a major theme in responses to the first survey. That term, many students did not purchase the assigned textbook because of its cost. For some, the purchase was cost-prohibitive; these students may have found themselves in a position where a textbook purchase would exacerbate an already tenuous financial existence as students (Broton & Goldrick-Rab, 2017). For others, the cost-benefit of purchasing the textbook was unclear. These students likely weighed need against cost.

Convenience was another issue factoring into student use of the textbook. Students wanted the ability to access course content when and how it was most convenient for them, and often this meant via a mobile device. Their comments suggested that using a physical textbook was cumbersome, both in terms of portability and interface. Although the loose-leaf version of the proprietary textbook meant that they could extract and walk around with just a few pages as needed and not the whole book, no one mentioned taking this approach.

Students perceive mobile access to be convenient, which is not surprising given the high rate of smartphone ownership among American young adults of traditional college age (Pew Research Center, 2019). In the end, whether students actually used a mobile device to access course readings is immaterial. Findings from the second survey suggest that although the OER textbook was fully accessible via a mobile app, using laptop and desktop computers was the norm for access. This finding likely reflects the actual situations in which students accessed the OER textbook. Although

we do not know for certain, we imagine that their access was concurrent with completing other course assignments, many of which were best done on a laptop or desktop computer for reasons related to software access and screen size.

In terms of use, several students took an assignment-driven approach. In other words, if they needed the information to complete a graded assignment and could not find it in another format (i.e., search for it online), they were likely to use the textbook. The proprietary textbook was considered a resource of last resort, and not a primary learning tool. One reason may be the format. Everything else students did in the course was digital, and the course topic also was digital. In this digital environment, a paper-based textbook feels like a shift back in time rather than a teaching approach that matches with current trends. We do not mean to suggest that paper textbooks are no longer necessary or valued, and a subgroup of students remains interested in reading paper-based text, but providing digital text allows students the option to choose the reading format that best matches their preferences and situational needs.

Textbook Features

Our second research question focused on the features that students want in a textbook. Across both surveys we identified the desire for less reading material or streamlined reading material, and increased use of non-text media. Students also wanted the ability to take and share digital notes on readings with their peers, and to print content as desired. Students made relatively few open comments about interface features, which may reflect our decision to use the LMS to host the OER textbook. This interface, although frequently maligned by students as required LMS interfaces often are, was familiar and expected. Consequently, students may not have felt they could reasonably have other expectations.

Although none of the students in this study raised the issue, accessibility remains a concern when digital materials are used. Specifically, adjustable text size and color or contrast, along with print and text to speech capabilities are important interface features for many students with disabilities, and their support in popular e-reading tool interfaces is variable (Mune & Agee, 2016). By using the LMS, we again opted for a platform that was familiar to our learners and likely bypassed student concerns in these areas.

Evaluation of OER Textbook Solution

The third research question examined student use and perception of the OER textbook. The OER solution was designed in accordance with student feedback about reading length and online and mobile accessibility. It consists of small chunks of reading material interspersed with brief videos, podcasts, and images.

The reported rate of OER textbook use was much higher than the reported rate of proprietary textbook use. From student comments, we infer that cost, portability, ease of access, and perceived usefulness led students to use the OER textbook. Students had a favorable reaction to brief, chunked readings and videos, and shared further ideas for the types of content and media that would be helpful for learning.

The OER textbook seemed to meet students' needs better than the proprietary textbook. On Survey 2, fewer students reported that the textbook was unnecessary, that they sought ancillary online information, or that the instructor provided all of the information that they needed via lectures. The majority indicated that the resources included in the OER textbook had been helpful for completing assignments and learning about course topics. Other studies have confirmed that

once they have experienced high quality OER, instructors and students have positive perceptions (Bliss, Hilton III, Wiley, & Thanos, 2013). We believe that the students offered positive feedback because the OER were customized to meet their needs. By designing our own resources, we ensured that our students received accurate, relevant, and focused learning materials. Although we used customized learning resources entirely by design, three of the 5 Rs of open – revise, remix, and redistribute (Wiley, n.d.) – support the ability to select, adapt, and combine OER from a variety of sources to meet curricular needs.

Student Beliefs about Textbooks and Reading

Like students in prior studies (Feldstein et al., 2012), students in this study expressed the belief that textbooks are not necessary for successful course completion. Within Survey 1, many students outright stated that they had not needed the proprietary textbook. This finding likely reflects the cumulative effects of student experiences in which textbooks were assigned and not used, textbook readings did not align with course assessments (i.e. poor instructional design), or instructors compensated for students not reading by replicating textbook content during lectures. This latter phenomenon is an example of students influencing an instructor's activities, and was evident in this course, too. During the semester when the proprietary textbook was in use, many students did not purchase or otherwise access it. As a result, instructors found alternate means of providing the necessary content to students. The different approaches reflected in the survey responses were providing PDFs of the book sections and incorporating the content into class lectures and activities.

Some students indicated that they simply sought the information online independently, and because they were able to find free information on the course topic, they did not feel the need to purchase a textbook. This finding likely reflects a high degree of comfort accessing and using online information in other contexts, and hints at a response to a provocative question asked by Feldstein and colleagues (2012, p. 8): "Do students find textbooks a more trusted, authoritative resource than online materials?" Based on this study, we would say no, and other studies corroborate our findings (Hilton III, 2016). Students seem to view textbooks as only one potential source of course information, and do not prioritize traditional textbook use due to cost, convenience, and interface (physical textbooks are not easily searchable) issues.

Interestingly, a few students left comments on Survey 2 claiming that there had not been a course textbook. These comments suggested that not everyone equated the readings and other resources embedded in weekly LMS modules with the content that they might be assigned to read in a textbook. Perhaps the chunking, brevity, and non-linear, hyperlinked format challenged their ideas about textbooks, or they maintained a narrow definition of textbook as a physical book that is available to purchase.

We were concerned by student comments about not wanting to read. As educators, we value reading as one strategy for learning. We did not want to reduce the amount of assigned course reading simply to appease students, and we did not feel that the prior reading assignments were unreasonable in length for a college course. However, upon careful consideration we found a different message in these comments. Many students enroll in a course to earn a grade and credit hours by achieving the learning objectives. They are prepared to do the required tasks, but do not necessarily want to read text that does not directly support that mission. Textbooks, however, are not always designed to offer streamlined course content. Publishers often require authors to deliver a certain number of chapters or words, and may expect chapters to be parallel in length and format

even if the content dictates otherwise. In this sense, textbooks may not uphold the slogan popularized by *The New York Times*, "All the news [or content] that's fit to print" but instead may encourage the opposite: all the content that's print to fit. By contrast, OER offer instructors the ability to adjust course texts so they focus on what students need to read.

Additionally, we started to think about how much non-textbook reading is required of students enrolled in online and blended courses. Many of these courses – ours included – are heavily reliant on text-based student interactions through discussion forums and blogs. These interactions generate more required reading for students, and as instructors we should be sensitive to how much time it takes to read peer-generated text each week.

Next Steps of the OER Textbook Project

The learning materials that we designed are not yet fully available on the Internet at the time of this writing, although they have been shared to Canvas Commons, the course repository for the Canvas LMS and we provide access to other people on request. The OER textbook is a living project. Our first priority was to meet our local students' needs and build a comprehensive set of course materials to support learners in this course. We have revised these materials and added additional media based on the student survey feedback, and feel confident that this first priority has now been satisfactorily met. We will, of course, continue to edit, update, and add to the OER textbook in order to ensure the content remains accurate and reflects current trends.

Our next steps are to make the OER textbook more fully open, offering the resources in a variety of formats and in a venue available to a wider audience than Canvas Commons. This is a part of the open experience that requires more labor. We need to find the best way to save, organize, host, and share the many learning objects that comprise our OER textbook, and to be mindful that we offer files that facilitate others to fully engage with our learning objects per each of the 5 Rs.

Limitations and Future Research

A major limitation is that this study relies solely on self-reported data. Given the degree of student candor about not purchasing or accessing the textbook in Survey 1 and in comments provided about the class in general on the last question of Survey 2, we believe that students likely responded honestly on the surveys. However, we were unable to confirm that students accurately reported their purchase, access, and use activities. We were unable to access analytic data from the LMS about how frequently students accessed different learning resources; having that data would have provided a useful point of triangulation.

We did not collect student grades in this study. Consequently, we cannot comment about the relative effectiveness of the OER textbook versus the proprietary textbook in terms of supporting student learning outcomes. Also, this is a single case study, which is not generalizable. We believe that most of our findings likely apply to similar courses, namely undergraduate educational technology courses. We encourage others to explore their own learning contexts to determine similarities to and differences from the learners and course described in this case, and to engage in petite generalization (Stake, 1995) as appropriate.

Implications

These findings have implications for instructors when selecting course materials. We encourage instructors to consider adopting or adapting open textbooks or other forms of OER, when available, and to consider making and sharing their own when these materials are not already available. Although adopting, adapting, creating, and sharing OER is a time-consuming process,

as more educators participate in the OER movement it will surely become easier to find relevant resources.

These findings also have implications for students in terms of both learning and financial well-being. Students benefit when proprietary textbooks are replaced with open solutions. They spend less money on learning materials, which means they are more likely to have and use these materials. These conditions, in turn, support learning. Students are likely to appreciate the flexibility of access that many digital OER offer as well.

Instructors should consider using focused, streamlined reading assignments, which may lead students to do more of the assigned readings. If those readings can be focused by eliminating extraneous text from the original, all the better. Additionally, instructors might be mindful of just how much reading students are required to do across all areas of an online or blended course.

Conclusion

As Hilton III (2016) noted, each situation in which OER are used will differ, and so too may the results. Although this study focuses on an instructor designed and developed textbook solution – a path we imagine relatively few readers will wish to undertake on their own – we recognize the extra effort that would be involved in revising, remixing, and redistributing OER textbooks as well. Poor instructional design, whether reflected in the textbooks themselves or in the selection of textbooks that do not align well with course outcomes, may occur whether the textbook is open or not. Adopted, adapted, and self-created OER can be effective and well-received by students, and offer instructors the important opportunity to design and implement effective instruction. In closing, like Wiley and Hilton III (2018), we believe that the interesting issues to explore moving forward are related to pedagogy, with possibilities for instructors and students to create and share their creations in support of learning processes.

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Using Debate in an Online Asynchronous Social Policy Course

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Abstract
This paper presents the use of a debate in an online asynchronous social policy course. Debate is frequently used as an instructional strategy in higher education, but little is known about the use of this tool in an online learning environment. Participants (N = 36) completed an online debate assignment, and both qualitative (reflection papers) and quantitative (survey) data were gathered to learn about the effectiveness of the assignment, and what students learned, liked, and disliked about the project. A majority of students reported the debate assignment helped them further understand course concepts, understand concepts better than lecture or reading would have, use or improve critical thinking skills, and improve collaboration among students in the course. Key themes from qualitative data are also reported, as well as recommendations for using this assignment in other courses.

Keywords: asynchronous, online debate, teaching social policy

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Using Debate in an Online Asynchronous Social Policy Course

The purpose of this paper is to describe how a debate assignment was used in an online asynchronous social policy course, and to reflect on student feedback and learning from this assignment. Social policy courses cover sometimes sensitive topics about which students may have conflicting viewpoints. One of the ways to address this issue and to depersonalize some of the topics is to structure a debate where students must argue from a certain perspective. Debate is a common instructional technique used in many disciplines, particularly the social sciences, and has been linked to the development of critical thinking skills (Freeley, 1996). The effectiveness of debate as a course assignment has been assessed in different disciplines and from varied

perspectives, including the development of critical thinking skills, improving student research and writing skills, and overall student engagement (Budesheim & Lundquist, 1999; Kennedy, 2009; Omelicheva & Avdeyeva, 2008). Less is known, however, about using debate in an online asynchronous environment (Park, Kier, & Jugdev, 2011). One of the challenges of online instruction can be moving activities from the traditional seated classroom to an online platform and achieving the same learning outcomes (Bates & Watson, 2008). This descriptive study explores the implementation of a debate assignment in an asynchronous online policy course, reports on student feedback related to this assignment, and provides recommendations for other faculty wishing to adopt a similar assignment.

Review of Literature

Debate as an Instructional Tool

Debate is a common instructional technique used in many different types of courses. It can be especially effective in courses where there is more than one "right" answer or perspective or when understanding differing viewpoints is important (e.g., in a social policy course). Instructors in several disciplines have used debate and examined its effectiveness in the classroom in encouraging active learning and critical thinking among students (Budesheim & Lundquist, 1999; Kennedy, 2009) and enhancing the overall learning process and student engagement (Omelicheva & Avdeyeva, 2008). However, there are limited studies related to using debate in a social policy course (Gregory & Holloway, 2005).

Particularly relevant to this research, Keller, Whittaker, and Burke (2001) explored the use of debate in a policy course and found that the assignment improved student policy knowledge and skills related to policy practice. In fact, student participants reported the debate was more valuable to them in developing topical knowledge than other more traditional forms on instruction (Keller et al., 2001). Students reported that the debates helped them think about issues from a different perspective and to think more critically—important in policy analysis and practice. Likewise, Gregory and Holloway (2005) examined debate as an instructional strategy in a social policy course. They also found that debate helped students develop critical thinking and argumentation skills, essential to effective policy practice in social work. Both Keller and colleagues (2001) and Gregory and Holloway (2005) reported on some of the challenges associated with a classroom debate, such as logistics (e.g., time) and working in a group. These challenges are consistent with previous literature regarding debate as an instructional tool (Schroeder & Ebert, 1983). While these challenges were taken into consideration in developing the debate assignment for this project, less is known about using debate in an online learning environment.

Online Debate

Online education is a growing field, with over 30% of college students taking at least one online course in 2016 (Seaman, Allen, & Seaman, 2018). Many colleges and universities are exploring ways to expand or extend their programs to students online. Some programs are offering courses completely online, while others are using a blended approach, incorporating online components into their existing courses. One of the challenges, however, is adapting traditional methods of instruction to online course delivery modes (Bates & Watson, 2008). Researchers have argued that online courses can be "as effective as traditional instruction when the method and technologies used are appropriate to the instructional tasks, there is student-to-student interaction,

and timely teacher-to-student feedback" (Hamzaee, 2005, p. 216). According to Clark (1994), the methods used in instruction—not the media—are most important in learning outcomes. It is therefore logical to think that, consistent with a debate in a face-to-face course, an online debate could be used to generate or increase participation from students and increase or improve critical thinking skills.

Richardson and Ice (2010) compared the effectiveness of three different types of online discussions (open-ended discussion, a debate, and a case-based discussion), in improving students' critical thinking skills. Using the Practical Inquiry Model (PIM; Garrison, Anderson, & Archer, 2001), they found that debate improved students' critical thinking achievement levels more than a typical open-ended discussion but slightly less than a case-based discussion. In another study, Weeks' (2013) examined an online debate assignment in a graduate course on leadership and found that online students had higher levels of participation and performance (i.e., better work and higher grades) on the assignment compared to students in her traditional seated course. Weeks (2013) noted that students seemed to think more deeply before posting online versus discussing the topics in class. In reflecting on her experience, Weeks noted that online debates last longer, providing students the opportunity to examine the topic differently—and perhaps more deeply—than in-person discussions. She concluded that online debate can be effective in increasing engagement in course discussions and prompting more complex or deep thought about the issues (Weeks, 2013). Richardson and Ice (2010) also noted that extended time may be needed to allow students to more fully engage in the critical thinking process. Likewise, in their exploration of online debate's ability to spur critical thinking in students, Mutiaraningrum and Cahyono (2015) found that the deliberate planning of a debate (e.g., assigned roles, expectations) helped students post more thoughtful and critical arguments. Mutiaraningrum and Cahyono (2015) also noted the flexibility of online debate, allowing both students and the instructor time to engage with and reflect on the material.

Park, Kier, and Jugdev (2011) examined debate as a teaching strategy in online education from the perspective of three faculty members in different disciplines. While each instructor approached the debate differently, debated different topics, and integrated the assignment into their course in a different way, Park and colleagues suggest that debates can be used "regardless of the mode of delivery … in paced or un-paced online courses … [and] at both the undergraduate and graduate levels of education" (2011, p. 14). They recommended that future research examine faculty and student experiences and perceptions with debate as an instructional strategy.

Purpose of This Research

Given this recommendation and the limited body of research related to the implementation and effectiveness of online debate, the purpose of this study was to explore debate as an assignment in an online asynchronous course and to examine whether this was a viable instructional strategy for this course moving forward. Note that the debate assignment used in this course was not just a debate held in a week or two on a discussion board, but a formal semester-long assignment with students working in groups. This differentiates this assignment from previous work in this area. Research questions that were addressed include (1) whether students liked this type of assignment and (2) what students learned from the assignment, specifically whether the debate helped with critical thinking skills. Thus, this descriptive paper examines the implementation of an asynchronous online debate in an online policy course using both quantitative and qualitative data, as well as reflections and recommendations for using this assignment in other courses and considerations for future research.

Methods

Procedure

Based on best practices in the existing literature regarding debate and online learning, an asynchronous online debate assignment was created and implemented in three sections of a policy course over an 18-month period. Distinct from some debate assignments discussed in the literature (e.g., Richardson & Ice, 2010; Weeks, 2013), this assignment was not held solely on the discussion board. Students were required to write papers, work collaboratively with assigned groups, and respond in a written rebuttal as a group. The policy debate assignment has several components and deadlines; a detailed guide of each required piece of the project, the specifics of each assignment, and accompanying deadlines were provided to the class, and a summary of the components is provided in Table 1 for reference.

Table 1

Debate Assignment Components

Assignment component	**Timeline**
Individual position statement	Week 1
Group position statement	Week 3
Rebuttal	Week 6
Open discussion forum	Week 8
Reflection paper*	Week 9
Peer Evaluation	Week 9
Survey*	3–6 months after course was complete

Note. Only the Reflection paper and the Survey data were used in this paper.

The first component of the assignment was an individual position statement. Students were randomly assigned to either the *pro* or the *con* side of the debate topic (selected by the class) and required to research the topic and write a 2–3 page position statement representing their assigned perspective and citing the scholarly literature. This allowed students to familiarize themselves with the topic and the literature before working with one another to create the group position statement. The group position statement was a collaborative effort, and students had page and reference requirements to meet. The group position statements were posted on the course website; students then had to read the other side's position statement and work together to post a group rebuttal statement and further make their own case. The purpose of this was to give students more time to examine the issue and the other side's argument and then craft a thoughtful response, thus addressing the time issue mentioned by previous research (Richardson & Ice, 2010; Weeks, 2013). At the end of this process, an online discussion forum was opened where students were asked to continue posting from their assigned perspective in an open debate; a minimum number of posts was required. Additional components of the assignment after the debate was complete included peer evaluation of the group members and a reflection paper on the project itself. After the course was complete, students were also asked to take an anonymous survey reporting on their experience with this assignment. While only the reflection paper and survey data were used in this paper, the assignment components and brief description are provided here for context and for those who may be interested in implementing a similar assignment in their own courses.

Participants

Students enrolled in three different sections of an online policy course across three semesters (42 students total) were assigned to complete the online debate project. Consistent with university IRB protocol for course projects, students were given an informed consent form and notified of the existing research project once the course project was complete; they then agreed or disagreed with having their assignment participation and feedback used for the project. Only those students who signed and returned the consent form were included in this study (N = 36). All participants (86% female) were graduate students enrolled in a hybrid human services program taking the social policy course in which this project was completed. All students had some exposure to and experience with online learning and asynchronous courses (i.e., had taken at least one online asynchronous class).

Measures

To address the questions about whether students liked the assignment and what they learned from it, measures included in the analysis for this descriptive project include a reflection paper at the end of the project and a survey sent after the course was complete.

Reflection paper. Qualitative data was gathered from students' reflection papers, where they were asked to comment on the debate assignment. Specifically, students were asked to write about what they liked, what they did not like, what they learned, and suggestions for improvements to the assignment. Reflection papers were submitted by students on the course learning management system. After the course was complete, the papers were downloaded, and identifying information was removed before analysis for this project.

Survey. The survey was conducted online, and students who agreed to participate were sent an anonymous link to respond; 100% of students who agreed to participate returned the survey. Survey questions were created by the author and were selected based on qualities important to the course, the assignment, and the relevant literature. Questions addressed understanding, engagement, critical thinking, and other key aspects of the assignment.

Analysis

Quantitative data from the survey was examined, and simple percentages of agreement and disagreement were calculated. The qualitative data in the reflection papers was coded for emerging themes or topics using qualitative techniques developed by Strauss and Corbin (2008). Open coding was used to generate a list of broad topics or categories discussed by the students. Thematic analysis was then used to analyze data based on these topics. The most common themes are reported here.

Results

Quantitative Data

Approximately 3–6 months after the course was completed, students received a survey asking about their experiences with the debate assignment. Table 2 displays the percentage of students that agreed or strongly agreed that the debate assignment helped in each area. A majority of students (a range of 78–92%) agreed or strongly agreed that the debate assignment helped them further understand course concepts, understand concepts better than lecture or reading would have, helped them use or improve critical thinking skills, and improved collaboration among students in

the course. Fifty-seven percent of students agreed or strongly agreed that the debate experience had helped in other courses or work, while only 28% of students reported that the debate project helped them feel more engaged in the course. See Table 2 for the percentage of participants who agreed (A) or strongly agreed (SA) with each statement.

Table 2
Percentage of Students That Strongly Agreed or Agreed With Each Statement

Statement	Strongly agreed (SA)	Agreed (A)	Total SA/A combined
1. The debate helped me further understand course concepts.	13	67	80
2. The debate helped me feel more engaged in the course.	15	13	28
3. The debate helped me understand concepts from the course better than a lecture or reading would have.	18	60	78
4. The debate helped me use and/or improve my critical thinking skills.	50	42	92
5. The debate improved collaboration among students in the course.	50	42	92
6. My experience with the debate has helped me in other courses or in my work.	7	50	57

Qualitative Data

The major themes that emerged from students' qualitative responses are presented below, along with student quotes to illustrate each theme.

Feeling apprehensive. One of the key themes that emerged was that students were apprehensive about engaging in a debate and doing so in a group, and they were especially nervous about completing this work in an online setting. One student commented, "I was nervous about doing a debate because I knew it would require a lot of research to back-up my argument." Another commented on the aggressive nature that can sometimes be present in debates: "I am generally a passive person and do not like to argue." Several students commented on the group aspect, especially for a semester-long project. One student remarked, "I was nervous about how I would work with a group without even meeting them in person." Another stated, "I have had negative experiences in group projects before and I am really uncomfortable with putting my grade in the hands of others." Lastly, a few students commented on the novelty of an online debate. For example, one student wrote, "I have never done a debate online and a little nervous about how this is going to go." Some students also commented that this apprehension seemed to affect their attitude toward the project initially. However, many of these fears were allayed once the project actually began and students were actively engaged with one another and the professor.

Challenged own viewpoint and opinions. Another common thread in the student comments was the fact that the debate forced students outside their comfort zones and made them examine their own views and opinions. Because students were randomly assigned to the pro or con stance, they were not always able to rely on their prior knowledge and views. One student wrote, "As I researched and wrote about [the debate topic] from a point of view that I have

disagreed with, I found myself challenged to think differently. I found that the problem was that I was looking at the topic from only one perspective, my perspective, my beliefs, opinions, etc. I saw no other way around it or how to potentially argue *for* it." Another student reported having "a hard time with this debate because I am arguing for something that I don't believe." This forced students to rely on the literature and data to support their arguments, instead of emotion and opinion; this is a goal in policy practice. As one student said, this assignment "helped me understand why some individuals see the system the way they do. A change in perspective can open up your eyes to a whole lot of things that I did not see before."

Difficulty with group communication/group conflict. Because this was a group project, some students commented on the challenges they faced, such as communication, time management, and group conflict. One student wrote that "working with a team is challenging … especially online. It's hard to do things when we aren't physically meeting with each other or seeing each other face to face." This was echoed by a couple students, but several students also reported how they managed this challenge in an online course. "My group used Skype to connect," one student wrote, and "I would suggest possibly making it a requirement that group members communicate via Skype. I enjoy face-to-face communication when working with others." Some students commented on the anxiety they felt being required to work in a group. For example, two students said, "It is difficult when working in a group since people have very different lives and work/school schedules," and "Group projects definitely cause some anxiety. I don't like to wait until the last minute to do things like some people." Others acknowledged this concern but found the project went better than expected: "Usually, I am not a big fan of group assignments because not everyone contributes, but they still get the same grade as the rest of the group. This was not the case with the debate assignment. I think that because the topic was so interesting, everyone wanted to do research and contribute to the assignment." Another student remarked, "I usually don't like to work in groups because it is difficult to find time to get together and count on each other, but this group worked well together to reach a common position." While group conflict was referenced a few times, there were no substantial issues during the assignment that came to the attention of the professor.

Gained knowledge. Students also frequently reported learning new content about the debate topic, perhaps more than they would have through other instructional methods. One student wrote, "I was frustrated at first because I thought I knew a lot about this topic, but from the other perspective. Being assigned to the opposite viewpoint made me really do my research and I learned a lot. I learned things that I didn't know were true … it's changed my point of view." Another student wrote that she enjoyed the debate assignment because it helped her understand the debate topic: "Before, I did not understand [the debate topic]. However, this assignment made me change my mind and see that I agree with [the pro side of the argument] and because of this debate assignment, I now can articulate why to my clients and coworkers." Other students agreed and made comments like "I learned a lot" or "The debate was very informative." Several students commented specifically on skills they learned or further developed by working on the assignment. For example, one student said, "Though I have always enjoyed a good debate, I believe this assignment has helped to [improve] how to present an argument, listen to the other side, and refute [their arguments]." Likewise, another student wrote, "I learned so many skills during this debate, skills I will most definitely need to advocate for those people I serve."

Improved critical thinking skills. A key benefit of debate in the literature is the development or improvement of critical thinking skills. This was reflected in students' comments: "Opening my mind to other opinions and letting go of my biases [was important]. It was then that I learned that I was able to see the problem or issue from both sides, rather than only my own." Another student wrote that this assignment "allowed me to see how people that I once thought were just insensitive could come to their conclusions. I learned that my point of view is not the only point of view out there." One student reflected on the varied skills gained from this project: "I have gained various insights from this assignment including critical thinking, researching and applying, adapting to group thinking, and most importantly, developing a perspective from a neutral, third-person context. Additionally, it made me realize that there is not always a right answer and this can relate to social policies in that they are subject to change as new information is researched, applied, and put forth through the persuasion process." Another student wrote, "Having to argue from a perspective that I did not agree with helped me become more objective and think critically." One student specifically applied her experience to those of policymakers: "I thought that we had thoroughly convincing evidence that our stance was correct, however, as I read the other point of view, I realized their stance was just as convincing. I can only imagine how difficult of a decision policymakers have in making decisions on social policy because every side can be argued exhaustively, extensively, and accurately based on current research. This assignment make me really think about how policy is created."

Enjoyed the assignment. Lastly, a common theme that emerged from the reflection papers was that students enjoyed the assignment. One student wrote, "Now that the debate is over, I must say that I am glad I did because it was very enjoyable …. I looked forward to the weekly challenges with this assignment." Another student wrote, "I learned and was challenged more than I expected with this project, thank you!" Several students wrote that the debate assignment was fun or engaging and they enjoyed collaborating with their peers.

Discussion

With online learning being a growing trend, educators will continue to grapple with adapting methods employed in face-to-face courses to an online mode of delivery (Bates & Watson, 2008). This descriptive examination of online debate as an instructional method in a social policy course provides insight into a relatively new and unexplored way to engage students in online courses and enhance their learning and critical thinking skills. Based on survey data and qualitative data from reflection papers, students reported that the debate assignment was helpful in understanding course content, using or improving critical thinking skills, and with collaboration skills. Reflections on the process and recommendations are presented here in the hope that other faculty will replicate this assignment and examine their own experiences, and those of their students.

The survey data demonstrates that a majority of students felt the debate assignment helped them further understand course concepts, perhaps better than a lecture or reading would have. Some students addressed this in their reflection papers as well, noting that requiring them to engage with the scholarly literature to write their individual position statement before working with their group forced them to have at least a cursory understanding of the topic. While general information about the debate topic was provided, students were required to find their own scholarly support for their arguments. This active learning strategy puts students in charge of their own learning and

allows them to learn and explore the topic on their own, as opposed to reading an assigned article or listening to a lecture. This is also consistent with Weeks' (2013) hypothesis that because online debates move more slowly than face-to-face, students have more time to reflect on their learning and compose more thoughtful arguments.

Both qualitative and quantitative data reflected that the assignment allowed students to use or improve critical thinking skills. Critical thinking skills are important in higher education and have been previously associated with student debate in a face-to-face classroom (Budesheim & Lundquist, 1999; Kennedy, 2009; Omelicheva & Avdeyeva, 2008; Schroeder & Ebert, 1983). Critical thinking skills are also essential for effective policy practice (Gregory & Holloway, 2005; Keller et al., 2001).

While not prominently reflected in the qualitative data, survey data indicated that the debate improved collaboration among students in the course. Requiring students to work together to create a group position and rebuttal statements helped improve their collaboration skills. Collaboration and communication were also required for students to successfully navigate group work in an online course. Fifty-seven percent of students agreed or strongly agreed that the debate experience had helped in other courses or work. This is an important statistic, given the nature of this course. Policy work requires being able to research, write, and collaborate with others in order to argue for or against a specific topic or issue. Students in this course were in the human services field and would likely need to advocate at some point for a client. Consistent with the limited previous work on debates in a traditional seated class on social policy (Gregory & Holloway, 2005; Keller et al., 2001), the online debate appeared to provide the same benefits and skill development opportunities for students.

Only 28% of students reported that the debate project helped them feel more engaged in the course. This is surprising, given the number of qualitative comments about the positive outcomes of group work. It is possible that students felt more connected to their group members but not necessarily the course as a whole. It is also possible that the debate project took their focus away from other course assignment and objectives, leaving students feeling engaged in the debate but disengaged from the course itself.

Limitations and Directions for Future Research

While this study provides insight into this assignment and its outcomes and lends credibility to the use of online debate in an asynchronous course, there are limitations. First, this is a small sample with a very specific assignment. It is unknown, for example, whether an assignment with this level of detail and number of components could be as effectively deployed in a larger class in order to increase sample size. Another limitation is that the professor of the course developed the assignment, analyzed the data, and wrote this paper. While objectivity was prioritized, there is likely some bias present, or perhaps students did not share as much as they might have with a third party. While the data presented here is very positive overall, there were likely problems or complaints that students did not share. Further exploration, perhaps through individual interviews with students or groups, would likely shed light on some of these issues. Additionally, while this study presents student satisfaction and perceptions of learning, actual student learning was not measured, nor were any pretests or baseline assessments given. Future research may want to assess students' critical thinking skills before, during, and after such an assignment. Likewise, levels of student engagement and/or collaboration could also be assessed.

Implications and Recommendations for the Classroom

Based on the experience of developing, implementing, and examining a debate assignment in an online asynchronous course and the themes from students' qualitative feedback, the following recommendations are offered to other faculty considering a similar assignment. Given the students' apprehension and wariness about the assignment from the beginning, it is recommended that faculty incorporate a team-building exercise into the beginning of the course to provide more time for students to get to know one another and to feel more confident in collaborating on the project. The importance of providing clear, detailed instructions cannot be overstated. In their study of online debate as an instructional tool, Hodgkinson-Williams and Mostert (2005) reported that one potential obstacle reported by students was that the goal and procedures of the debate needed to be clear from the outset. Mutiaraningrum and Cahyono (2015) also noted the importance of clear guidelines and steps required to participate in an online debate. Thus, the assignment guidelines for this project are detailed and rather long. Students reported that having a detailed guide was helpful, however, especially in an online class where you do not see the students face-to-face to present the project and answer questions. This is no different, however, than the clarity needed in all assignments in online courses.

Having viewpoints and opinions challenged was also a common theme in student feedback. Assigning students to a pro or con perspective forces them to think more objectively and research the facts, not just rely on their opinions. One student even suggested that groups be assigned based on students' individual position statement; once students submit their position, assign them to the opposing viewpoint to argue. Indeed, Hodgkinson-Williams and Mostert (2005) found that students learned more by having to argue an assigned point of view, often conflicting with their own. Giving students time to process this assigned position and the slower nature of an asynchronous debate (compared to a traditional debate) proved helpful, allowing more time for contemplation and thoughtful response. This is consistent with previous literature (Hodgkinson-Williams & Mostert, 2005; Mutiaraningrum & Cahyono, 2015; Weeks, 2013).

Group conflict and communication was another key theme. When the course is online and asynchronous, students may need support and suggestions for connecting with their peers. As one student suggested, using Skype or another videoconferencing platform may be helpful. Providing structured group space on the course learning management system or suggesting platforms such as Google Drive might be an opportunity to help bring groups together and promote collaborative work. Also, as noted above, providing a team-building exercise or an opportunity to connect as a group may be helpful in alleviating these concerns. Once students engage in the process, most enjoy the debate and report learning relevant information and skills. It is important to assure students this is a manageable project and to provide support and consultation as necessary.

Gaining knowledge and critical thinking skills were themes from the student data and are reflected in prior literature as well. As noted, having student write their own position statement before working with their group gives them a starting point. Doing their own research requires them to learn about the topic and their assigned perspective. Having students work with others to create a group statement forces them to evaluate what information from their individual papers to include and how to collaborate with others. Creating a group rebuttal statement requires students to read and analyze the other side's argument and craft a thoughtful response (Zare & Othman, 2015). The structure of this assignment allows multiple opportunities for students to learn and develop knowledge and skills.

Conclusion

With online learning being a growing trend, educators will continue to grapple with adapting methods employed in face-to-face courses to an online mode of delivery and with developing new approaches and methods of instruction. This descriptive examination of debate as an instructional method in an online asynchronous policy course provides insight into a relatively unexplored way to engage students in online courses and enhance their learning and critical thinking skills. The data presented here support the success of this assignment. It is hoped that this case study will provide lessons learned so that more online instructors might use asynchronous debates in their teaching and examine the effectiveness and impact of the tool for themselves.

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Learning Analytics to Inform the Learning Design: Supporting Instructor's Inquiry Into Student Learning in Unsupervised Technology-Enhanced Platforms

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Abstract
Instructors may design and implement formative assessments on technology-enhanced platforms (e.g., online quizzes) with the intention of encouraging the use of effective learning strategies like active retrieval of information and spaced practice among their students. However, when students interact with unsupervised technology-enhanced learning platforms, instructors are often unaware of students' actual use of the learning tools with respect to the pedagogical design. In this study, we designed and extracted five variables from the Canvas quiz-log data, which can provide insights into students' learning behaviors. Anchoring our conceptual basis on the influential conversational framework, we find that learning analytics (LA) can provide instructors with critical information related to students' learning behaviors, thereby supporting instructors' inquiry into student learning in unsupervised technology-enhanced platforms. Our findings suggest that the information that LA provides may enable instructors to provide meaningful feedback to learners and improve the existing learning designs.

Keywords: effective learning strategies, learning design, learning analytics, unsupervised technology-enhanced platforms.

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Learning Analytics to Inform the Learning Design: Supporting Instructor's Inquiry Into Student Learning in Unsupervised Technology-Enhanced Platforms

Effective learning strategies are defined as the study approaches that are linked to superior learning and subsequent performance of learners. Examples include study strategies like active retrieval of information via self-testing and distributed or spaced practice of information (Bjork, Dunlosky, & Kornell, 2013). Robust evidence from cognitive psychology literature confirms that learning strategies like active retrieval of information and spaced practice enhance long-term retention when compared to rereading or massed practice of study materials (Carpenter, Pashler,

& Cepeda, 2009; Karpicke & Smith, 2012; McDaniel, Agarwal, Huelser, McDermott, & Roediger, 2011; McDaniel, Thomas, Agarwal, Mcdermott, & Roediger, 2013; McDaniel, Wildman, & Anderson, 2012). According to the Institute of Education Sciences (IES), part of the U.S. Department of Education, the above-mentioned effective learning strategies improve learning among all students, in particular struggling learners, irrespective of grade or subject (Pashler et al., 2007).

Students' metacognitive monitoring may influence their choice and use of learning strategies (Sánchez-Alonso & Vovides, 2007). Self-monitoring by learners plays an important role in determining successful learning experiences and achievement (Artino, 2008; Dabbagh & Kitsantas, 2004; Sánchez-Alonso & Vovides, 2007; Sun & Rueda, 2012). For example, self-testing may be used as a self-monitoring strategy (McMahon, 2002). However, the majority of students may lack metacognitive awareness regarding the benefits of effective learning strategies (Bjork et al., 2013; Karpicke, Butler, & Roediger, 2009). Therefore, due to the subjective differences in levels of self-monitoring, students often monitor their learning inadequately (Butler & Winne, 1995). High achievers self-monitor and evaluate their learning better, while low-achieving students may often misevaluate their performance and use of strategies (Butler & Winne, 1995; Hacker, Bol, Horgan, & Rakow, 2000; Lester, Mott, Robison, Rowe, & Shores, 2013; Zimmerman & Martinez-Pons, 1990). Feedback from external sources, such as an instructor, can play a vital role in encouraging the use of effective learning strategies among students who have poor metacognitive awareness (Hattie & Timperley, 2007; McMahon, 2002; Roll, Wiese, Long, Aleven, & Koedinger, 2014).

The metacognitive awareness among learners assumes special importance in higher education, where students have to take an autonomous and active role in learning outside classrooms, such as self-directed environments where there is less guidance from instructors (Bjork et al., 2013; McMahon, 2002). Such settings refer to the unsupervised use of technology-enhanced learning platforms, such as online testing and learning tools. Studies affirm the value of the use of technology-enhanced platforms, like a learning management system (LMS), in conducting self-paced, learner-centered activities outside the classroom (Al-Busaidi, 2013; Chou, Peng, & Chang, 2010; Dias & Diniz, 2014; Islam, 2013; Nguyen, 2017; Wang, 2017; Zhang, Zhao, Zhou, & Nunamaker, 2004). For example, pedagogical tools like low-stakes quizzes can be effectively delivered via LMSs as learning designs which provide structure and opportunities for repeated practice and self-monitoring among learners (Angus & Watson, 2009; Coates, James, & Baldwin, 2005; Doige, 2012; O'Sullivan & Hargaden, 2014). Angus and Watson (2009) point out that certain formative aspects of assessments, like an opportunity for multiple attempts; timely formative feedback, which facilitates the development of mastery goal orientation and self-reflection among learners; and randomized questions could be attainable only in the online format. However, in unsupervised technology-enhanced platforms, instructors may lack access to students' actual learning behaviors and, hence, may not be successful in implementing timely interventions aimed to encourage productive learning behaviors.

Framework for the Study

The conceptual framework chosen for this study is the influential conversational framework proposed by Laurillard (2002), which suggests that interaction and feedback between instructors and students play a key role in enhancing student learning. The following paragraph explores in detail the role which instructors can play in this regard.

Instructors can play a two-pronged role in encouraging productive learning behaviors among students. They can encourage productive learning behaviors through mindful design and implementation of formative assessments (Knight & Sydney, 2018; Wise & Shaffer, 2015). More importantly, they can monitor learning behaviors and intervene by timely and meaningful feedback to support metacognitive awareness among students (Black & Wiliam, 2009; Black & Wiliam, 1998a; Govaerts, Verbert, Duval, & Pardo, 2012; Kaendler, Wiedmann, Rummel, & Spada, 2015). The role of instructors assumes importance in relation to the way assessments are conducted in the classrooms. Traditionally, when assessments are used to gauge students' learning and assign grades, only the final performances are considered as learning outcomes. In this case, instructors usually provide feedback only about the accuracy of the assigned task's outcome. The feedback that focuses on task accuracy may provide minimal guidance to the learners to monitor their learning (Butler & Winne, 1995). Alternatively, formative assessments implemented by the instructor can act as a guide to improve the learning process as well as future instruction (Baleni, 2015; Black & Wiliam, 1998a, 1998b; Leahy, Lyon, Thompson, & Wiliam, 2005; McTighe & O'Connor, 2005). This is because formative assessments provide instructors with ongoing information about learner behaviors and allow instructors to provide timely feedback to encourage productive learning behaviors and alter unproductive ones.

Importance of Interlinking Learning Analytics and Learning Design

As discussed in the previous sections, instructors may design and implement formative assessments intended to improve student learning on technology-enhanced platforms. However, in unsupervised technology-enhanced platforms, instructors remain unaware of students' activities and behavior patterns. Hence, they may not be able to provide students with feedback aimed to encourage the use of effective learning strategies. Possessing an understanding of learner behaviors with respect to the implemented learning design may be a prerequisite for providing meaningful feedback to students (Lockyer, Heathcote, & Dawson, 2013; van Leeuwen, 2015). Learning design is defined as the pedagogical intent and sequencing of an instructional technique (Lockyer et al., 2013). Studies confirm that evaluating the correctness of learners' solutions may be an easy task, while it could be more challenging to evaluate the quality of their learning strategies (Roll et al., 2014). Data gathered from technology-enhanced learning platforms, related to students' activities on those platforms, are required to understand how students interact with the system (Roll, Aleven, McLaren, & Koedinger, 2007).

Learning analytics (LA) allow instructors to access actual student behavioral data, especially when learning happens in unsupervised technology-enhanced learning platforms. LA is defined as "the process of collecting and studying usage data in order to make instructional decisions that will support student success" (Becker, 2013, p. 63). Instructors may need access to student behavior data to evaluate the effectiveness of the implemented pedagogical designs (Dyckhoff, Zielke, Bültmann, Chatti, & Schroeder, 2012; Lockyer, Heathcote, & Dawson, 2013). When instructors have access to students' learning behaviors, they may make pedagogic changes soon enough to impact practice, including modification of the existing instructional design to encourage productive learning behaviors. This cyclical design process is represented in Figure 1.

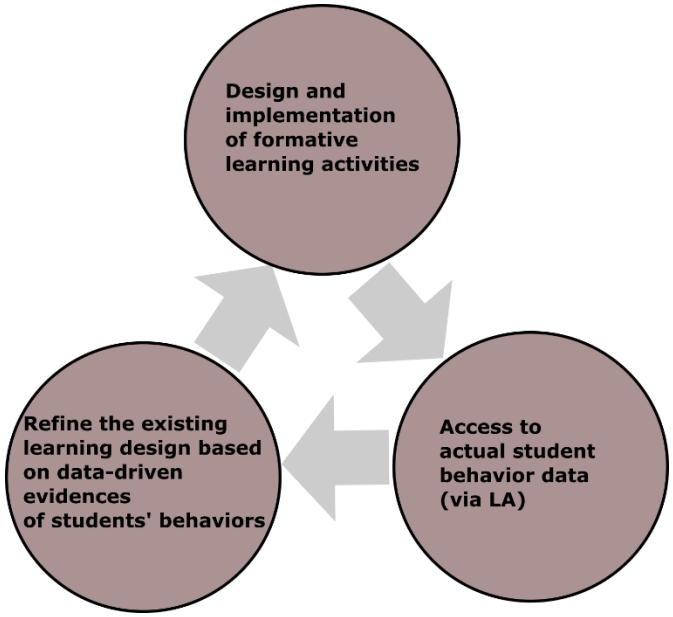

Figure 1. The cyclical process of design and refinement of the implemented learning designs based on data-driven evidence.

LA has been increasingly used to support learning and teaching. After the implementation of learning designs, LA may help instructors understand the extent to which requirements of the design are met by their students (Kennedy et al., 2014). In short, the data available to instructors that are related to student behaviors allow instructors to reflect on student learning, provide learners with meaningful feedback, and refine the implemented learning design (Kennedy et al., 2014). Despite the potential of LA studies to provide instructors with real-time data related to student behaviors while learning is ongoing, only a few empirical studies explore how LA can support instructors' inquiry into student learning (van Leeuwen, 2015). Several analytic tools are available that collect and analyze data related to student engagement with technology-enhanced platforms (Arnold, 2010; Bakharia & Dawson, 2011; Kuosa et al., 2016; McKay, Miller, & Tritz, 2012; Silius, Tervakari, & Kailanto, 2013). But one of the major limitations of the existing tools is that they do not take into account the implemented pedagogic design, which may primarily determine how students engage with the learning platforms (Kennedy et al., 2014). Interconnecting learning design with the data collected from technology-enhanced learning tools by means of LA remains a largely unexplored area (Lockyer & Dawson, 2012). This limits the effective use of analytic data in meaningful ways.

The following case study from an undergraduate general microbiology class at Colorado State University investigates how meaningful information related to students' learning behaviors with respect to the learning design can be obtained via LA so that instructors can use such information for course-based improvements.

Methods

The following sections provide the context of the implemented learning design and details of the research design and study.

The Implemented Learning Design

This section explains the details of the implemented learning design in the undergraduate microbiology class: Microbiology, Immunology, and Pathology (MIP henceforth) within the Department of Microbiology, Immunology & Pathology at Colorado State University. The instructors of MIP had set up online quizzing on Canvas, the LMS at Colorado State University. The motivation behind the design and implementation of this learning design is the finding that quizzes or tests that require students to actively recall information promote learning and help them remember the information for longer periods. This phenomenon, demonstrated in controlled experiments as well as experimental studies in classrooms, is known as the "testing effect." Similarly, distributing the practice time into multiple sessions is demonstrated to be more effective than massing all the study sessions close together. This finding is referred to as the "spacing effect." In short, the online quizzes were designed based on the benefits of active retrieval and spaced practice of information on long-term retention of information.

The quizzes were to be attempted by the students unsupervised at their own pace and convenience (timing and location of quiz taking was the students' choice). The students were encouraged to watch an instructional video as a prerequisite to taking the online quizzes. This video briefly summarized the benefits of active recall and spaced retrieval on long-term retention and advised the students to learn the material in advance, not use their class notes while attempting the quizzes, and actively retrieve the information required to complete the problem via distributed practice over multiple sessions. The intent of the video was to encourage students to behave in ways that were beneficial for their learning.

Students could attempt the quizzes up to 10 times, as the intention was to promote learning among students rather than test their current knowledge (i.e., use quizzes as a learning tool rather than merely as an evaluative tool). They could retake the quizzes multiple times in order to achieve mastery of the topic and earn the highest score. The highest score achieved was kept in the Canvas gradebook. Each quiz was open for 9 days. The quizzes were low-stakes, contributing to less than 10% of the final grades. Every attempt of the quiz had a set of 10 random questions allotted from a question bank. The timeline sequence of the online quizzes and subsequent summative examinations are shown in Figure 2. As illustrated, each quiz was immediately followed by the relevant summative examination (Quiz 1 by Exam 1, Quiz 2 by Exam 2, Quiz 3 by Exam 3, and Quizzes 4 and 5 by the final comprehensive exam). This quiz structure allowed students to practice content before being tested on the relevant summative exam. In short, this design was implemented as a structure that provided students an opportunity to take part in a flexible, yet focused learning activity.

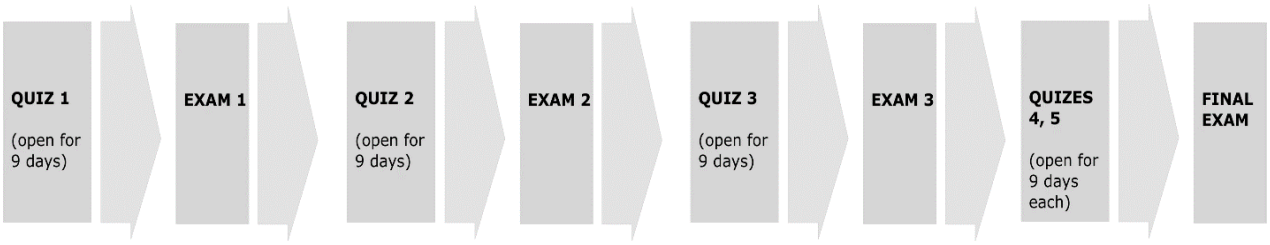

Figure 2. Timeline of quizzes and exams implemented in the MIP course.

Problem Statement

The self-administered nature of the quizzes and limited data-reporting options available on the existing Canvas dashboard presented two problems to the MIP instructors. First, the actual quiz-taking behaviors of students were not available to us. Hence, postimplementation of the learning design, we did not possess information regarding whether the actual student behaviors accorded with the pedagogical intent of the implemented design. For example, did the students attempt the quizzes just before the deadlines only to secure credit? Did the students distribute the multiple possible attempts over the period in which the quizzes remained open, or did they mass all attempts together? Second, we were unable to provide meaningful and timely external feedback to students regarding their quiz-taking behaviors and use of strategies. Instead, we provided each student with a comparison of their individual scores with the class averages on exams (or comparison to the student's own scores in the earlier quizzes) and/or motivational feedback, such as "you are progressing well in this course" or "you need to put in more effort." However, motivational feedback is of limited value and may not help students understand deficits in their learning behaviors.

Need for Quiz-Log Analytics

The broad research question identified for the study was the following: Are learners' behaviors aligned to the pedagogical intent of the instructor's implemented learning design? To answer this question, the analysis of quiz logs collected from Canvas was considered necessary for the following reasons.

Providing students with formative feedback about their actual learning behaviors could encourage them to metacognitively monitor their behaviors and regulate their learning better. Students often may not be reliable monitors of their learning strategies and can overestimate the use of a specific tactic (Butler & Winne, 1995; Winne & Jamieson-Noel, 2002; Winne et al., 2002). Therefore, self-reports about the use of learning strategies may be inaccurate and unreliable. A more accurate report of students' learning strategies can be obtained by the analysis of Canvas quiz-log data.

Present-day technology-enhanced platforms log large volumes of metadata related to student activities in these platforms. But the dashboards of these platforms typically have built-in monitoring features that report only limited data. The remaining logged data are unavailable and incomprehensible to instructors, making it difficult to understand students' behavioral patterns. Usually, the information presented in dashboards of LMSs is simple metrics of students' frequency of interaction, such as the first and last login, messages the student has read and posted in discussion threads, number of downloads of study materials, number of pages visited, and scores

achieved in assessments (Mazza & Dimitrova, 2007; Bueckle & Börner, 2017). These frequency measures may not provide instructors with meaningful insights into learner behaviors since these do not sufficiently capture student engagement and are not directly correlated to learning. For example, a higher number of logins does not guarantee that a student is more engaged in learning. Instructors may need access to variables closely related to students' learning behaviors to provide meaningful formative feedback, which could act as pointers to alter misguided learning strategies. We assume such variables can be extracted from the available log data.

The two specific research questions identified in the study, related to the quiz-log analysis, were the following:

- RQ1: What variables related to students' productive learning behaviors can be identified from Canvas quiz logs?
- RQ 2: Are there associations between the identified variables related to productive learning behaviors and exam scores?

Data Collection

Data from Canvas can be collected for data mining at many levels of granularity, ranging from course level to events or actions level (related to each quiz submission). The nature of the problem determines the choice of data collection, which implies that the collected data have to align with the research questions under consideration (Romero & Ventura, 2013). The specific research questions in this study demanded data collection of the quiz-log data from Canvas at the events/actions level.

Canvas data is stored in a "star schema" convention, where information is stored as a relational schema of facts and dimensions tables. Fact tables are designed at a low level of detail (or granularity), which implies events can be recorded at a very fine granularity. Dimension tables contain attributes which describe the fact data.

A set of predefined routines and protocols called application programming interface (API) was used to access data from Canvas. Data collection spanned three main tables in Canvas—namely, the user (has attributes of the user/student), quiz submissions (contains details regarding the last submitted quiz), and submissions (has attributes related to the latest submission of a quiz). The data schema of the three tables, including the column names, description of stored data, and interrelationship between the tables can be found in Figure 3.

USERS

CANVAS COLUMN NAME	DESCRIPTION
id	Unique surrogate ID for the user. This ID is obfuscated to protect the identity of the user
canvas_id	Primary key for this user in the Canvas users table
name	Name of the user
time_zone	User's primary timezone

QUIZZES

CANVAS COLUMN NAME	DESCRIPTION
id	Unique surrogate ID for the quiz submission
canvas_id	Primary key for this quiz submission in the Canvas table 'quiz submissions'
quiz_id	ID of the quiz the quiz submission represents. Foreign key to the quiz dimension table.
submission_id	ID to the submission the quiz submission represents. Foreign key to the quiz submission dimension table.
user_id	ID of the user (who is a student) who made the submission. Foreign key to the user dimension table.
submission_scoring_policy	Denotes if the score has been manually overridden by a teacher to reflect the score of a previous attempt (as opposed to a score calculated by the quiz's scoring policy. Possible values are 'manually_overridden' or the general quiz scoring policies, i.e. 'keep_highest', 'keep_latest' and 'keep_average'. Defaults to the scoring policy of the quiz the submission is associated with.
started_at	Time at which the student started the quiz submission
finished_at	Time at which the student submitted the quiz submission

SUBMISSIONS

CANVAS COLUMN NAME	DESCRIPTION
id	Unique surrogate ID for the submission
canvas_id	Primary key for this record in the Canvas submissions table
submitted_at	Timestamp of when the submission was submitted
attempt	The number of attempts made including this one
quiz_submission_id	Foreign key to the quiz_submission_dim table
user_id	Foreign key to the user_dim table

Figure 3. Canvas data schema.

Data Preprocessing

LMSs log traces of data related to students' learning activities. However, since these platforms are not designed for data mining, data are not stored in structured and systematic ways. Also, not all LMS log data are stored in the same format. Therefore, educational data mining tasks may require time-consuming data preprocessing for cleaning up the data and modifying it to appropriate forms (Bienkowski, Feng, & Means, 2012; Krüger, Merceron, & Wolf, 2010; Merceron & Yacef, 2008). Additionally, when data collection occurs at granular levels related to the implemented learning design, analysis and interpretation of student interactions become increasingly complex (Kennedy et al., 2014). The following sections describe the data preprocessing tasks and extraction of variables related to learner behaviors from Canvas quiz logs. We provide this detail to emphasize the importance of choosing data structures and formats which represent the event under consideration while converting the available semistructured data into a structured format.

The responses to the API calls which were used for data collection were in JavaScript Object Notation (JSON) format. For each quiz, all events related to a single quiz submission were retrieved. Since a student could make multiple attempts for a given quiz, events related to each attempt were to be considered to have a complete overview of student quiz-taking behaviors. The summary of each attempt in the quiz-log data consisted of quiz submission events which had information including the quiz ID, Canvas ID (Canvas creates an alternate ID, labeled the "Canvas ID," for all students corresponding to their university enrolment ID) of the student, and quiz submission events, such as the current number of attempt of a given quiz, remaining number of possible attempts, day of the attempt, the start time and end time for the current attempt, the score for the attempt, and an indication of off-task activity (i.e., the number of times the student has left the active page during the attempt under consideration).

The retrieved events were available in a format where an event related to the submission of each attempt of a quiz corresponded to the respective quizzes. It was necessary to reorganize the raw data to a format wherein events corresponded to the individual student. Later, this would allow easy traversal through the data set and retrieval of the required information corresponding to each student. Data was modified to the desired format using Python scripts. The hierarchical, nested structure of the heterogeneous data after this reorganization is shown in Figure 4.

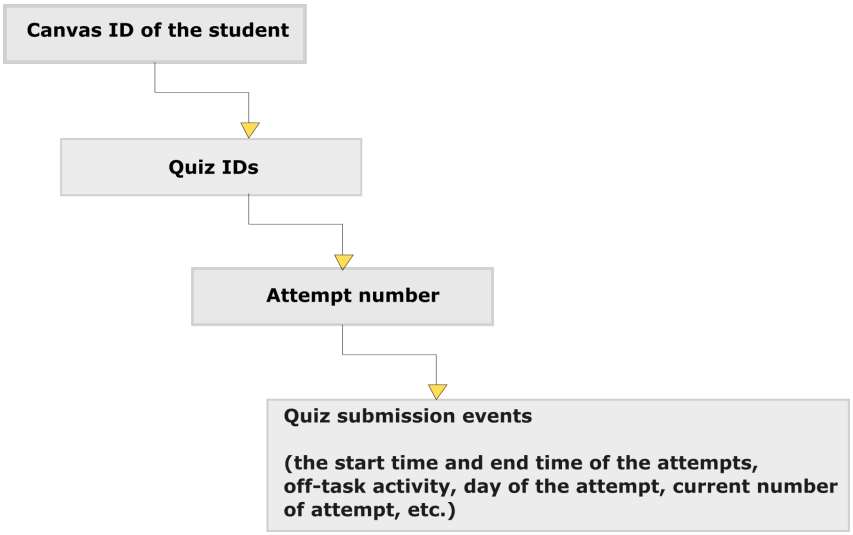

Figure 4. Quiz-log structure after data preprocessing.

Design and Extraction of Variables Related to Learner Behaviors From Canvas Quiz Logs

There is no pre-identified standard set of variables in the literature which meaningfully capture learners' behaviors with respect to the varying pedagogical intent and design of the different learning activities planned (Macfadyen & Dawson, 2010; Saqr, Fors, & Tedre, 2017). Variable selection depends on the context of the course, learning design, learning environment, and purpose of the study (Agudo-Peregrina, Iglesias-Pradas, Conde-González, & Hernández-García, 2014; Gašević, Dawson, Rogers, & Gasevic, 2016; Rienties, Boroowa, Cross, Kubiak, & Mayles, 2016). Hence, mindful design and extraction of variables are required to translate the logged data into meaningful indicators of students' effort. The following paragraphs explain the process of variables identification from Canvas quiz logs, which could provide meaningful information related to students' learning behaviors as they interacted with the learning design implemented in the MIP course.

We explored the Canvas quiz-log data to design and build variables which reflect the self-regulated quiz-taking behaviors of students with the unsupervised online quizzing platform. Exploration of the quiz-log data in relation to learners' choice of study strategies, including spaced practice and massed practice (placing all study attempts close together instead of distributing them), was conducted to extract and build variables. Emphasis was given to the design of meaningful variables associated with productive learning behaviors, such as students' focus on the task, as indicated by the quality of time spent online, the spacing of study events, procrastination behavior, and the number of attempts of quizzes (indicative of more practice). As was explained in the background, the rationale behind the choice of these variables was the consistent findings from previous studies, which show that effective learning strategies, such as repeated practice, distributed practice, and quality time spent on learning, usually lead to higher performance (de Freitas et al., 2015; Hung & Zhang, 2008; Macfadyen & Dawson, 2010). We only considered actionable variables—that is, those that would potentially provide hints to the instructors on how to effect changes in learners' behaviors or make decisions related to future design and implementation of quizzes. Adding static, nonmalleable variables, like demographic information or prior performance of the participants, could limit the possibility of providing the students with

personalized and targeted formative feedback (Hung et al., 2017; Tempelaar, Rienties, & Giesbers, 2015).

Participants

Quiz logs pertaining to each quiz submission were collected from Canvas for 133 students taking MIP during the fall semester of 2017. To protect student identity, we intentionally did not collect demographic identifiers on individual students, as differences among students were not a focus of our research questions. However, MIP students typically are in their third year (junior year) at the university.

Results

To answer RQ 1, an exploration of Canvas quiz-log data was done, which led to the identification of five variables related to student learning behaviors. A few of these variables are directly logged in quiz logs, while the rest of the relevant variables had to be derived by manipulating the available data. The details about the design and extraction of each of these variables from the Canvas quiz logs are discussed in detail below.

Total time spent. Carroll's Time-on-Task hypothesis, one of the pioneering works investigating the relationship between students' classroom behavior and learning, hypothesizes that a student who spends more time engaging with the study materials has greater opportunities to learn (Carroll, 1989). This hypothesis implies that off-task activities (behaviors not related to learning, including disengaging from the study material) reduce learning. Based on this hypothesis, it was important to track time spent on task and off task for each student.

The variable "total time spent" was calculated as a measure of the aggregate time a student spent on all attempts at an individual quiz. The attribute "time spent," which is recorded in the Canvas log data for each submission of a quiz attempt, was extracted. Total time spent was obtained by adding up the time a student spent across all quiz attempts. This measure of total time spent was approached with caution, as it may have included the time spent off task by the students as well. Hence, to have a more accurate measure of time spent on task, a new variable called "off-task behavior" was built, as explained below.

Off-task behavior. Canvas logs an event type related to the student's off-task behavior for each quiz submission event, logged when the current Web browser tab becomes inactive for a long duration during the quizzing activity. For example, this event could occur when a student leaves the online quizzing system within Canvas and engages in off-task activities, such as browsing other tabs or temporarily leaving the system. This feature logged by Canvas was considered appropriate as a measure of off-task behavior after preliminary exploration of quiz-log data and parallel experiments conducted to establish the validity of this event type as a measure of off-task behavior. We compared the off-task activity of students as they took tests in two conditions (one proctored and the other nonproctored). The proctored testing condition showed significantly less off-task behavior compared to the nonproctored condition, as indicated by the Wilcoxon signed-rank test ($Z = -7.22$, $p < .01$).

Closeness of the first attempt to the due date. There is evidence to support the claim that the higher the number of test attempts, the more it potentiates subsequent learning among students (Soderstrom & Bjork, 2014). Therefore, attempting the quizzes early on was considered a productive learning behavior, as it may have given students the opportunity to practice tests

multiple times. Procrastination in students' quiz taking was measured as the closeness of the day of the first attempt of a quiz to its due date. For example, if a quiz was due on a given date *d*, and the day of the first attempt by the student was *d1*, *d1* - *d* was considered an indication of procrastination behavior. This attribute was termed the "closeness of the first attempt to the due date."

Canvas logs the date and start time of each attempt by the student, labeled as "started at." The attribute "started at," which is logged in Canvas corresponding to the first submission of a quiz attempt, was extracted to calculate the day of the first attempt. The due date was a date set by the instructors as part of the learning design.

Number of attempts. Studies show that retrieval attempts and practice, even if unsuccessful, enhance learning (Hays, Kornell, & Bjork, 2013; Kornell, Jensen Hays, & Bjork, 2009; Richland, Kornell, & Kao, 2009). This may be because unsuccessful attempts can initiate learning between attempts (McDaniel et al., 2011). Quiz designs where grades are awarded for the best attempt among multiple possible attempts encourage subsequent practice among students (Zimmerman, Moylan, Hudesman, White, & Flugman, 2011). In the learning design implemented in MIP, students could attempt a quiz up to 10 times to allow them to practice concepts until they felt confident in having mastered a concept.

In the Canvas quiz-log data for each student, each submission associated with quizzes has a feature labeled "attempt," which logs the ordinal number of the attempt the student makes for the quiz under consideration. The variable "number of attempts" was calculated as the highest number of attempt (maximum value among the logged number of attempts) a student makes for the given quiz.

Spacing the study sessions. Robust findings from psychology as well as studies conducted in classrooms support the claim that distributing or spacing the study time into multiple sessions is more productive for long-term retention than massing the study time into a few sessions (Kapler, Weston, & Wiseheart, 2015; Larsen, Butler, & Roediger, 2008; McDaniel et al., 2013; Nazari & Ebersbach, 2018; Roediger & Karpicke, 2006; Schutte et al., 2015).

In MIP, students could attempt a quiz up to 10 times and were free to choose how to space these attempts across time. The quizzes were open for a window of 9 days, and the students could distribute their attempts over that period or mass them all together on a single day. A score was assigned to the student depending on the number of days across which the attempts were distributed. For example, a student who spaced their practice across three different days would get a score of three and a student who massed their attempts in one day a score of one.

Correlations between variables related to productive learning behaviors and exam scores. To answer RQ 2, we examined the relationship between the variables related to productive learning behaviors and grades in exams (exams which immediately followed a quiz as well as the final exam). Two of the variables identified from the quiz-log data, the off-task behavior and closeness to the due date, significantly correlated with the exam scores. For Quiz 1, correlation between scores in Exam 1 and off-task behavior was $r(90) = -.51$, $p < .01$; between scores in final exams and off-task behavior was $r(90) = -.45$, $p < .01$; between scores in Exam 1 and closeness to the due date was $r(90) = -.22$, $p < .005$; and between scores in final exams and closeness to the due date was $r(90) = -.21$, $p < .005$. For Quiz 2, correlation between scores in Exam 2 and off-task behavior was $r(90) = -.30$, $p < .01$; and between scores in final exams and off-task behavior was $r(90) = -.30$, $p < .01$. For Quiz 3, correlation between scores in Exam 3 and off-task behavior was

$r(90) = -.33$, $p < .01$; between scores in final exams and off-task behavior was $r(90) = -.34$, $p < .01$; between scores in Exam 3 and closeness to the due date was $r(90) = -.35$, $p < .01$; and between scores in final exams and closeness to the due date was $r(90) = -.40$, $p < .01$.

Discussion

The present study is significant for the following reasons:

Technology-enhanced learning platforms encourage metacognition among learners by supporting self-reflection and self-monitoring (McMahon, 2002). Despite the potential of such platforms to encourage effective learning behaviors and support learners' metacognitive awareness, use of these platforms remains limited in two main areas. First, changes in pedagogic practice to take advantage of the functionalities offered by LMSs are often not implemented (Collis & van Der Wende, 2002; Mitrovic, Suraweera, Martin, & Weerasinghe, 2004; Sinclair & Aho, 2018). For example, many instructors use these platforms mainly to deliver course materials electronically to the students (Campbell, 2007; Vovides, Mitropoulou, & Nickmans, 2007). Second, the integrated features, functionalities, and logged data that can be mined for understanding learners' interaction patterns are rarely explored (Milliner & Cote, 2018). In order to maximize the use of LA data available from technology-enhanced learning platforms, instructors may have to design and implement evidence-based reflective instructional activities (Hernández-Leo, Martinez-Maldonado, Pardo, Muñoz-Cristóbal, & Rodríguez-Triana, 2019). This implies that instructors may have to keep in mind the possibilities of meaningful data collection as early as the design stages of learning activities. The current work encourages instructors to consider the possibilities of implementing formative learning designs and exploring behavioral data with respect to the pedagogical design to refine the implemented design as well as encourage productive behaviors among students.

Previously, instructors have relied on qualitative methods like interviews or observations to understand students' learning behaviors (Mor, Ferguson, & Wasson, 2015). The present work encourages instructors to exploit the potential of using data-driven evidence to explore the actual behaviors of students collected from a technology-enhanced platform. Real-time access to students' actual learning strategies from quiz-log data analysis may help instructors understand patterns of learner behaviors in unsupervised platforms. In turn, instructors can provide meaningful feedback targeted to improve self-reflection among students who show less metacognitive awareness of their learning behaviors. Students' reflection of their choice of study strategies may encourage effective use of the quizzes as a learning tool, which promotes self-testing and spaced retrieval of information.

Many of the existing LA tools (e.g., analytics reported on LMS dashboards) to understand students' learning behaviors and their patterns of engagement rely on static data (like demographics and prior academic records) and/or simple metrics related to student engagement levels, like login frequency, the frequency of course materials accessed, number of discussions posted, and number of downloads of course materials. Criticism of the use of static variables is that these variables cannot be manipulated to implement specific interventions that target student learning and provide insight for improving teaching strategies. Simple metrics that track student engagement may lack the power to contribute to the understanding of student learning (Lodge & Lewis, 2012). Due to this limitation, existing tools may not support instructors in improving their

learning activities. Variables considered in this study, which are related to student learning behaviors, are malleable and pedagogically meaningful and, hence, address this limitation.

Overall, this work offers instructors the chance to think about the design of interventions that have a direct and immediate impact on teaching and learning processes (Wise, 2014). Interventions planned with the goal of improving learning strategies that students employ within an unsupervised quiz will allow instructors to move beyond making mere predictions of exam scores. The focus of the current study is on improving the quality of learning of all students and is not limited to identifying at-risk students. The approach undertaken in this work may eventually aid in making the transition to a learner-centric approach (where the use of study strategies, involvement level, and performance of each student with the online platform is tracked and followed up with meaningful personalized feedback) from a variable-centric approach (comprising mere comparison of class averages on summative exams).

The future work will classify students based on their patterns in learning behaviors and examine the differences in exam scores among the identified groups of students. Further, the results of the quiz-log analysis will be shared with instructors to understand the pedagogical implications, such as the possibility of providing meaningful feedback to students and redesigning the quizzes. To meet this end, a qualitative study is planned wherein interviews with the MIP instructors will be conducted.

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The Collaborative Mapping Model: Relationship-Centered Instructional Design for Higher Education

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Abstract
Collaborating with faculty is an integral part of the instructional designer's role. However, faculty can be skeptical regarding the added value of the instructional designer's expertise and contribution in helping them (Intentional Futures, 2016). Additionally, instructional designers experience a high degree of job misperception and struggle to advocate for clear and defined roles (Drysdale, 2018). Four primary responsibilities of instructional designers in higher education were defined by evaluating the industry standard models of instructional design, comparing their structure and usage for relevance to the consultative role designers assume in higher education. The collaborative designer piece was missing from the literature leading to the development of the collaborative mapping model (CMM) that puts relationship at the center of higher education instructional design and addresses issues of scale, quality, and empowerment. Development of the CMM was informed by several key theories and concepts, including authentic leadership theory (Kiersch & Byrne, 2015), shared leadership theory (Bolden, 2011), and appreciative inquiry (Kadi-Hanifi et al., 2014).
After several years of implementation and refinement, the preliminary research described here was conducted to examine the effectiveness of the model toward facilitating the collaborative relationship between instructional designer and faculty. Fifty faculty who had designed a course in partnership with an instructional designer through the CMM were surveyed regarding their experience with the process. Among the results, 92% of the 37 respondents indicated an improvement in the quality of their courses and 73% indicated that they saved time by working with an instructional designer in the CMM. Key themes included an increased value and respect for the expertise of the instructional designer, a significant improvement to the quality of online courses designed and developed through the CMM, and enthusiasm for continued collaboration with instructional designers. This study describes the development of the model, an overview of theoretical influences and processes, and the results of research examining the effectiveness of the CMM of instructional design.

Keywords: instructional design, instructional design models, collaboration, faculty partnership, advocacy, leadership, course mapping, curriculum design, professional roles

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The Collaborative Mapping Model: Relationship-Centered Instructional Design for Higher Education

While higher education administrators may recognize the value instructional designers bring to online learning, limited resources for staffing can inhibit the kind of growth needed for institutional leaders to effectively empower them (Fredericksen, 2017). Brigance (2012) suggested that instructional designers are positioned to be leaders in their institutions, due to their significant expertise in online learning and instructional design. French and Raven (2010) posited that this expert power has the potential to increase social influence. Instructional designers, as leaders with influence but not overt authority, can advocate for their role as partners with faculty. However, designers often struggle to persuade resistant faculty to collaborate and often find it challenging to stay focused on their primary work: the conceptual design of courses through consultation with faculty (Intentional Futures, 2016). This key role is frequently misperceived or misrepresented, stretching instructional designers thin and allowing secondary job responsibilities to overtake the primary work of design collaborations (Drysdale, 2018). According to Seaman, Allen, and Seaman (2018), recent enrollments in online courses have been increasing while face-to-face enrollments have decreased. Expertise in online learning design is more vital than ever in order to recruit, retain, and graduate students through high-quality online programs (Shaw, 2012). A new model of instructional design focused on collaboration and building positive relationships between faculty and designers was developed to address these challenges of misperception, collaboration, scalability, and quality. Known as the collaborative mapping model (CMM), this approach to instructional design encourages faculty and designers to value each other's considerable and distinct expertise. The CMM was developed specifically to address the unique challenges instructional designers face in higher education. After several CMM design model iterations from 2014 and 2017, this paper presents the findings of research to assess the effectiveness of the model from the perspective of faculty who designed online courses in partnership with an instructional designer using the CMM process. Developed specifically for higher education, the CMM is positioned differently than other models of instructional design, the most ubiquitous of which are rooted in the fields of corporate training and professional learning.

Literature Review

Instructional design is a field of practice that focuses on the design, development, and implementation of learning experiences (Saba, 2011). The design of learning is enacted and guided through models of instructional design. Andrews and Goodson (1980) conducted a pivotal study comparing a range of instructional design models that were developed by individual practitioners. They discovered that most models of instructional design emerged from the individual experiences, context, and perspective of their creators, and that many were modifications of previously existing models of design (Andrews & Goodson, 1980). Sixty-five percent of the models compared in the study claimed a theoretical origin, including learning theory, while 50% claimed an empirical origin; these underpinnings were not mutually exclusive (Andrews & Goodson, 1980). Models of design from this study espoused one of three purposes: teaching the instructional design process, production of instructional products and materials, or a reduction in the cost of education (Andrews & Goodson, 1980, p. 11). Further, each model had a focus on either the design of single learning experiences or systems of learning, such as programs or curricula (Andrews & Goodson, 1980).

Gustafson and Branch (2002) produced a taxonomy of instructional development models, which they defined as inclusive of both design and development practices. They categorized the included models of development into three classifications: classroom-centric, or created to improve small-scale instruction; systems-centric, or created to design and improve programs and curricula; and product-centric, or created to facilitate development of instructional materials (Gustafson & Branch, 2002). The taxonomy described characteristics of design models in relation to these three orientations, including team or individual effort, the skill needed to successfully implement the model, and the anticipated degree of iteration (Gustafson & Branch, 2002, p. 34). The models included in the taxonomy were developed for situational use and lacked a clear, pervasive approach aside from a commitment to the basic tenets of instructional systems design: analysis, design, development, implementation, and evaluation (Gustafson & Branch, 2002). Neither Gustafson and Branch's (2002) taxonomy nor Andrews and Goodson's (1980) comparison of design models were organized by modality. However, since the advent of the Internet as a native and ubiquitous environment for learning, this characteristic has become an important facet of instructional design models, particularly those used in online learning.

Although many instructional design models exist, three have emerged in the field as the primary processes used across different industries, iterated upon both formally and informally based on context: ADDIE, AGILE, and backward design. However, these instructional design models operate less as clear processes for designing and developing learning systems and experiences than as design philosophies or approaches that inform the work, role, and focus of instructional designers.

The ADDIE Model

The ADDIE model—which stands for *analyze*, *design*, *develop*, *implement*, and *evaluate*—is of uncertain origin; some suggest that it emerged at Florida State University from work commissioned by the U.S. Army, although the acronym ADDIE was not formally used during the project (Molenda, 2003). Further, ADDIE did not appear in any of the major literature around instructional design models from the 1980s or 1990s (Molenda, 2003). As a result, Molenda (2003) concluded that ADDIE was "merely a colloquial term used to describe a systematic approach to instructional development, virtually synonymous with instructional systems development" (p. 35). Still, the key tenets of ADDIE have become the cornerstone of instructional design and development processes across many contexts; ADDIE is widely characterized as the traditional industry-standard model of instructional design.

In each phase of ADDIE, the instructional designer works with a subject matter expert (SME); the focus of ADDIE is on the systematic and intentional creation of high-quality learning materials. The ADDIE approach begins with assessing the needs, environment, and characteristics of learners through detailed *analysis*. The next stage, *design*, moves from needs assessment to conceptualizing interventions and experiences tailored to learners, and informed by the SME. The *development* phase is inclusive of all steps for product development, and often emerges as a back-and-forth between the instructional designer, who produces storyboards, writes copy, creates assignments, and develops rubrics or assessment metrics, and the SME, who provides content and feedback. In the *implementation* stage, students learn using the developed materials; the ADDIE model culminates in an *evaluation* of their learning and the effectiveness of the instructional materials created through the design process. As an instructional design model, ADDIE takes a broad approach to categorizing the activities of instructional design with significant leeway given for the perspectives and process of each instructional designer or team. The model emphasizes the

development of quality products—the materials created as a result of the instructional design process.

The AGILE Model

The AGILE model—which stands for *align*, *get set*, *iterate and implement*, *leverage*, and *evaluate*—was developed by Conrad Gottfredson, and has roots in agile software development and project management (Neibert, 2013-a). The agile philosophy emphasizes prioritization and iteration for the purpose of rapid development and deployment of learning solutions that meet the performance needs of an organization. Often used in the design and development of e-learning materials—technology-driven learning experiences often delivered in a self-paced, asynchronous format—the AGILE model has become a standard practice in corporate and professional e-learning environments where the emphasis is on an accelerated pace of delivery and a team-centric approach to learning development. In AGILE design, the first stage of work is *alignment*: ensuring that stakeholders and team members are aligned on strategy and business needs for the project, as well as the value it will add for learners (Neibert, 2013-a).

The second stage of AGILE, *get set*, focuses on analysis of the audience, performance goals, the operational demands of the project, and, in complex projects, establishing a learning experience and performance plan (LEaP) as a support mechanism for learners (Neibert, 2013-b). This is the primary planning stage prior to the development of instructional materials in Stage 3, known as *iterate and implement*. This phase focuses on rapid cycles of development and incremental implementation, with a stated purpose of creating adaptable learning experiences at a scale and pace that meet the needs of the organization (Neibert, 2014). The final two stages, *leverage* and *evaluate*, focus on access and quality: leveraging the technology resources of an organization for pervasive delivery and evaluating the quality and success of the learning experiences developed (Neibert, 2014). Although AGILE has similarities to ADDIE, it repositions the role of the instructional designer to one participant of a larger team working to produce learning materials for specific business needs. AGILE methodology encourages rapid iteration and detailed project management as vital responsibilities for all stakeholders. As a result, the focus of the AGILE model is on improving the efficiency of processes, leading to responsive product development that results in a change seen as valuable to the organization and, ideally, the learner.

Backward Design

Backward design was first defined by Wiggins and McTighe (2005) as a method of planning learning by focusing first on the intended outcomes for students, then moving backward through their stages of engagement: outcomes, assessments, and learning activities. This approach to curricular and classroom planning, also known as Understanding By Design (UbD), encourages a student-centric approach to learning design that shifts the focus of learning design and teaching from content to student learning (Bowen, 2017). The stages of backward design are informed by the experience and perspective of the faculty or instructional designer. Many focus on outcomes development through the use of Bloom's taxonomy, which places action verbs into categories of student engagement based on the level of sophistication and challenge (Bloom, 1956). Others center on outcomes development as an exercise of identifying academic, content-specific, or professional skills in which students will be expected to be proficient upon completion of the course. The next element of backward design is to describe the assessments which measure student growth on the intended outcomes. The final stage is to define learning experiences, curate resources, and develop learning materials that prepare students for the identified assessments

(Bowen, 2017). Backward design has been operationalized into a method of instructional design or curriculum planning; however, Wiggins and McTighe (2005) did not intend for their approach to be seen as a prescriptive method of design but as a means of focusing design work on the needs of students. Similar to both ADDIE and AGILE, backward design is an approach to learning design intended to frame the work of instructional design but not to strictly dictate its method or process. Still, backward design has been adopted as a formal process of instructional design and is largely focused on producing high-quality, student-centered learning experiences.

The Missing Piece: Defining the Roles of Instructional Designers in Higher Education

ADDIE, AGILE, and backward design were not intended as formalized processes or models of instructional design but as approaches to design, upon which instructional designers and teams iterate based on the unique needs and expectations of their contexts and learners. However, all three have been operationalized as formal approaches to instructional design, each with a key focus on either process or product development. As none of these models were developed specifically for the needs of faculty or instructional designers in higher education, each has been adapted to the meet the needs of the higher education context. As a part of this research into the commonly used instructional design models, the roles instructional designers play at institutions of higher education became a further focus of interest. Gustafson and Branch (2002) characterized the design and development of learning as two separate but connected processes. Intentional Futures (2016) identified four common tasks associated with instructional designers: designing courses, training faculty, technology support, and project management. These core responsibilities of instructional designers were further categorized into four key roles: traditional designer, course developer, technology support, and collaborative designer. These roles each have a different area of focus, associated with the design models that align most with their primary set of responsibilities. Additionally, the roles were categorized by the type of leadership exhibited and experienced by designers who assume these roles: collaboration focused or compliance focused, and high oversight or high autonomy. These leadership categories were influenced by Blake and Mouton's (2010) managerial grid, which described management style in relation to the degree of concern for production or people. Roles with high compliance or high oversight were categorized as focused more on process or product than people, while the role with high collaboration and autonomy—collaborative designer—was categorized as focused more on relationship. Figure 1 shows the results of this categorization, with instructional designer roles associated with a specific model of instructional design.

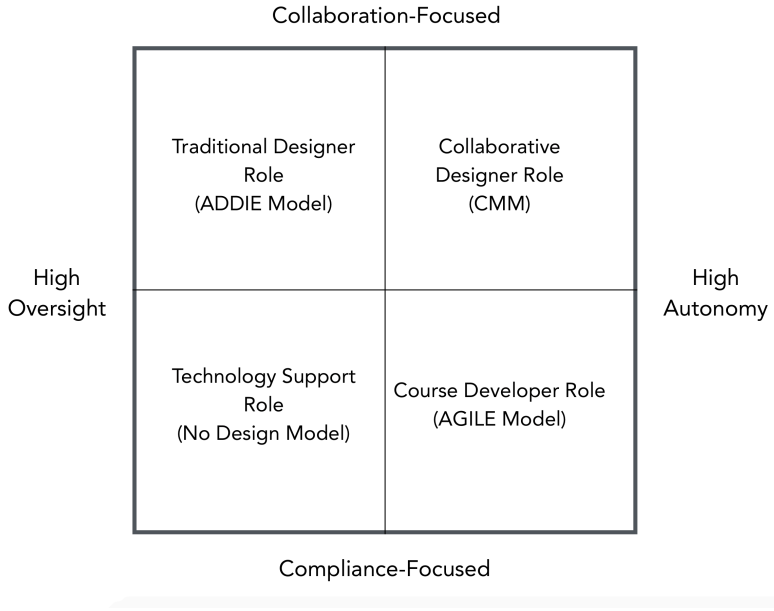

Figure 1. Roles and associated models of instructional design.

This categorization of instructional designer roles and models became the basis of development for the CMM: No ubiquitous model of instructional design had been developed and implemented for the collaborative designer role, which focused on relationship rather than on product or process.

Traditional designer. Professionals with a traditional instructional designer role focus on designing high-quality products, such as online courses or modules, in concert with a faculty member who acts as the SME for the project. Traditional designers operate as their own project managers, coordinating all aspects of the design or redesign project, including setting up meetings and establishing deadlines for deliverables from SMEs. Primary decision-making authority over the instructional decisions of the course—such as pedagogy, assignment types and differentiation, structure of the learning experiences, and assessments—are made by the instructional designer. SMEs, however, maintain expertise and authority over content—course readings, articles, videos, case studies, and any other passively consumed information relevant to and valuable for students in the course or learning experience. The designer–faculty relationship, in this context, focuses on mediating differences of opinion and value, working toward consensus from two different perspectives on the purpose and value of the course. While both designer and faculty member have equal authority, their expertise covers different areas, and they often operate independently, with meetings focused on cycles of iteration, mediation, and approval in order to deliver a high-quality design and—if timelines allow—a developed product. The traditional designer role is most closely associated with the ADDIE model of instructional design.

Course developer. Instructional designers with a course developer role operate primarily as developers of instructional materials, including digital media, documents, presentations, and content or assignments which integrate use of instructional technology tools. Course developers often work directly within a learning management system or with e-learning authoring software to produce course copy and content for faculty, focusing on cycles of design iteration for these materials based on faculty feedback. The designer–faculty relationship for course developers

favors the authority of faculty, as they are expected to possess both the content knowledge and teaching expertise, while the instructional designer focuses their skills on technology training and development of learning resources. The course developer role is most closely associated with the AGILE model of instructional design.

Technology support. Instructional designers with a primary focus on technology support experience both course design and development as a peripheral responsibility. Their focus is first on providing customer service and training to faculty in the use of instructional technologies. Tasks or responsibilities for designers in a technology support role may include phone, chat, or direct support, ticket escalation, formal and informal consultation on instructional technology, and troubleshooting issues with technology. Although critical for faculty and student success, this role occupies a peripheral place in instructional design and development. As such, no model of instructional design was associated with technology support.

Collaborative designer. Instructional designers with a collaborative design role focus foremost on the pedagogical work of learning design. They view faculty as partners and collaborators in the process of conceptualizing learning and adopt a student-centered mindset. Collaborative designers hold no direct decision-making authority over courses but instead rely on their influence and expertise to guide faculty toward innovative designs inclusive of the unique perspectives, values, and expertise of their faculty partners. Collaborative designers do not see faculty as SMEs, but as co-teachers with different expertise and shared investment in the well-being and transformative learning of their students. Production of learning materials may or may not be an expected responsibility of collaborative designers; regardless, their focus is first on pedagogy, and all decisions on technology or developing instructional materials are filtered through the lens of pedagogy. Although the backward design approach is often used by collaborative designers, it is not a model intended for or focused on the collaborative relationship between instructional designers and faculty.

Through this process of discovery, it became apparent that no widely known model of instructional design had been specifically created or implemented for the collaborative designer role, specifically the relationship between higher education faculty and instructional designers. I developed the CMM to address the clear gap in design models associated with the role of the collaborative designer in higher education. Each of the other roles of instructional design focus on either product or process, while collaborative designers focus first on relationships. Collaborative designers foster shared investment, collaborate from different frames of expertise, and value faculty members as far more than SMEs: These designers see SMEs as the teachers, content experts, mentors, and practitioners that must have their visible presence and active influence infused into the courses they teach to help students improve their lives and learning.

Conceptual Influences on the Collaborative Mapping Model

The CMM has four primary conceptual influences: authentic leadership theory, shared leadership theory, appreciative inquiry, and backward design. Kiersch and Byrne (2015) define authentic leaders as those who "are transparent and consistent in decision making and in interactions with followers. They situate themselves to make well-informed decisions by encouraging followers to voice diverse viewpoints and by incorporating those decisions into their decision-making process" (p. 293). Authentic leaders act based on their values and morals; they espouse integrity and expect their colleagues and followers to act in kind (Kiersch & Byrne, 2015). In the collaborative designer role, instructional designers act as leaders; the CMM encourages

designers to act with authenticity, emphasizing diverse perspectives and a values-centric approach as critical elements of successful partnership and design. As collaborative designers do not hold authority over faculty but possess influence based on their expert power (French & Raven, 2010), authentic leadership is the cornerstone of positive relationship development.

Bolden (2011) described leadership as "not the monopoly or responsibility of just one person" in shared leadership theory but as the collective responsibility and social process found in teams and professional relationships (p. 252). Shared leadership de-emphasizes the single authoritative leader, instead focusing on leadership as a process distributed to two or more people. In the collaborative designer–faculty relationship, both people hold significant but different frames of expertise and responsibility. Shared leadership theory and the CMM encourage a collaborative approach to decision-making and inquiry, rather than paradigm based on authority and independent responsibility.

Appreciative inquiry (AI) is an approach to change management that focuses on positive core questioning as a means of enacting change, rather than the identification of problems or challenges. The core value of AI is in its focus on positive inquiry: "its ability to engage, enthuse, energize and enhance learning communities" (Kadi-Hanifi et al., 2014, p. 584). The four stages of AI, known as the 4D cycle, are *discovery*, *dream*, *design*, and *destiny* (Kadi-Hanifi et al., 2014). The *discovery* phase facilitates an exploration of the things people value most in their current environments and relationships. The *dream* phase encourages thinking beyond the scope of the current environment, instead imagining and casting a vision for the best future built on the foundation of the elements shared in the *discovery* phase. The *design* phase focuses on conceptualizing a plan to realize the future and vision from the *dream* phase; *destiny*, the final phase, outlines a commitment to change, fueled by the shared investment created in the previous phases of the 4D cycle (Kadi-Hanifi et al., 2014). Appreciative inquiry influenced the CMM as the means for building shared investment between instructional designers and faculty; rather than focus on perceived problems in a course or with the people designing the course, appreciative inquiry promotes the things that matter most and elevates those in the design of learning experiences.

Although backward design is an influence on the CMM, it does not strictly guide the process of design used in the model. Rather, the CMM retains a focus on students rather than on content or assessment as the starting point for design. This focus may be realized in a variety of ways based on the perspectives and preferences of both the instructional designer and the faculty member. Examples include developing formal learning outcomes or a commitment to the emergence of learning based on the input and contributions of students.

Process Overview of the CMM

Like other models of instructional design, the CMM consists of two overarching elements: the design of learning experiences and the development of instructional materials. In the CMM, these elements are structured as two distinct phases; the roles of both instructional designer and faculty change in each phase. In the design phase, the instructional designer guides the faculty member through a process of inquiry regarding their students and the course, visualizing the conversation into a course map that captures the different elements present in the learning design: overall course structure, topics, passive learning resources, learning activities and assignments, outcomes, and alignments.

Design phase. The design phase consists of a series of five mapping meetings—sometimes more, sometimes less, depending on the complexity of the design and the emerging faculty–designer partnership—each with a different focus.

Consultation 1. The first meeting is a planning session for the designer to learn more about the faculty member, their perspectives on and hopes for their students, their pedagogical perspective, their experience with the modality in which they will be teaching, and the key elements of their course. The instructional designer encourages faculty to not rely on previous materials for this stage of inquiry; rather, the designer hears and learns about the faculty, the course, and the students through conversation, in order to discover and reinforce the values and perspectives that need to be infused into the course design or redesign. In this meeting, the instructional designer also gives a process overview.

Consultations 2 and 3. The next two meetings focus on student outcomes. Although this process varies from one designer to the next, the goal is to encourage faculty to think about their perspectives on and hopes for students, and to write them as statements that will resonate with students and frame their experience in the course. Outcomes development can be highly formalized or less rigid; it can focus on Bloom's taxonomy as a means of development or on framing the course through participation, encouraging students to write their own outcomes in categories related to the content of the course. There is room here for adaptability and flexibility based on the perspectives and pedagogy of both the instructional designer and their faculty collaborator.

Consultations 4 and 5. The final two meetings are used for delineating topics within the determined structure of the course, typically a weekly structure, and to conceptualize assignments and align them to outcome statements. A critical element of these mapping sessions is faculty self-discovery. Instructional designers do not aim to tell faculty what or how to change in the CMM, which positions designers as evaluators or critics of faculty work. Rather, they facilitate self-discovery through positive core questions and through shared ideation. Recommendations for change then shift from criticisms of previous work to designing new ideas, pathways, solutions, and ideas through partnership.

The instructional designer's role during the design phase of the CMM centers around positive core questions; examples of such questions include the following:

- What are the things you love most about your course?
- How would you envision this decision affecting your students' learning?
- How can I ensure that our time together is fruitful and helpful?
- How do you envision your students changing as a result of the time they spend with you and each other in this course?
- What would you say makes your teaching and your course truly unique?
- How does the structure of your course help your students build confidence as the concepts increase in difficulty and complexity?

Such questions promote a sense of purpose in the meetings but also orient the time toward positive relationship building. By asking questions about the faculty member, their course, and their unique experience and perspective, the instructional designer demonstrates that they value the faculty member and want to work in a collaborative capacity. For instructional designers, who struggle to collaborate effectively with faculty (Intentional Futures, 2016), these questions also help reinforce their role as expert pedagogical collaborators.

The mapping process of the design phase can be facilitated through any visual mapping tool. A sample course map can be found in Figure 2.

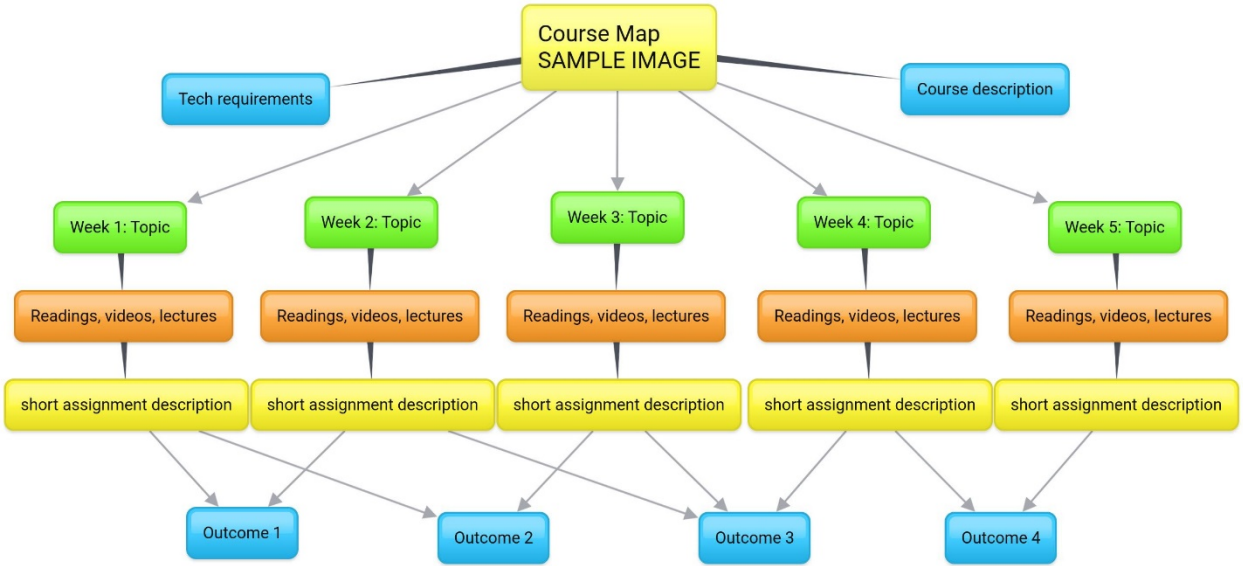

Figure 2. Course map sample image.

The course map template consists of a row on top for weekly topics, a middle row for learning resources and materials, and a row for assignments and activities with an evaluated deliverable. The outcomes row is situated on the bottom of the map, even though instructional designers start with outcomes design. This is to visualize the course from the perspective and experience of students, who first see and experience topics, then content, then assignments, which ideally lead to outcomes. This structured map is not the only way to implement the CMM; however, it is a useful way to visualize—for faculty and students alike—the experiences designed into the course. The visual medium makes it easier to consider more opportunities for change in both new and redesigned courses.

The first of these opportunities is workload balance and calculation, or how much time students are asked to spend each week in the course, and what kind of engagement they will have during that time. Another is the intentional design of the course as a system of learning: What is the pedagogical approach taken throughout the course? Is it reinforced each week, or are there spaces of divergence from the intended pedagogical perspective? Are learning activities diverse enough to keep students engaged but consistent enough to build confidence and healthy rhythms? Have your design decisions led to technology integration, or is technology driving your decisions? Another opportunity is to adjust assignments or outcomes based on the visible alignment between these two elements. It is simple to see outcomes or assignments that are not aligned, which become opportunities for positive change in the course.

Development phase. In the development phase of the CMM, the instructional designer transitions to a consultative role; rather than leading the mapping sessions, the designer now moves into a role focused on providing feedback and guidance at the behest of their faculty partner, who assumes primary responsibility for developing instructional materials. During the development phase, faculty will ideally participate in a professional development course designed to give them

the experience of being an online student while also equipping them with teaching and development skills to create their courses. In the absence of such a course, the instructional designer may be consulted more frequently, and must manage expectations and maintain role clarity with their faculty partners. Consultation topics include sharing assignment directions for feedback, requests to review videos, or looking through the entire course to see if it is consistent with the design created in collaboration. The faculty partner leads the development phase, while the instructional designer coaches, consults, and provides feedback. This is a critical element of the CMM, as it empowers instructional designers to focus their time primarily on design collaborations, empowers faculty to create course materials through their unique experience and presence, and makes the model scalable within the funding and personnel constraints common to instructional design teams.

After several years of refining the CMM, I wanted to know if it was solving the challenges that led to its creation. As a result, this study examined the effectiveness of the model from the perspective of faculty who had designed a course in collaboration with an instructional designer through the CMM. The research question was, "How has the CMM influenced the experience of faculty designing and developing learning experiences in partnership with an instructional designer?"

Method

To address this research question, I chose an action research design focused on evaluating program effectiveness. Action research is an emergent process focused on solving practical challenges through the discovery and implementation of creative solutions (Ivankova, 2015). Further, action research "addresses specific practical issues that have value for a specific community and professional setting" (Ivankova, 2015, p. 30). The CMM was developed to address the practical challenges instructional designers have collaborating with faculty, addressing role misperceptions, and advocating for their professional roles. As such, an action research design focused on program effectiveness was the best way to assess the effectiveness of the model from the perspective of faculty who had participated in instructional design using the CMM. The population for the study was a group of 50 faculty who had designed an academic, credit-bearing course in partnership with an instructional designer through the CMM, identified through purposive sampling.

A survey consisting of eight closed-ended, Likert-style questions, and a single open-ended question captured faculty reactions. The Likert-style questions were required, and the open-ended question was optional. The survey was field tested by a group of SMEs, including instructional designers familiar with the CMM, faculty, and researchers versed in qualitative, quantitative, and action research methodologies. This focus group of experts provided feedback that helped clarify the questions and ensure the validity of the survey. The survey was conducted through Google Forms and was open for a period of 2 weeks; all submissions were anonymous, and any identifying information from the open-ended question was de-identified and anonymized prior to data analysis. The survey was sent out to identified faculty via email; I sent out reminders twice a week during the data collection window to encourage a high response rate. Data were analyzed for the Likert-style questions by calculating the mean for each response to each question. The open-ended question was analyzed through an emergent qualitative coding pass in which I highlighted key quotes and consistent themes from the participants' responses.

Results

Out of the 50 participants, 37 responded to the survey for a response rate of 74%. Respondents identified their perspective on Likert-style questions as *strongly agree*, *agree*, *neutral*, *disagree*, or *strongly disagree*. The results of each Likert-style question may be found in Table 1.

Table 1

Results of the Faculty Survey (N = 37)

Question	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The quality of my course improved from working with an instructional designer.	59.4%	32.4%	2.7%	0	5.4%
I plan to collaborate with an instructional designer on a course map again in the future.	78.3%	13.5%	2.7%	0	5.4%
Creating a course map made me more open to developing the course (writing assignments, etc.) with an instructional designer.	43.2%	48.6%	2.7%	0	5.4%
Collaborating with an instructional designer on a course map saved me time designing my course.	54.0%	18.9%	18.9%	2.7%	5.4%
The collaborative mapping model was useful for evaluating the design and structure of my course.	54.0%	35.0%	5.4%	0	5.4%
Collaborating on a course map made teaching my course more seamless.	35%.0	40.5%	18.9%	0	5.4%
The collaborative mapping model improved the quality of my course design work as a faculty member.	48.6%	43.2%	2.7%	0	5.4%
The course map helped me evaluate my course in ways I had not previously considered.	62.1%	27%	5.4%	0	5.4%

The results of the Likert-style questions indicated a clear value associated both with collaboration with an instructional designer and with the CMM, specifically with the development of a course map. Eighty-nine percent of respondents either agreed or strongly agreed that the course maps helped them evaluate their courses in new ways. Seventy-five percent of respondents agreed or strongly agreed that collaborating on a course map made their teaching more seamless, and 73% agreed or strongly agreed that collaborating on a course map saved them time. Ninety-two percent of respondents indicated that they intended to collaborate with an instructional designer again on a course in the future.

The open-ended question at the end of the survey was, "How has collaborating with an instructional designer in this model of course design helped you most as a faculty member?" Of the 37 respondents to the survey, 18 chose to answer the open-ended question. One respondent indicated that "the expertise of the instructional designer and his collaborative work style led to productive work sessions, brainstorming, outcome development, and overall better design than I could accomplish myself." Another participant shared that "through mapping I learned that my courses required too much work. I was able to eliminate some assignments which I think made the remaining ones more meaningful." One faculty member shared that it helped them "find redundancy of material, gaps in content and improve assignments for stronger connections to the content being taught." Finally, two respondents shared that the collaboration with a designer was new, though they were experienced teaching online. These participants indicated that "the experience was absolutely wonderful and resulted in a polished product at the beginning of the course," and that after teaching online for 10 years, "with the instructional design group I feel I am offering the best online course I have ever done."

Discussion

The purpose of this study was to evaluate the effectiveness of the CMM of instructional design from the perspective of faculty who had designed a course in partnership with an instructional designer using the model. I administered a survey comprised of eight Likert-style, closed-ended questions and one open-ended question to 50 faculty, chosen through purposive sampling. The results indicated that faculty found significant value in collaboration with instructional designers using the CMM. The results from the Likert-style questions indicated a strong perception among respondents that the CMM—and collaborating with an instructional designer—was beneficial and resulted in positive changes to their courses. Further, faculty indicated an improvement to their teaching preparation, time investment, and openness to collaboration with an instructional designer. Responses of *disagree* or *strongly disagree* were minimal across all questions, and *neutral* responses were only of note in two questions, the first of which asked if collaborating with a designer saved time, and the second of which asked if course maps made teaching more seamless. The results from the Likert-style questions indicated strong support for both the CMM and for faculty collaborating with an instructional designer.

Analysis of the open-ended question responses indicated three key themes: value and respect for the expertise of the instructional designer, a significant improvement to the online courses designed and developed through the CMM, and enthusiasm for continued collaboration with instructional designers. Faculty participants noted that the designs they created were both better than what they could have done independently and that they were the best online courses they had ever offered. Further, two participants suggested that they wished the instructional designers had more time available to work with them; this is both a reflection on the insufficient size of the instructional design team from this study and the value the faculty members placed on their expertise and input. None of the open-ended question responses indicated a misperception in the role of instructional designers. No respondents referenced technology support, assistance, or content development as the role of an instructional designer. Instead, responses focused on the process of design, the collaboration with an instructional designer, the benefits experienced from working with a designer, or the intent to continue working with an instructional designer.

Recommendations and Conclusions

Based on the data collected and analyzed in this action research study, the CMM appears to be an effective model of design for instructional designers in higher education. Faculty indicated that significant value was added to their work from partnering with an instructional designer in this model, and they indicated no role misperceptions in their open-ended question responses. However, there are limitations to the study, including the exclusive focus on faculty perceptions of the value of the CMM. Instructional designers were not included in this study as participants; further, the study was enacted through an action research model, a contextualized approach to research intended to solve practical problems of practice. Although the CMM was designed to solve profession-wide challenges in higher education instructional design, the data reflects the results of only a single location and faculty body. While this is helpful and reflects a positive trend, broader studies in a variety of higher education contexts—inclusive of the perspectives of instructional designers—may be warranted. Additionally, an opportunity exists to evaluate the effectiveness of the CMM for designing larger systems of learning than courses—specifically, full academic programs.

I recommend that instructional designers and online learning administrators implement the CMM at their institutions if they experience role misperception, challenges in collaborating effectively with faculty, or have concerns about the scalability of quality instructional design for online courses and programs. The data in this research study indicated a clear positive influence on each of these issues. Focusing first on relationships, rather than product or process, builds a truly collaborative culture between faculty partners and instructional designers.

Instructional designers hold unique and significant expertise that faculty often do not have; they are positioned to be leaders of positive change at institutions of higher education but need the tools and advocacy to have a visible and lasting influence. The collaborative mapping model equips instructional designers toward this end: building meaningful relationships through partnership in design, advancing the work of faculty and designers both for the betterment of student learning.

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Impactful Leadership Traits of Virtual Leaders in Higher Education

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Abstract

Universities are increasingly leveraging virtual teams into their organizational structure and strategic framework for many functions including academic administration and faculty leadership. One benefit of a virtual workforce is the ability to hire the most qualified individuals regardless of where they are physically located. As the virtual workforce expands, leaders may intuitively rely on traditional face-to-face approaches and strategies for employee oversight and motivation. These techniques may be ineffective or challenging to use in the virtual environment necessitating new approaches. Leaders of virtual teams need to understand the intricacies associated with these groups and be cognizant of factors that assist in creating cohesiveness, trust, and communication amongst virtual teams.

This qualitative phenomenological study explores leaders' perceptions surrounding competencies needed to effectively lead virtual teams in online education. A decisive sampling method was used to identify 10 experienced academic leaders who supervise virtual teams. As a result of the interviews, seven major themes emerged: (a) training and development; (b) trust; (c) emotional intelligence; (d) communication/team building/technology; (e) employee recognition and motivation; (f) leadership styles; and (g) virtual leadership competencies unique to higher education. Based on these themes and further evaluation, the need for specific soft skills and robust technology emerged. Specifically, organizational success partially hinges on comprehensive training for virtual leaders, the significance of trust, emotional intelligence, and effective, respectful communication.

Keywords: Virtual leader, online virtual leadership, virtual higher education, educational leadership, academic leadership, higher education, online learning.

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Impactful Leadership Traits of Virtual Leaders in Higher Education

In today's environment, more organizations are investing in the creation and utilization of virtual teams to help support their operations, improve cost efficiency and to expand their talent pool. Among the organizations moving to more virtual entities are institutions of higher learning and universities. As the popularity of online classes continues to grow, it is important for institutions to support faculty, staff and students in ways that are conducive to their needs (Mohr & Shelton, 2017). In this contemporary environment, virtual leaders must apply up-to-date leadership and collaboration skills to increasingly complex work environments, such as in the higher education space. As the collegiate landscape becomes more diverse and virtual, universities that offer online programs continue to expand and employ workers who work remotely, rather than from a traditional office. As a result, many virtual team leaders may attempt to use the same leadership skills used to oversee face-to-face teams without success. Virtual team leaders must be aware of the essentials that come with managing virtual teams and be cognizant of factors that assist in creating a culture of collaboration, trust, and the appropriate use of communication amongst virtual teams (Azderska & Jerman-Blazic, 2013).

Virtual academic communities have increased in size and scope and are continuing to expand due to globalization efforts and the growing upsurge in online student enrollment. The higher education environment is very diverse. Long gone are the days when a traditional brick and mortar university was the only option for potential students. Many of these traditional universities are offering online programs, and some universities only offer online programs. Public and private universities co-exist as well as for-profit and non-profit entities. Based on the institutional dynamics, the utilization of virtual teams and virtual programs vary. There are differing dynamics as well: size, student base, degree program offerings, as well as the support and flexibility that are offered to students. Increasingly, students are electing to pursue their education outside of the traditional brick and mortar venues, choosing to take some or all of their collegiate level classes online. It is imperative that collegiate leaders understand these challenges and hire wisely for virtual leaders who can optimally lead virtual academic teams. The phenomenal growth of online learning in higher education institutions has created an indisputable need for guidelines that assist new and continuing online instructors about how best to teach in the online environment (Martin, Budhrani, Kumar, & Ritzhaupt, 2019). Accordingly, virtual teams comprised of faculty and faculty leaders face unique challenges.

Given that creative and innovative management methods are needed, at the root a strong sense of trust is necessary for managing virtual teams effectively (Bonatti & Horner, 2011). The emotional intelligence of a virtual team leader is significant, and the aspects of communication and trust are vital (Bryant, 2013). Without a culture of trust from managers, team members may resist change and underperform. A compelling culture of trust between managers and virtual employees is necessary to counteract the absence of physical support. Hill, Kang, and Seo (2014) identified leadership attributes in virtual academic management situations to include encompassing technology suited for the situation, creating a sense of community with shared objectives, and working together across institutional constraints.

A virtual leader who is perceived as being untrustworthy can damage the integrity and efficiency of the virtual team, but also nurtures a negative view of the organization from the employee's perspective. Virtual employees who do not trust their leader or their organization typically do not demonstrate a formidable level of organizational citizenship. As a result, these employees may lack loyalty to the organizational unit, and fail to fully commit to the business

needs (Goudy, 2015). Challenges can be presented when an organization hires and trains leaders to manage virtual teams who may, or may not, be suitable, capable or committed to do so. The demand for economical and robust talent management for virtual teams requires a framework for building and maintaining virtual teams to support the success of the organization (Mukherjee, Hanlon, Kedia, & Srivastava, 2012).

Purpose of the Study and Problem Statement

The purpose of this study was to explore the vital success factors of virtual leaders and ascertain their leadership influence on team performance in institutions of higher education. The results of this study could be used as the underpinning for further research on virtual teams in academia, what their specific needs are, and their potential to contribute to universities' organizational profitability, as well as boost their competitive place in the increasingly saturated higher education market (Ogren, 2016).

The particular problem examined in this study was the deficiency of information on virtual leadership to include which specific skills are needed to successfully lead virtual teams in the higher education arena. In addition, there are the questions of how to cultivate these competencies in the complex higher education environment, and what, if any, leadership traits are unique to the higher education leaders leading in a virtual capacity. Information gained about these specific skills could allow higher education entities to concentrate their training efforts and increase employee engagement and allegiance to the university, potentially reducing the costs of attrition (Thaly & Sinha, 2013).

Enrollment in online universities has grown substantially in recent years. Currently, enrollment in online education programs continues to grow even though enrollment in higher education as a whole is on the decline. More than 6 million students took at least one online course in Fall 2015 (Allen & Seaman, 2017). Following this trend, online virtual academic employee teams have grown in popularity and demand. Without the necessary training to adequately support the virtual teams, leaders often observe reduced productivity, feelings of isolation from virtual team members, and increased employee attrition. Some universities, as well as other organizations, deploy virtual teams but do not provide the essential training to successfully support leaders and team members, leading to loss of revenue, negative team morale issues, and productivity challenges (Thaly & Sinha, 2013). As a result, virtual teams fail as often as they are successful, because they are often not led and sustained appropriately (Ogren, 2016). If leaders are not conscientious of the competencies associated with managing virtual teams, students may be negatively impacted. To diminish the high failure rate of virtual teams, up to 71% (Morgan, Paucar-Caceres, & Wright, 2014), more information and evidence is needed. Prior literature included studies on virtual leadership in a wide variety of industries, however a gap existed in applying virtual leadership in online higher education. This study expands current literature from the unique perspective of the online education leader.

Literature Review

The review of the literature focused on areas relevant to the purpose of this study: to explore the vital success factors of virtual leaders and determine their leadership capabilities. Likewise, the literature review informed the study's research questions and design. Altogether, precedents of the research topics were found in the literature on leadership in virtual workplaces, working in teams, and virtual team leadership in higher education.

Various leadership models and theories are explored, as well as seminal and ongoing literature on virtual teams, virtual team leadership, and virtual team leadership in higher education. Past studies around the topics of trust, employee engagement, effective communication styles and the use of technology are examined. As they pertain to effective virtual leadership, the concepts of emotional intelligence, motivation and employee interactions are discussed. Throughout the literature the similarities, difference and challenges between face-to-face leadership traits and those virtual in nature are conveyed.

Leadership in Virtual Workplaces

A unilateral leadership strategy is critical to organizational success; research delineated characteristics of virtual team leadership include communication, understanding, role clarity, and leadership attitude (Saafein, 2013). Whereas these leadership attributes are important in face-to-face environments, it is even more critical to understand and practice these attributes in a virtual leadership role.

As organizations are becoming more dynamic and agile, virtual teams are becoming progressively customary and compulsory (Mukherjee, Lahiri, Mukherjee, & Billing, 2012). Part-time employees as well as full-time employees working regularly from remote locations were employed by two out of three Fortune 500 companies at the beginning of this century (Kirkman, Rosen, Gibson, Tesluk, & McPherson, 2002). More recently, a proliferation of virtual teams has infiltrated the American business arena, to include higher education. This growth has stemmed from updated strategies, as well as demand (Booth, 2011). Investigation of leadership in virtual workplaces begins with the robust body knowledge of leadership in general, across industries. Salient theories and practices include transformational leadership, and virtual leadership coupled with technology.

Transformational leadership. Transformational leadership usually provides more support for employee motivation and increases followers' commitment to engage in experimental strategies and actions (Carmeli, Sheaffer, Binyamin, Reiter-Palmon, & Shimoni, 2014). As a result of Hirschy's (2011) study, six leadership practices which effective leaders can use to overcome the challenges associated with leading virtual teams emerged to include: (a) establishing and maintaining trust using communication technology; (b) ensuring that distributed diversity is understood and appreciated; (c) managing virtual work-life cycle meetings; (d) monitoring team progress using technology; and (e) enhancing the visibility of virtual members within the team and within the larger organization. Silvas (2016) proposed that virtual academic leaders need to apply transformational leadership practices and that they should engage followers' interests to make the organization better. In consideration of follower engagement, particularly when the face-to-face clues are not present, this seems to be an area in which a transformational approach is beneficial to both traditional leadership, and leadership within the academic environment.

Virtual leadership with technology. The use of up-to-date, reliable technology is critical to virtual faculty members, students, leaders and administration in the higher education setting. Overcoming obstacles in virtual settings requires highly involved, experienced and present leaders. An effective virtual leader uses the available technology to communicate and engage his or her teams; however, it is the capability of the virtual leader, not the technology that ultimately determines team success (Casebier, 2014). Once these systems and norms have been established, teams and team leaders should focus on tools beyond conventional phone and email, and employ more innovative technologies for collaboration such as wikis, blogs, Zoom, Skype, and the like,

all with the goal of increasing employee engagement and connectivity, and to promote an overall comfort with technology (Crisp & Jarvenpaa, 2013). Among other things, technology can provide a linkage to connect virtual team leaders to their teams, and virtual team members to each other. The ability to instantly connect can provide a sense of community as well as promote visibility. Visibility is an indispensable piece of the concept of trust and can assist with avoiding and potentially recovering from communication breakdowns and misunderstandings (Bjorn & Ngwenyama, 2009).

Virtual teams. The virtual team make up can vary based on industry. Virtual teamss can be very structured, mirroring a more traditional organizational hierarchy, or project-based, which are frequently self-managed, and at times have no designated leader. The advancement of technology in the workplace has brought about several changes to organizations and their employees, altering core elements of the organization, such as its performance, outcomes, structure, and culture (Jackson, 2015). Although technology is essential to the virtual team, because some or all virtual team members do not interact face-to-face on a regular basis, they can exhibit a lack of social skills, they can be more inclined to exhibit hostility, express a lack of trust, and interact on a more superficial level than face-to-face teams (Azderska & Jerman-Blazic, 2013). Communication is less comprehensive and less satisfying for some virtual teams, and building trusting and collaborative relationships may happen less frequently, if at all (Peñarroja, Orengo, Zornoza, & Hernández, 2013). Without good communication and trust, it is difficult for any team to function effectively, particularly a remote one.

Feelings of uncertainty, diminished trust, and a lack of open communication are challenges for virtual teams. Trust among virtual teams is a fundamental element of their framework; there needs to be a mutual understanding of the factors that contribute to trust, communication, and leadership challenges. Without proper and clearly defined communication channels and expectations, trust cannot be cultivated, and without trust, there cannot be open communication. This conundrum points to a mutually exclusive relationship, and validates the unique responsibilities virtual leaders have, the greatest of which is establishing and maintaining trust. A successful leader needs to analyze the cadence of team communication, what channels they will use to communicate, and through which channels as a means of providing consistency. An awareness and a strong grasp of the factors that contribute to trust and communication, as well as the leaders' awareness of challenges in virtual teams, are paramount to group success, and to the success of the overall business (Mukherjee, Lahiri, Mukherjee, & Billing, 2012).

Virtual team leadership. It is paramount that a virtual team leader be aware of the intricacies associated with virtual teams and be cognizant of the fundamental needs and factors that assist in creating trust in these environments. A strong sense of communal trust enriches communication, which can lead to an effective virtual team culture, and can be integral in improving successful task performance. This can ultimately lead to broader organizational success (Berry, 2011a). Trust is palpable within a team when virtual team members communicate effectively and openly with each other and are accountable for their actions (Roussin & Weber, 2012). Within the literature, the significance of leadership effectiveness, trust, and communication consistency has been established. In their research, Chen, Wu, Ma, and Knight (2011) found that communication frequency was not the fundamental indicator to team success. Consistent expectations around team communication as well as the cadence of meetings was more of a marker of success.

Without the aid of a physical presence and the cues associated with face-to-face interactions, leaders must find a way to demonstrate a strong virtual presence (Avolio, Sosik, Kahai, & Baker, 2014), as well as be agreeable to update and modify their managerial and interpersonal communication skills for the virtual workplace. Virtual leaders can directly impact outcomes by applying self-management behaviors associated with: (a) establishing specific, challenging, and mutually accepted goals; (b) monitoring, evaluating, and providing feedback to members and teams; (c) coordinating and synchronizing activities, information and tasks; and (d) establishing task assignments, roles and balancing workloads among members (Ziek & Smulowitz, 2014). While self-management and assessment by the virtual leader is paramount, the dynamics of working in a virtual team are more complex than working alone in a remote setting, and can present issues of professional isolation and exclusion in the workplace (Vega, Anderson, & Kaplan, 2015). This distinction should be at the forefront for the virtual leader when assessing performance and analyzing culture. Trust in virtual teams, from a leadership perspective, should be cultivated thoughtfully, carefully and slowly. In the professional setting, trust is typically defined as the faith or confidence in another person or organization's integrity, fairness, and reliability; however, trust is typically lower, initially, within virtual teams (Berry, 2011b).

Virtual Team Leadership in Higher Education

There is a copious amount of research available on virtual leadership and leadership theories. However, virtual leadership in higher education is under-researched. Leaders in higher education wear many hats; they are required to know and understand curriculum, assessment, pedagogy, legal issues, personnel issues, current research, and professional development (Peart, 2014). There is an increased pressure for faculty and administrators to be accountable for learning outcomes and retention. That being said, it would behoove faculty and faculty leaders to be engaged in improving pedagogical strategies by implementing techniques and best practices that are effective in producing improved student outcomes in the online environment (Orcutt & Dringus, 2017). Throughout the industry, pressure exists for higher education entities to be accountable for the achievement of learning outcomes and retention. Educators and administrators are increasingly interested in improving pedagogical strategies by deploying practices that are effective in producing improved student outcomes in the online environment (Ekmekci, 2013). Virtual team leaders are an integral part of this strategy.

Regardless of the outpouring of literature surrounding the topic of leadership, there is no general or widely accepted theory of leadership for the past, present, or future that can be perfectly adapted or modified for higher education. In addition, there are unique factors related to higher education's need to develop sustainable leaders. Leadership development and professional development is a critical element of the higher education mission (Caillier, 2014). As the popularity of and student enrollment in online classes continues to grow, it is imperative for institutions to support faculty and administrators in ways that are conducive to their needs, and to create professional development programs and skill sets that are tailored to the needs of online faculty members with the goal of improving the faculty's effectiveness (Williams, Layne, & Ice, 2014).

The importance of intellectual curiosity and the quest for knowledge is at the root of higher education. Intellectual leadership should underpin a university and the university education it offers (McFarlane, 2011). However, in many cases the germinal culture of a university has been replaced by behaviors associated with managerialism, and the primary concern of a university is the bottom line. At times, it seems that there is a dollar amount which is placed on the head of

every student and staff member. McInnis, Ramsden, and Maconachie (2012) postulated that strong leadership is necessary to maintain strong faculty and administrators, who in turn will inspire, influence, and enable future leaders. Leaders must take care to inform, educate, train, listen to, support, and empathize with managers as they start to work in, and with, an entirely new way of organizing and utilizing teams. This preparation is integral to discussing virtual teams in online higher education institutions. In their research, Nydegger and Nydegger (2010) identified several tactics to effectively manage virtual teams. These strategies include the importance of culture, defining purpose and roles, as well as clear and consistent guidelines and expectations.

Leadership and emotional intelligence in virtual higher education. The relationship between emotional intelligence and academic success is a noteworthy linkage in analyzing leadership in higher education.

Emotional intelligence has often been a formidable connector to transformational leadership, self-efficacy, and spirituality, as well as academic success (Weichun, Sosik, Riggio, & Baiyin, 2012). A leaders' emotional intelligence awareness and prowess may be pivotal to improving effectiveness, particularly in virtual teams. Emotional intelligence can be the proverbial glue that bonds organizations together as it relates to relationship management and the leadership development process. The importance of a leader's emotional intelligence is often a dominant topic discussed in organizations; however, the importance and analysis of how this impacts virtual teams is under-researched (Bryant, 2013). The integration and analysis of strong emotional intelligence characteristics within the hiring and training process may amplify virtual leaders' effectiveness in higher education. Virtual academic leaders play an even more important role in structuring the communication practices, culture identification, and work processes than within traditional universities (Jang, 2013). Within the virtual academic community, this statement might be somewhat intuitive, underscoring the importance of being able to analyze the salient differences between virtual and non-virtual academic leaders.

There are distinct differences between virtual and non-virtual leaders. Having a strong sense of emotional intelligence and enhanced communication skills allows a successful virtual leader to address conflict via several channels, including polling outside participants in group discussions, promoting appropriate conversation channels when disagreements occur, creating a culture of trust to allow these conversations to occur, as well as encouraging the input of more reserved members of a team. Understanding how a virtual team functions based on team role composition, comfort level, and skill set is a competency that virtual leaders need to possess (Eubanks et al., 2016).

Summary

Leadership is an extensively studied discipline, and in proposing this research, it is necessary to hone-in on the aspects that are most salient for virtual higher education environments. Transformational leadership practices are pillars that provide important substance to education where leaders are, or should be, thoroughly involved and invested in developing others, including faculty. Inquiry on leadership in virtual higher education environments is informed by several bodies of knowledge; some which are well-researched and well-known; others are emerging only in the second decade of this millennium.

Emotional intelligence techniques are critical to leaders who must be able to establish group norms and create a sense of culture and connectivity via technology. These leadership behaviors are particularly fundamental when applied to understanding how virtual academic teams

can flourish. Altogether, virtual leaders need explicit training and guidance around these topics as they engage in leading virtual teams, particularly for leaders who are new to the concept. The foundational literature of leadership, virtual work environments, trust, communication, and employee motivation and engagement shape the body of knowledge surrounding virtual leaders and virtual teams in higher education.

In the task of selectively presenting academic virtual leaders' characteristics, the authors turn to the psychological and sociological orientation of virtual leaders: trust, emotional intelligence, readiness for the job, and leading others to organizational success. We take the liberty of drawing a line around a second set of leadership factors, arguably and equally important, that gathers the factors of communication, team building, technology, employee recognition, and motivation, as behavioral outcomes of recognizable leadership styles. The results and conclusions in the present article emphasize the disposition and development of leaders who are increasingly tapped to create, guide, and administer online higher education programs. This study also paves the way for future research in the area of virtual leader effectiveness in the academic setting.

Method

This research investigated the perceptions of virtual leaders in online, higher education institutions, regarding their successful leadership traits, behaviors, strategies, and beliefs. A qualitative phenomenological research design was applied to explore the lived experiences of virtual leaders in online higher education institutions as they led their virtual teams. The lived experiences were evaluated through a series of open-ended interview questions with 10 virtual academic leaders (Appendix A). The phenomenological approach allowed participants to share experiences and encounters in an unimpeded manner (Moustakas, 1994). An interview guide was used to sustain a consistent and vibrant dialogue and elicited more details on the specific traits virtual leaders used. The interview protocol invited the discussion to include commentary on two supporting areas of those lived experiences: developing the personal competencies needed to lead virtual teams in the complex online higher education setting, and leadership unique to the virtual online environment.

Participants

There is a limited population of virtual academic leaders who could contribute to the body of knowledge surrounding this topic; as such, a focused sample of 10 participants was chosen. These administrative leaders included virtual team leaders and managers who were currently working, or had worked, as a virtual team leader within higher education. All of the participants held leadership roles at private universities and were geographically located in different areas throughout the United States. Participant demographics are described in Table 1.

Table 1
Participant Information

Pseudonym ID	Job role	Education	Job experience
Alice	Vice President of Academic Operations	Ph.D.	30 years
Chantal	Campus/Academic Director	Ph.D.	15 years
Gabrielle	Senior Director of Academic Disputes	J.D.	15 years
Becky	Full-Time Faculty	Ph.D.	10 years
Lorenzo	Program Chair	Masters	12 years
Karen	Director of Faculty Training	Masters	13 years
Bill	Program Chair	Masters	12 years
Melissa	Campus Operations	Masters	13 years
Garth	Academic Director	Ph.D.	20 years
Jerry	Regional Director of Academics	Ph.D.	19 years

Additionally, participants currently or previously directed virtual teams of staff, staff faculty and part-time faculty members in a remote setting, with responsibility for five or more individuals. In their roles as leaders, participants had been responsible for the coaching, training, and development of these employees. By defining the population on these aspects, the selected participants were diverse in the scope of authority in their positions, their educational background and their tenure with their institutions.

Purposeful sampling was used in this study, aligned with qualitative research designs (Creswell, 2009) and 10 virtual leaders were chosen for the study. The goal was to ensure deep and thorough data collection; that is, data saturation that reaches the point in data collection when new information provides little or no changes to the analysis (Guest, Bunce & Johnson, 2006). While collecting data, participants were assigned a pseudonym before the interviews were transcribed; the pseudonym was used to guarantee confidentiality to the highest extent.

Data Collection and Analysis

The semi-structured interview protocol was designed to solicit empirical, opinion-based answers and to facilitate an understanding of the interviewees' perspectives, experiences, and thought processes while the interview was taking place. The 10-question interview guide was developed using wide-ranging, unrestricted questions. The interview topics focused on gathering information on guiding trust, activities and tools used for employee engagement, leadership theories and beliefs, and job preparation and training.

The phenomenological approach allowed participants to speak at length, without a formalized structure, and allowed participants to share their lived experiences in an unimpeded manner with a focus on gaining an understanding of each virtual leader's perception of his or her experiences (Creswell, 2009). Interviews were conducted telephonically or via Skype which provided the virtual leaders the opportunity to speak in a medium that was familiar and comfortable for them. This setting facilitated participants' willingness to answer the questions honestly, candidly, and without receiving unintended cues, messages, or body language reactions from the interviewer.

An amended van Kaam method of analysis (Moustakas, 1994) of phenomenological data was used for this study. This method was most appropriate for ensuring that each participant experience was cataloged and analyzed equally to understand the participant's perceptions. After a preliminary review, statements which were deemed irrelevant or repetitive were deleted, leaving only the horizons or "textual meanings and invariant constituents of the phenomenon" (Moustakas, 1994, p. 97). The qualitative analyses netted fundamental themes and identifiable patterns in the interviewees' communications (see Table 2). Themes were groupings of codes that emerged either during or after the process of code development (Fraenkel & Wallen, 2007). The emerging core themes were thematically labeled within different invariant constituent nodes for further analysis.

Table 2

Initial Codes and Emergent Themes

Theme name	**Aligned codes that led to theme**
Training and development	Lack of training; self-taught; trained for other reasons (not to lead); lack of training had no impact
Trust	Trust
Emotional intelligence	Emotional intelligence
Communication/team building/technology	Monitor performance; set expectations; inclusion for virtual employees; virtual employees not treated the same; computers; video conferences; telephones; team meetings; individual meetings; face-to-face meetings; frequency of meetings
Employee recognition/motivation	Motivation; self-motivation; reviews; budget
Leadership styles	Leadership; leadership styles; trust
Virtual leadership competencies unique to higher education	Virtual leadership different for higher education versus other settings

In analyzing the data, the researchers looked for themes and key phrases, then placed them in to brackets or clusters. The researchers used bracketing, to ensure non-judgmental behavior, setting aside pre-understanding (Sorsa & Asted-Kurki, 2015), thereby safeguarding the rigor and validity of this study.

Trustworthiness of Data

Altogether, the research procedures were planned and executed to address trustworthiness of the collected data in several ways. Credibility and transferability were maintained through a robust data collection plan, deep engagement on the part of the researchers, and detailed responses from participants. Special care was taken to ask follow-up questions, to ask the interviewees to share examples and specific experiences, and to provide ample time for a conversation to occur. Thus, study findings are transferable to other contexts and individuals.

To establish confirmability, a process was used to meticulously analyze data and corroborate findings. Feldman, Sköldberg, Brown, and Homer (2004), suggested that a narrative analysis of the data allows for tacit or implied understandings to emerge from the stories the participants tell during their interviews (Krause, 2017). Member checking was conducted to assure that the responses provided by the interviewees were congruent with the respondents' experiences

(Bergold, 2012). Furthermore, participants reviewed transcription of their interviews to check for accuracy.

Results

Results of this qualitative phenomenological study reveal the lived experiences of virtual leaders operating in the higher education environment. Thereby, they delineated the behaviors and practices they employed to successfully lead their virtual, academic teams. Following conscientious narrative and thematic analyses, 24 codes were identified, and seven major themes emerged: (a) training and development; (b) trust; (c) emotional intelligence; (d) communication/team building/technology; (e) employee recognition and motivation; (f) leadership styles; and (g) virtual leadership competencies unique to higher education.

Participants' reflections were fluid with much cross-referencing among all themes. As a means of reporting results, the seven themes are treated in two subsets. On the one hand, there is a set of themes on readiness for virtual leadership in academia: training and development, trust, emotional intelligence, and virtual leadership competencies unique to higher education. On the other hand, there is set of themes, somewhat tactical, that reflect how leaders' activities and guidelines are refined as they execute effective virtual leadership in these areas: communication, team building, technology, employee recognition and motivation, and leadership styles. Throughout the study results, we hear the voices of those who were successful, or not; who were guided well, or not.

Theme 1: Training and Development

Training and development surfaced as a theme, elucidating that virtual higher education leaders lack the training they need to lead virtual academic teams. All 10 (100%) of the participants stated that they had no formal training to lead virtual teams. Yet, an interesting phenomenon that stemmed from the interviews is that the participants drew upon their previous experiences in the virtual environment. Many revealed that they used their experiences as a virtual student or faculty member to assist them in leading virtual teams. Other participants shared that they had experience as a virtual employee and used that knowledge to lead their virtual teams once they moved from virtual employee to virtual leader. Becky capitalized on her ability to lead by watching people in current virtual leadership roles, stating "I was fortunate to have great leaders and the opportunities to grow in positions so that helped provide me with tools, resources, and skills needed to be a good leader/virtual leader."

Several of the respondents stated that they had managerial and leadership experience, although not virtual, and drew upon that body of knowledge to attempt to lead their virtual teams. In a similar vein, some leaders used professional development and college courses as experience. Lorenzo talked about taking courses in management and his own experiences as an employee. Gabrielle shared she had professional development training, but no formal training to be a virtual leader. Becky discussed that she had lots of hands-on training and stated "my education was [that I was] an online student for my master's and doctorate."

Theme 2: Trust

Trust was identified as a significant theme in the results, mirroring elements of the grand construct of trust: accountability, getting to know employees, and clear expectations. Trust is a fundamental component of any leader/follower relationship and the results of this research support

the unequivocal need for trusting relationships between virtual leaders and their teams in the academic environment. Several subsets of trust that were unveiled from the interviews were:

Accountability. Other participants viewed accountability as a component of a trusting relationship. Jerry connected leadership and accountability stating, "I need to be accountable as a virtual leader; if I say I am going to do something I do it, your accountability is even greater."

Getting to know employees. The basic focus on simply getting to know their employees helped foster a culture of trust. Gabrielle shared her strategy by stating, "Leaders need to get to know their employees to build trust; consistency builds trust; constant and consistent communication builds trust." The interviewees shared many experiences in getting to know employees to cultivate trust. Picking up the phone to hear how an employee is doing and to share a virtual cup of coffee were described as examples to build connections with virtual employees.

Clear expectations. Trust associated with setting clear expectations was critical to Karen. She described this by stating, "To build trust, I set expectations from the beginning as this lets them [employees] know what needs to be done; after this I give them the freedom to do their work." It is critical that virtual employees have a sense of trust in their virtual leader and that the virtual leader shows, if deserved, he or she would trust virtual employees to do their work just as face-to-face employees are trusted.

Theme 3: Emotional Intelligence

Each interviewee shared aspects of emotional intelligence (EI) as critical and necessary to virtual leader competency. Responses from the participants supported that there is a link between emotional intelligence, successful leadership, and academic success. Many of the participants stated that emotional intelligence was not only critical for virtual leaders; it was far more important than any other competency they had. Participants stated that having strong emotional intelligence allowed them to self-reflect, to assist them in reading their employees from a distance, and also assisted them in navigating the nuances associated with leading virtual employees, particularly online faculty members.

The participants' fluid exploration of their lived experiences offered descriptive narratives of their virtual leadership in higher education. For the convenience of our readership, the themes that can inform a forward-looking agenda for developing virtual leaders have been discussed in greater detail. Turning to the second subset of the themes, there is brief reporting on communication, team building, technology, employee recognition, and motivation.

Theme 4: Communication/Team Building/Technology

The interviewees noted that robust and reliable technology is vital, as if virtual employees must cling to a lifeline. As a result of this, when there are challenges or a lack of technology, productivity and morale can suffer. Becky shared unique experiences and activities to support how she worked to virtual engage her virtual teams in that "Every once in a while . . . with a virtual colleague I would have a happy hour [no-alcohol, just informal meetings to catch up and share gossip]." Sharing his experience Lorenzo said, "I encourage my employees to form connections with each other; if an employee asks me a question, even if I know the answer, I encourage them to reach out to a colleague so they build rapport with each other."

Theme 5: Employee Recognition and Motivation

Employee recognition and employee motivation surfaced throughout the interviews. Alice reported, "Appreciation and acknowledgement is important for motivation; I recognize things like birthdays or work anniversaries." When asked to share how she tried to motivate her employees, Gabrielle stated, "Some people are motivated by performance or positive feedback; give people a project to work on if they like that sort of thing." Focusing on personal contact and how this is relevant to motivation was important as Garth said, "I try to motivate virtual employees through personal contact with them; I give them encouragement and let them know they are doing a great job; a little Starbucks gift card out of the blue for doing something helps."

Theme 6: Leadership Styles

Results focused on differing leadership styles, with frequent emphasis on trust. After sharing his thoughts on his leadership style, Lorenzo reflected on what he had learned in his tenure as a virtual leader, stating, "Everything you think you know about leadership, be willing to kind of blow up all your preconceived notions of how to manage people." When prompted to reflect on her leadership style and her experiences, Becky affirmed by stating, "I think that . . . If you're highly motivated, and you're organized, and you have good communication skills, you can and you will be a great virtual leader."

Returning to a primary readiness theme, participants discussed the leadership competencies unique to their workplaces, online higher education. In the final set of results, the salient components of effective virtual leadership are applied to the target industry of higher education. Participants offered their expertise while addressing the overarching goal of organizational success for their teams and institutions.

Theme 7: Virtual Leadership Competencies Unique to Higher Education

Results of the interviews revealed varied views on the components of leadership and management. They elaborated practices of successful virtual team leaders, and how they are unique to the higher education environment. Most of the interviewees had experience working virtually only in higher education. When asked if leading in higher education was different or unique, Lorenzo shared:

> I definitely think so, since the expectations are much clearer in higher education due to the nature of our industry. While defining success can sometimes be nebulous in other settings, it is much easier to define in higher education, especially since specific metrics can be developed to assess student and faculty performance that create benchmarks for coaching and mentoring. This is often not the case in other settings, especially if an organization is working in a new industry that may not have defined norms and expectations. Higher education professionals are forced to work within an environment that is strictly defined by rules and expectations that are put in place by our accreditors and the Department of Education. While innovative leadership is the norm in many industries, we have to be much more cautious in the higher education industry, especially since everything we do will be closely scrutinized by all stakeholders.

When answering a question about how he was managing higher education employees (administrators and faculty), and whether it was different than managing employees in other industries, Jerry speculated:

> We would all like [to] think that we are unique and special and the same holds true of the higher education industry but that is probably not the case. One difference though is probably the emphasis on academic credentials. It is likely that a leader in higher education is going to have a lot more formalized education than is needed for say, many business industries. In addition, it is not uncommon for leaders in higher education to not just [only] be employees of an organization, an institution, but also instructors who also teach so they manage a group and yet, are also part of the group which they manage so it is likely that the power distance among virtual leaders is less than in other industries.

When asked by the researcher to postulate on the differences between being a virtual leader in higher education versus other professional settings, Garth went on to share:

> Even though higher education and professional settings share some common markers with respect to virtual management, higher education differs in two very important markers: entitlement and academic freedom. Higher education professionals, especially tenured faculty, feel a sense entitlement to a permanent position. So first off, unlike the professional sector, there is no job retention leverage. Secondly, the concept of academic freedom is widely misunderstood by the majority of academic faculty. For the most part, they see themselves [as] an old town sheriff from western days. They are the law; they are always right and no one can make them change. This combination is magnified many times over in a virtual academic setting, contrasted with a traditional brick and mortar setting. In the traditional setting, faculties come together for regularly scheduled faculty meetings, see each other in committee meetings, and get a feel for each other. In short, they have more opportunities to learn to trust [spoken with air quotes]. Managing faculty in a traditional setting is more like herding cats. They still have the problems of entitlement and academic freedom, but it is not as pronounced as in virtual faculty.

Generally, it is important to distinguish between theory versus practice, but for participants this was a challenge given their lack of experience outside of the higher education space. When prompted to share how one could operationalize managing faculty, Garth asserted:

> In a virtual setting, "getting a feel" for your faculty members, that is so critical in maintaining focus and the academic mission, is extremely difficult to achieve. For this to happen, leadership skills have to be even greater than those required for the traditional brick and mortar academic setting. Often, meetings are simple phone calls, devoid of the typical visual cues one has in a face-to-face setting. There is no sitting down over coffee or lunch in a face-to-face. That simple breaking of bread, which is a strong tool in the brick-and-mortar setting that works so well in bringing people together doesn't exist in the virtual setting. Collaborative skills, the ability to gently persuade, bridge building and fostering a sense of trust with the faculty are at the top of the skill list for the virtual leader. Yes, these are very important skills for the traditional brick-and-mortar setting leader, but they are even more critical for the virtual leader. These skills require a special "touch" to pull off in the virtual setting with faculty geographically dispersed, having a sense of isolation and the vision that they are the only sheriffs in town. It is a unique challenge for the virtual leader.

Discussion

Many of the findings of this research reflect what we know about leadership and working in virtual teams. This study extends the body of knowledge by linking to precedents, and also suggests a forward-looking agenda, noted in the applications and recommendations sections. In 2002, 9.6% of students enrolled at both public and public, 2- and 4-year institutions engaged in distance education, and in 2015 29.7% of the same population took one or more distance courses (Allen & Seaman, 2017). Consequently, universities are relying on effective leadership to meet the demands of and guide this online learning growth. Knowledge gained from this research, as well as from future research, could enable institutions of higher education to focus training efforts on their online learning teams and potentially increase employee engagement and commitment, thereby reducing costs of turnover (Thaly & Sinha, 2013).

Data analyses in this study isolated seven invariant constituents or themes comprising the participant leaders' lived experiences with their virtual, academic teams. All participants reported that they received no training of any kind to lead their virtual teams, and they had to fall back on past experiences as an online student or faculty member. The experiences shared by the participants focused on a strong need for communication, recognition, setting clear goals and vision, having reliable technology to do the job, and a meticulous focus on the leadership styles needed to successfully manage their virtual teams. Trust emerged as an enormous component for virtual leaders; both in how they led their teams, and in the environments and culture they created. The participants shared their experiences in how they used technology to lead their teams and foster engagement. Likewise, they conveyed how important emotional intelligence was to have in their leadership capabilities.

Training and development. All 10 (100%) of the participants shared that they had no formalized training to lead virtual teams. Oftentimes, people were assigned to a leadership role over a virtual team with little or no training from the organization. As a result, many new leaders, like the participants in this study, are forced to develop skills informally, as they go, and to make up new rules along the way. When mentoring was available for the interviewed virtual leaders it was deemed valuable. Others suggested that mentoring should be part of their workplace training and development (Crisp & Cruz, 2009). An understanding of the differing leadership theories associated with virtual leadership should be compulsory for this training. This would be a rich component of developing those who will successfully lead academicians. The results of this study revealed that although many virtual leaders could lead their teams efficaciously, they could perform better with appropriate tools and resources. These virtual leaders sometimes met challenges with their own effort to devise new and innovative ways of leadership to get by.

Trust. Trust was identified as a substantial theme in this study, surfacing throughout the participants' discussions. Participants shared that trust between leaders and their employees is vital and foundational (Cho & Lee, 2012). The participants spoke more specifically, explaining that trust is one of several factors associated with creating effectiveness within virtual teams (Berry, 2011a). Overall, trust is a salient phenomenon in the contemporary business environment (Schilke & Cook, 2013) and clearly in the higher education online learning arena as well.

Emotional intelligence. Emotional intelligence was affirmed as an indispensable skill set for virtual leaders, as noted in the participants' discussions. In fact, emotional intelligence has clearly been a noteworthy predictor of transformational leadership, self-efficacy, and emotional support as well as academic success (Weichun et al., 2012). Participants stated that having strong

emotional intelligence allowed them to focus on empathy, as well as to self-reflect, to aid them in 'reading' their employees from a distance, allowing them navigate the nuances associated with leading virtual employees, particularly faculty members. Leading a virtual team requires a different management and leadership approach to achieve optimal success and productivity, including a focus on emotional intelligence (Peart, 2014).

Virtual leadership competencies unique to higher education. Among the findings of this study, several leadership competencies are needed for higher education virtual leaders. A focus on employee motivation and recognition was identified as integral, particularly when leading teams of virtual faculty. In addition, a strong understanding of technology and communication skills and a desire to bring virtual teams together in various activities is needed. Therefore, academic leaders should be educated and trained in leadership theory and encouraged to cultivate thoughtful and sincere relationships with their virtual faculty employees (Curry, 2016). The results of this study align with the existing literature surrounding this topic as it is imperative to take the traditional leadership practices occurring in face-to-face working environments; then, explore how those practices affect the virtual administrator-to-faculty relationship (Fincham, 2013). A logical outcome is that the virtual environment of higher education affects the relationship between virtual faculty members, employees, and educational leaders (Morgan et al., 2014).

Recommendations for Future Research

A key limitation of this study is that most participants only had experience leading virtual teams within higher education. Another limitation of the study is that participants had varied levels of experience in leading virtual teams. Considering the present themes elucidated by academic leaders in the virtual higher education environment in this study, there are future research directions that are both interesting and necessary. A recommendation for continued research is to duplicate this study while focusing on virtual leaders who are affiliated with a particular university. In addition, to expand the scope of the research and validity, examining this amongst private and public universities is paramount. As shared in this study, training and development was a fundamental concern amongst the participants. This may vary, or not be a concern at all across differing private and public universities, as well as the specific resources provided. Findings gleaned from such a study could provide insight on how other institutions train and develop (or do not) their virtual leaders. In addition, a cross-analysis of virtual leadership departments in industries outside of higher education could provide valuable insight to successful virtual leadership behaviors that could translate to the higher education space.

Virtual teams and virtual leaders are often more prevalent outside of the higher education arena and may have more sophisticated tools to onboard new virtual leaders. From an educational perspective, educators may have a different philosophy in terms of leadership; however, other industries, such as technology may be able to provide a more robust and less philosophical approach to virtual leadership tactics.

The researchers plan to replicate and expand on this study to determine if opinions and perceptions have changed in the rapidly changing educational environment. Retention metrics, graduation rates, and course progression analytics are all important indicators for higher education leaders. As online programs, and potentially virtual teams, continue to grow, an interesting phenomenon would be to see if successful virtual leaders had any correlation to higher success within their online programs. In addition, even if a higher education institution was exploring

online programs or had a small portion of their students taking online classes, comparing virtual leaders with face-to-face leaders and teams could provide valuable data.

Lastly, the researchers are developing training tools related specifically to supporting the themes that emerged in this study. Current plans include deploying and testing the new tools for adoption and effectiveness in an upcoming study.

Conclusions

This research provided insight about leading virtual teams in the dynamic and evolving higher education setting. Based on the growing trend of online education, while overall college enrollment has declined, the documented 29.7% of all college students taking a virtual course indicates that we serve a population of 6 million learners (Allen & Seaman, 2017). As universities create and sustain online programs, we must confront the reality that virtual leaders may not equipped to lead remote and distributed teams.

While virtual leadership has been investigated with an industry-relevant focus, scant literature exists on virtual leaders within higher education. This pilot qualitative study's robust data, stories of leaders striving to manage their virtual academic teams in the complex and regulatory higher education environment, help address the deficiency in existing literature. The themes that emerged implicate the significance of understanding the intricacies of virtual leadership and the importance of implementing robust tools and resources to support successful academic leadership.

The importance of communication has long been established in scholarly research as a fundamental component of successful leadership. Further analysis would be valuable regarding common languages and shared meanings that are often evident in the team dynamic; particularly, how these commonalities may influence virtual team performance in comparison to leadership outside of the virtual sphere. Leaders' conscientious efforts to match the message and occasion to communication technologies, frequency, and cadence can help in creating a trusting environment among team members.

Data provided from this study may be useful for higher education administrators, faculty leaders, and staff as they expand or create online programs, particularly their virtual academic teams. A formalized training program focusing on the specific resources and considerations for remote employees would facilitate supporting both the remote employee and their leaders within the academic environment.

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Appendix A: Interview Questions

1. What training, if any, did you receive prior to becoming a virtual leader?
2. How do you as a virtual leader build trust amongst your individual team members?
3. What type of activities, if any, have you conducted in order to keep your team members engaged?
4. What types of tools do you use, or have you used, to communicate with your virtual team members?
5. What are your perceptions and experiences with communication as a virtual leader?
6. How do you keep your virtual employees motivated?
7. What efforts do you make, if any, to assure that virtual team members are included in the culture, happenings, events, communication, and activities the same as the team members who are not virtual?
8. How would you describe your leadership style?
9. What role, if any, do you think emotional intelligence has in your ability to lead virtual teams?
10. Are there any additional comments, thoughts, or experiences you would like to make regarding any challenges or successes you've experienced as a virtual team leader?
11. Have you had any experience working in a virtual setting outside of higher education? If so, what type of organizational setting? What leadership styles were used to manage virtual employees?
12. In your opinion, is being a virtual lead different in higher education than other professional settings? If so, why/how?
13. Is there anything unique for being a virtual leader in an academic setting versus other professional settings? If so, what?

Introduction to Section II of *Online Learning* Volume 23, Issue 3

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This third issue of 2019 contains 8 articles that were received through our regular submission process. These papers reflect a wide array of topics, research questions, and methods. This collection of studies advances our understanding of faculty and professional development, instructional design, and student, research, and ethical concerns in online settings.

The first three papers deal with faculty and faculty professional development issues. The first of these is "Examining Faculty Perception of Their Readiness to Teach Online" by Florence Martin, Kiran Budhrani, and Chuang Wang of the University of North Carolina. Using survey methods, the study looks at faculty attitudes about the importance of online teaching competencies and faculty's perception of their ability to confidently teach online. The paper defines readiness to teach online as a function of these two – i.e. relevance of online teaching and competence to be effective. An important finding from the study is that the competencies faculty find most important differ from the competencies they believe they can perform. These results and their implications are discussed in depth in the paper.

The next paper is "Using Social Media as a Platform for a Virtual Professional Learning Community" by Laurie Bedford of Walden University. As the previous study suggests, professional development is a critical component of faculty competence with online instruction. The authors assert that social media use for professional development has primarily focused on informal learning in unstructured formats. This paper explores whether more structured approaches might support the development of an effective online learning community among participants. Using interviews to elicit insights from 22 doctoral mentoring faculty who engaged in a structured social media environment the author reports that the platform was an effective way to engage faculty, build relationships and foster shared learning.

The third paper is "What Is an ID? A Survey Study" by Olysha Magruder of Johns Hopkins University, Daniel Arnold and Shaun Moore of Oakland University, and Mel Edwards of Purdue University. This paper provides context for the role of the instructional designer and the influence of online learning on the evolving nature of this faculty-support role. The question driving this research focuses on the competencies instructional designers report. Results from a survey of 139 instructional designers indicate that the ability to evaluate programs and incorporating learning theories are the most critical competencies for the profession, but various other competencies are deemed important. These results have significant implications for practice and the further development of the profession.

The next paper in this section is "Well Begun Is Half Done: Using an Online Orientation to Foster Online Students' Academic Self-Efficacy" by M'hammed Abdous of Old Dominion University. While the previous papers broadly explore variables impacting faculty preparedness to teach online, this paper looks at student readiness for online learning. Using a large sample of student (n = 3,888) the study looks for relationships between participation and satisfaction with an online orientation and students' confidence to complete online course activities, to interact with classmates and the instructor, to use of a learning management system (LMS), and to socialize with classmates. The study found that satisfaction with the online orientation strongly predicted students' self-confidence to use the LMS, as well as their confidence to interact with and to socialize with their classmates. The author concludes that the use of a learner-centered orientation, with learning activities that reflect course activities, is crucial to online students' success in online learning.

The fifth paper in this section is "One Size Does Not Fit All: Toward an Evidence-Based Framework for Determining Online Course Enrollment Sizes in Higher Education" by Susan Taft of Kent State University and Karen Kesten and Majeda M. El-Banna of the George Washington University. Online course enrollments have long been a topic of controversy with some arguing that there need be no limit at one end of the spectrum (e.g. MOOCs) and those arguing that smaller is better for online quality at the other. For the most part, the large scale argument holds sway in non-degree programs (MOOCs) and smaller scale is typical of coursework in degree-granting programs. Within this context of "traditional" online courses leading to degrees, class size is still a topic of concern and this paper provides much needed nuance into the topic of optimal course size. The paper presents evidence compiled from 58 articles found in recent higher education journals reported by researchers from a variety of disciplines. The paper also includes a framework with recommended class sizes based on learning needs and pedagogical strategies with examples of courses in five size categories.

The next paper is "Examining the Role of Motivation and Learning Strategies in Student Success in Online Versus Face-to-Face Courses" by Emily Stark of Minnesota State University. This study examined differences between student learning strategies and motivations in online and face-to-face courses in a survey of 778 students using the Motivated Strategies for Learning Questionnaire (MSLQ). Results suggest that students in online courses had lower levels of both intrinsic and extrinsic motivation to succeed and viewed their online course as less interesting and useful compared to students in face-to-face courses. However, students in online courses reported greater self-efficacy compared to those in face-to-face courses, i.e. they felt more able to successfully complete the work online. Students in online courses reported using fewer learning strategies, including rehearsal, organization of information, metacognition, and seeking less help from peers and the instructor, compared to those enrolled in face-to-face courses. Possible explanations for these and other differences are discussed along with implications for future research.

The seventh paper in this section is "Research Ethics of Twitter for MOOCs" by Eamon Costello, Enda Donlon, and Mark Brown of Dublin City University. Social media data are frequently seen as valuable for educational research, especially for non-traditional online learning contexts such as Massive Open Online Courses. The data are publicly available, informative, and easy to access. However, using this data is not without risk. The goal of the research presented in this paper was to ask what ethical considerations researchers have reported when investigating MOOC learners' and teachers' Twitter activity. A key result was that almost three quarters of the

studies analyzed did not contain any mention of ethics. This is problematic in that collection of personally identifiable and potentially compromising data is inherently an activity with ethical concerns. The authors provide discussion of the results and suggestions for future research.

The final paper in this issue is "Artificial Intelligence and The Academy's Loss of Purpose" by Anthony Picciano of the City University of New York Hunter College and Graduate Center. This paper, also focusing on ethical and related concerns, discusses the future of higher education as online technology, specifically adaptive learning and analytics supported by artificial intelligence, develops and evolves. The paper argues that online and adaptive learning have already taken hold within the academy, but the most significant changes are still unfolding. These evolving technologies may have the potential to change traditional roles in higher education in unpredictable and highly disruptive fashion. These possibilities are summarized with implications for the future of higher education professional roles.

We invite you to read and share this issue with colleagues and to consider submitting your original work to *Online Learning*.

Examining Faculty Perception of Their Readiness to Teach Online

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Abstract
Faculty readiness to teach online is a state of faculty preparedness for online teaching. In this study, it is measured by faculty attitudes about the importance of online teaching competencies and faculty's perceptions of their ability to confidently teach online. Validity and reliability of faculty responses to an online instrument and factors related to faculty perception are examined. Descriptive statistics and item-level means for the competencies are provided. For course design, course communication, and technical competencies, faculty rated the perception of importance higher than they rated their ability in these areas, whereas for time management their perception of their ability was higher than their attitude about its importance. MANOVA showed significant differences in gender, years of teaching online, and delivery method for faculty perceptions of importance of online teaching competencies. Significant differences were also noted in years of teaching online and delivery method with respect to ability to teach online.

Keywords: faculty readiness, online teaching, faculty attitude, faculty ability, faculty perception

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Examining Faculty Perception of Their Readiness to Teach Online

Technological developments require faculty members to consider new ways to prepare, organize, deliver, and assess courses and learning materials for online teaching (Pagliari, Batts, & McFadden, 2009; Sorcinelli & Austin, 2006). Bawane and Spector (2009) argue that the competencies required to teach online are not substantially different from those needed to teach face-to-face; it is assumed that a faculty member's past teaching experience serves as foundation to teaching online (Wray, Lowenthal, Bates, & Stevens, 2008). However, some researchers disagree with this idea and explain that teaching in the online modality is different from teaching in the classroom and that the online faculty member's role is different from that of a faculty member teaching in the classroom (Ko & Rossen, 2017; Wray et al., 2008). Online faculty focus on instructional time and space, virtual management techniques, and the ability to engage students through virtual communication (Easton, 2003).

Online Teaching Competencies

A competency is "a knowledge, skill or ability that enables one to effectively perform the activities of a given occupation or function to the standards expected in employment" (Richey, Fields, & Foxon, 2001, p. 26). Online researchers have examined competencies in online technologies (Guasch, Alvarez, & Espasa, 2010). Early work of Berge (1995) looked at conditions of successful online teaching and categorized four areas of competency: (1) pedagogical, (2) social, (3) managerial, and (4) technical. Subsequent researchers (Aydin, 2005; Bawane, & Spector, 2009; Goodyear, Salmon, Spector, Steeples, & Tickner, 2001; Guasch et al., 2010; Varvel, 2007; Williams, 2003) expanded Berge's (1995) work to describe faculty functions, roles, and competencies. Williams (2003) defines four general categories to describe faculty competencies in higher education: (1) learning and instruction, (2) communication and interaction, (3) management and administration, and (4) technology. Guasch et al. (2010) analyzed previous research on university teacher competencies for teaching and learning in virtual environments and concluded that online faculty take on a designing/planning function, social function, instructive function, technological domain, and management domain.

In this study, we examine four areas of online teaching competencies: course design, course communication, time management, and technical. We focused on these four competencies based on our review of literature and existing readiness instruments. This is described in detail in the Instrument subsection under the Methods section.

Course design. Course design is identified as a pedagogical competency, alongside course implementation, facilitation, and assessment (Varvel, 2007). The course design process involves planning instruction with course objectives, instructional strategies, activities, and assessments that align to objectives (Varvel, 2007). Major considerations when designing courses are defining appropriate activities and workload for students (Napier, Dekhane, & Smith, 2011). Courses need to be organized into a structure, a course syllabus, and course guidelines to define requirements (Darabi, Sikorski, & Harvey, 2006; Fein & Logan, 2003; Ko & Rossen, 2017; Palloff & Pratt, 1999). Chunking information into modules enhances student learning (Fein & Logan, 2003).

Effective strategies for online courses include discussions (De Gagne, 2009) and case studies. Case studies provide real-life examples to maintain student interest, motivation, and active learning (Gudea, 2005; Ryan, Carlton, & Ali, 2004; Turner, 2005). Varvel (2007) explains that faculty need to evaluate the instructional effectiveness and value of learning materials for a course, as well as ensure those selected align to the given context, curriculum, and outcomes. Faculty also adjust materials based on credibility, clarity, validity, reliability, accuracy, currency, accessibility, usability, and quality of course resources (Varvel, 2007). Materials may include text; audio, video, and other delivery media; and simulations to aid student understanding, interpretation, and internalization of new information (Varvel, 2007).

Faculty must decide whether assessments should be redesigned for the online course (Fein & Logan, 2003). Faculty need to design assessments considering whether students will work individually or interact with peers in groups, striking a balance between independent, interactive, and interdependent activities (Gunawardena, 1992). Courses also need to provide students with grading criteria (Ko & Rossen, 2017). Course design involves not only preparing materials, course lectures, activities, and assessments in advance, but also providing clear expectations of assignments and/or activities and anticipating student questions (Darabi et al., 2006). Faculty must create an organized course where objectives, structure, content, activities, assessments, materials, and interaction components of the course are made explicit.

Course communication. Goodyear et al. (2001) highlight the importance of interpersonal communication and interaction between the teacher and students in online courses. Faculty must be able to communicate through writing and/or audio to the students within the given learning modality (Varvel, 2007). Feedback needs to be adequate, timely, and prompt. Communication on rules and regulations, due dates, netiquette, course expectations, ethical practices, the code of conduct, and policies for the course as well as information about accessibility, privacy, and copyright are necessary (Coppola, Hiltz, & Rotter, 2002; Darabi et al., 2006; Ko & Rossen, 2001; Varvel, 2007).

Facilitating discussions is a key competency when teaching online (Redmond, 2011). Discussion forums, emails, and chats give educators a variety of tools to promote learner–instructor, learner–content, and learner–learner interaction (Moore, 1993). Faculty must be able to moderate, participate in, and advance discussions to encourage participation (Darabi et al., 2006). Faculty should apply a variety of active, engaging, and effective communication methods, carry internal dialogue, and formulate effective responses (Varvel, 2007).

Time management. Competent faculty have adequate time-management skills so that lifestyle commitments do not interfere with the ability to instruct the course (Varvel, 2007). Online course design and planning is time-consuming and takes significantly longer for a first-timer, as all the course objectives, content, activities, and assessments have to be redesigned for an online format. The second time the online course is taught is less time-consuming compared to the first time (Visser, 2000).

Darabi et al. (2006) found that top-five tasks faculty spend most of their time on are assessing learners' attainment of learning objectives, providing feedback, injecting questions that promote higher order thinking, and providing directions for assignments. Faculty spend additional time outside of class to help struggling students, including addressing questions about students' technical difficulties (Napier et al., 2011). Faculty also spend time outside of class giving attention to details of student performance as they monitor students and maintain proper records and gradebooks (Coppola et al., 2002; Darabi et al., 2006; Varvel, 2007). Visser's (2000) comparative analysis revealed that the time and effort involved in course development and delivery may partially depend on the accumulation of faculty experience, level of institutional support, and technical support. Faculty experience on previous online course design and facilitation, and established support at the university might reduce the time for subsequent course design and facilitation. Aydin (2005) found that participants who were faculty and graduate assistants believed that the ability to manage time efficiently was very important for successful online teaching.

Technical. Technical competencies are specific to the use of the technology, independent of pedagogy (Varvel, 2007). They include technical knowledge (e.g., knowledge about how to use software, synchronous and asynchronous tools, operating systems, learning systems and tools, and Web browsers, and how to implement security updates) and proficiency in the use of current technology, the ability to troubleshoot technology issues, and the ability to assist learners effectively (Darabi et al., 2006; Varvel, 2007). The expansion of online content, Web 2.0 tools, and audio- and video-based learning materials has put pressure on faculty to curate digital online resources for online students (Espiritu, 2016). Faculty also need to learn how to select, manage, use, and/or produce videos for course lectures, welcome videos, and demonstrations. Designing a course that supplements or replaces classroom lectures with online content requires more technical competencies, such as instructional websites and interactive learning environments (Young, 1997). Faculty often get frustrated with technical glitches and the amount of time required to type text for

instruction or communication (Coppola et al., 2002). Faculty must learn to access technical assistance, not only to seek help for their issues but also to ensure learners are provided assistance when required, especially students using adaptive/assistive technologies (Varvel, 2007). Faculty are increasingly expected to handle Web-based enrollment courses, as online gradebooks are becoming a norm (Brooks, 2010).

In our review of the literature, we found that the discourse among researchers on the competency frameworks, roles, requirements, and tasks to teach online is rich. There is, however, limited research on the readiness of faculty to perform these online teaching competencies. More importantly, such competencies differ for faculty by culture, contexts, organizations, and countries (Aydin, 2005; Bawane & Spector, 2009; Guasch et al., 2010; Williams, 2003), which in turn implies that readiness will vary by these same factors. Thus, there is a need to further study faculty readiness to teach online.

Faculty Readiness to Teach Online

Several institutions use a readiness instrument to assess faculty readiness to teach online, but most of these are not systematically studied or empirically tested. Few researchers have studied faculty readiness for online teaching. Gay (2016) examined the assessment of online instructor e-learning readiness before, during, and after course delivery. They found that the availability of online help desk services is an urgent need of online faculty. Lichoro (2015) found that faculty members do not feel adequately prepared to teach online. However, there is still a need to identify competencies to prepare faculty to teach online, and by doing so we will be providing guidance to prepare faculty to teach online. Downing and Dyment (2013) examined teacher educators' readiness and preparation for as well as their perceptions of preparing preservice teachers in a fully online environment and found that teachers considered online teaching time-consuming. Based on the research examined, it was found that faculty new to online teaching felt a lack of readiness to teach online and needed technical and pedagogical support, and time-management strategies.

We define *faculty readiness to teach online* as a state of faculty preparation for online teaching. Within the context of this study, we focus on two aspects of readiness: (1) faculty attitude on the importance of online teaching and (2) faculty perceptions of their ability to confidently teach online. *Attitude* refers to the viewpoint a person has about something and its personal relevance to them (Krosnick & Petty, 1995). *Ability* has reference to the capacity to successfully perform (Ferguson, 1954). Since measuring faculty's direct ability was not possible, we focused on their perception of their ability to teach online. Several researchers have examined the relationships between attitude, ability, and readiness (Bayram & Comek, 2009; Logan & Johnston, 2009; Rollnick, Mason, & Butler, 1999). However, researchers have not yet examined the relationships between attitude, ability, and online teaching readiness.

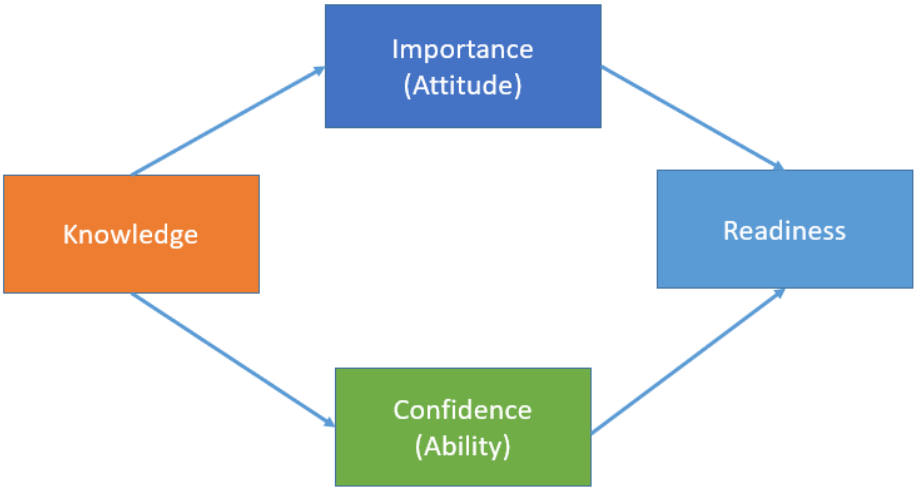

Figure 1. Theoretical framework for faculty readiness to teach online. Adapted from *Health Behavior Change e-Book*, by S. Rollnick, P. Mason, and C. C. Butler, 2010: Elsevier Health Sciences.

Attitude (importance). Since teaching in the online modality is different from teaching in the classroom, faculty competencies to teach online require faculty to adjust their attitudes towards technology and teaching. It is essential to examine faculty attitudes on the importance of the various competencies for online teaching. Students are likely to experience more positive learning outcomes when their faculty have positive attitudes towards online course delivery (Volery, 2000). Denis, Watland, Pirotte, and Verday (2004) emphasize that faculty rate competencies that promote student interaction and build student–instructor relationships as most important. In Denis et al.'s (2004) study, respondents rated pedagogical roles as most important. Darabi et al.'s (2006) study showed that faculty place most importance on managerial aspects of teaching, such as keeping records and maintaining course accuracy; the top-five tasks their respondents rated as important included reviewing the course for accuracy, assessing learners' attainment of learning objectives, and maintaining expertise in their subject area.

Ability (confidence). *Instructor ability* is conceptualized as the teachers' beliefs about or perceptions of their own competence at teaching, related to use of instructional strategies and teaching effectiveness (Lee & Tsai, 2010). Research on online teaching ability can contribute to understanding how teachers' ability affects what they do when they teach online (Wallace, 2004) and contribute to the development of resources to best meet faculty development needs (Northcote, Gosselin, & Reynaud, 2015). Northcote et al. (2015) measured online teaching ability, surveying the variations in self-confidence to carry out online teaching tasks, such as selecting technological resources, conducting virtual interaction, facilitating content migration, ensuring course alignment, and establishing course structure. Their study revealed that faculty had lowest self-efficacy in selecting technological resources and highest self-efficacy in online course alignment, which was to effectively align learning objectives, course assignments, assessment strategies, and learning activities within online courses. Aydin (2005) studied perceptions of ability and importance for online teaching competencies related to technology use, communication, time management, online education, and content. Results show that faculty have higher perceptions of the importance of these competencies and yet lower perceptions of their ability with regard to these competencies, recognizing that they need improvement to perform better at online teaching.

Perception of online teaching ability was seen to improve with professional development programs for faculty (Northcote et al., 2015).

Demographic Factors in Online Teaching

Studies have examined gender differences in online teaching. Aydin's (2005) study found that gender had no effect on faculty's perception of roles and competencies. However, Briggs's (2005) survey found gender-specific differences in perceptions of the importance of the 11 online teaching roles and competencies. Chase (2002) found differences in gender on instructional design practice, particularly on course design. Shea (2007) found differences in gender pertaining to motivations to teach online. In other studies, men rated their ability to use instructional technology higher than women did, but both genders had similar frequencies of technology use (Spotts, Bowman, & Mertz, 1997). Women faculty tended to explore more relational approaches to teaching and use technology for different purposes than men did (Campbell & Varnhagen, 2002). Thus, gender differences related to teaching with technology are worth further investigation.

Other factors that influence faculty's positive attitudes toward teaching online are prior experience teaching online, availability of online courseware, improved training and facilities, feedback from students, and flexibility of time and teaching schedules (Clay, 1999). Shea's (2007) study showed that the number of times faculty had taught online was an important consideration in how motivated faculty are in the online modality; with more experience in the online modality, self-confidence levels increase. Less experienced faculty report that they struggle to communicate because of the absence of face-to-face interaction, are unfamiliar with effective online pedagogy, lack the opportunity to observe online teaching before engaging in it, lack the opportunity to experiment with the technologies of online teaching, and have inadequate time to learn about online teaching (Shea, 2007). Carrol, Sanmamed, and Sellés (2013) found that faculty who have more teaching experience online also have greater perceived ability to perform pedagogical competencies online.

Purpose of This Study and Research Questions

While several universities have a readiness measure to assess faculty's readiness to teach online, few studies have been systematically conducted to measure faculty readiness. The purpose of this study is to examine faculty perceptions on their readiness to teach online by examining their attitude about the importance of competencies and their perception of their ability to teach online. Research questions of this study include the following:

- What are faculty attitudes on the importance of online teaching competencies and faculty's perception of their ability to confidently to teach online?
- What demographic factors are related to faculty attitudes about online teaching competencies and their ability to teach online?

Methods

Research Design

This is a survey-based research study in which the SurveyShare electronic tool was utilized. Surveys are commonly used to elicit information about attitudes that are otherwise difficult to measure using observational techniques. Sometimes educators conduct descriptive research to obtain information to learn more about people's attitudes, opinions, demographics (e.g., gender,

age), beliefs, and behaviors. Using a survey or the survey method as a means to collect data about people is common in descriptive research (Johnson & Christen, 2004).

Data Sources

The survey was distributed through the SurveyShare electronic survey tool to three distribution lists in the United States: the Association for Educational Technology (AECT) Communications (1,984 members), the American Educational Research Association (AERA) Online Teaching and Learning Special Interest Group (250 members), and a southeastern public university's faculty (529 members) in the United States. We had a sentence in the recruitment email stating that this survey was to be completed by faculty who have taught online. A total of 205 faculty responded to the survey, of whom 144 (70%) were female and 56 (27%) were male. Five of the respondents (3%) did not identify their gender. The mean age of the participants was 49.55 years, with a standard deviation of 10.94 years. Respondents from the AECT and AERA listserv and from the southeastern public university's faculty were not statistically significantly different from each other with respect to age, $t(188) = 1.04$, $p = .30$; years of teaching, $\chi^2(df = 3) = 4.11$, $p = .34$; years of teaching online, $\chi^2(df = 3) = 7.09$, $p = .07$, and gender, $\chi^2(df = 1) = 2.17$, $p = .34$. As a result, all respondents were grouped together for further analyses. Table 1 presents a description of the participants, including age, gender, rank, delivery method, level, years teaching, and years teaching online.

Table 1
Faculty Demographic Characteristics

Variables		Frequency
Rank	Full professor	22 (12.4%)
	Associate professor	49 (27.7%)
	Assistant professor	43 (24.3%)
	Instructor/lecturer	54 (30.5%)
	Clinical faculty	9 (5.1%)
Delivery method	Asynchronous	84 (42.2%)
	Synchronous	15 (7.5%)
	Hybrid	39 (19.6%)
	Face-to-face	61 (30.7%)
Level	Undergraduate	57 (28.1%)
	Graduate	146 (71.9%)
Years teaching	0–5 years	21 (10.5%)
	6–10 years	38 (19.1%)
	11–15 years	36 (18.1%)
	More than 15	104 (52.3%)
Years teaching online	0–5 years	94 (46.3%)
	6–10 years	54 (26.6%)
	11–15 years	35 (17.2%)
	More than 15	20 (9.9%)

Note. Not all participants responded to all questions; thus, percentages are based on the number who actually responded to a particular question.

Instrument

The Faculty Readiness to Teach Online (FRTO) instrument (Table 2) was developed by the authors with reference to the literature (theoretical models and previous research). Research studies (Downing & Dyment, 2013; Gay, 2010; Lichoro, 2015) were reviewed to identify a framework and instrument that can be used to measure faculty readiness to teach online.

We also reviewed the 20-item readiness instrument from the University of Toledo (2017), which had categorized the readiness skills into basic technical skills, learning management system (Blackboard) experience, course planning and time management, and communication. The faculty self-assessment used when preparing for online teaching at Pennsylvania State University was also reviewed. The 30-item survey ranked items within three categories: technical, administrative, and pedagogical competencies. For this research, we did not adopt either of the existing instruments because we did not feel that these instruments captured the entirety of faculty readiness in the lens we were looking through. We used the broader categories from the University of Toledo survey and included technical, design, time management, and communication in the design of the instrument. We chose to use some of the items from the Pennsylvania State University survey (Pennsylvania State University, 2017) but preferred the categorization from the University of Toledo survey (University of Toledo, 2017). Content validity was checked with three experts in instructional technology and three additional faculty who teach online. The survey initially had six categories and 28 items and was narrowed down to four categories, but the number of items increased to 32 from the process. Two of the sections—(1) engagement and (2) assessment and evaluation—were merged with other sections. Also, the items increased based on recommendations from content experts about items they felt were missing.

Based on our review of the literature (e.g., Downing & Dyment, 2013; Gay, 2016; Lichoro, 2015) and our examination of faculty readiness instruments adopted by universities (University of Toledo and Pennsylvania State University), we designed a framework of faculty readiness to teach online including course design, course communication, time management, and technical competencies (see Figure 1).

In addition to demographic information, the instrument consists of two constructs: attitude based on importance and perception of ability. The same items were used for each construct, and the respondents were asked to rate how important each competence is for online teaching and how well they are able to accomplish the tasks based upon their own judgment of their competencies. The competencies fall into four categories: course design (nine items), course communication (10 items), time management (six items), and technical competence (seven items). In the section for attitude, respondents were asked to rate the importance of the competencies on a 5-point Likert scale from 1 (*not important at all*) to 5 (*very important*). In the section for ability, respondents were asked to rate their capability to accomplish the tasks based upon their own judgment of their competencies on a 5-point Likert scale from 1 (*I cannot do it at all*) to 5 (*I can do it well*). Cronbach's alpha for all items for attitude was 0.88 and for ability was 0.92.

Data Collection

The survey was created using SurveyShare, which is an online survey tool. Institutional Review Board approval was received. Recruitment emails were sent to instructional technology listservs for the AECT and the AERA Online Teaching and Online SIG. Recruitment emails were also sent to the faculty who teach online at a southeastern university.

Data Analysis Procedure

Confirmatory factor analysis was employed to examine the structural aspect of validity (Messick, 1995). The goodness-of-fit indices included standardized root mean square residual (SRMR), root mean square error of approximation (RMSEA), comparative fit index (CFI), incremental fit index (IFI), and the 90% confidence intervals of RMSEA. Some research studies have questioned the validity of Hu and Bentler's (1999) two-index strategy in model fit assessment (Fan & Sivo, 2005), and suggested that this two-index strategy was based on very restrictive assumptions and tended to reject adequately fitting models (Marsh, Hau, & Wen, 2004). Therefore, this study placed more emphasis on the combinations of multiple goodness-of-fit indices. The suggestions provided by LISREL to add paths from observable variables to latent variables were not followed because this could mechanically fit the model not suggested by theory (MacCallum, Roznowski, & Necowitz, 1992). Only two pairs of items were allowed to covary because these items have a lot in common.

Descriptive statistics (means and standard deviations) are reported both at the item level, at the subscale level, and also by various demographic factors. Cronbach's alpha was used to check the internal consistencies of the responses to the survey items. Pearson correlation coefficients were calculated to show the relationship between the subscales. Multivariate analysis of variance (MANOVA) was employed to examine the differences among faculty in their responses to the survey with respect to gender, rank, teaching experience, teaching online experience, primary level of teaching, primary delivery method, support received, and required training. We used effect sizes from MANOVA (small = .01; moderate = .06; large = .14) to document the size of obtained differences (Cohen, 1988).

Survey Validation

Cronbach's alpha was used to show the internal consistency (reliability) of the participants' responses to the FRTO survey. Cronbach's alpha for all items for attitude was 0.88, and for ability was 0.92. For faculty attitudes on importance, the subscales were 0.79 (course design), 0.82 (course communication), 0.82 (time management), and 0.81 (technical). For their perception of ability, the subscales were 0.92 (course design), 0.86 (course communication), 0.83 (time management), and 0.88 (technical).

The confirmatory factor analyses showed a fairly good fit of the data to the model: CFI = .92, IFI = .92, SRMR = .089, RMSEA = .093, and 90% confidence interval of RMSEA ranged from .090 to .096. The two-level structure of the CFA is shown in Figure 2.

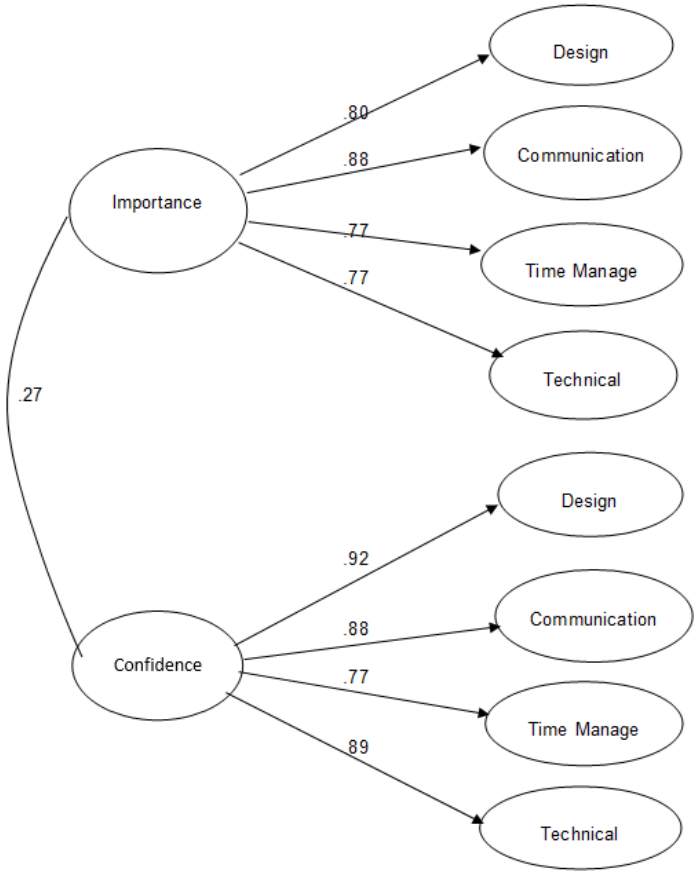

Figure 2. Two-level confirmatory factor analysis model.

Two pairs of items were allowed to covary because they shared a lot in common:

- Pair 1: Create online assignments (Course Design 8) and manage grades online (Course Design 9). Both items were about assignments, and managing grades is expected to be correlated to creating online assignments.
- Pair 2: Create instructional videos (Course Design 5) and create and edit videos (Technical Competence 5). Both items were about creating videos, so it not surprising that these two items should be highly correlated.

Results

Faculty Perceptions on Their Attitude (Importance) and Ability (Confidence) to Teach Online

Descriptive statistics (means and standard deviations) by item within each of the four subscales—course design, course communication, time management, and technical—are reported in Table 2. Most of the items on this survey were rated high for both attitude and ability.

Attitude (importance). In *course design*, designing learning activities (M = 4.63) and creating online course orientation (M = 4.50) were rated the highest. In *course communication*, responding to student questions promptly (M = 4.70) and providing feedback on assignments (M

= 4.65) were rated the highest. In *time management*, schedule time to design the course prior to delivery (*M* = 4.56) and spending weekly hours to grade (*M* = 4.44) were rated the highest. In *technical*, navigate within the course in the learning management system (*M* = 4.72) and complete basic computer operations (*M* = 4.58) were rated the highest.

Ability (confidence). In *course design*, organize instructional materials into modules or units (*M* = 4.68) and create online assignments (*M* = 4.62) were rated the highest. In *course communication*, use email to communicate with the learners (*M* = 4.82) and send announcements/email reminders (*M* = 4.77) were rated the highest. In *time management*, spending weekly hours to grade assignments (*M* = 4.47) and schedule weekly hours to facilitate the online course (*M* = 4.42) were rated the highest. In *technical*, complete basic computer operations (*M* = 4.79) and navigate within the course in the learning management system (*M* = 4.62) were rated the highest.

Table 2
Descriptive Statistics on Survey Responses by Item

	Faculty readiness competencies	Attitude (importance) *M*(*SD*)	Ability (confidence) *M*(*SD*)
	Course Design		
1	Create an online course orientation (e.g., introduction, getting started)	4.50 (0.70)	4.50 (0.73)
2	Write measurable learning objectives	4.49 (0.77)	4.57 (0.63)
3	Design learning activities that provide students opportunities for interaction (e.g., discussion forums, wikis)	4.63 (0.64)	4.44 (0.76)
4	Organize instructional materials into modules or units	4.48 (0.75)	4.68 (0.63)
5	Create instructional videos (e.g., lecture video, demonstrations, video tutorials)	3.80 (1.00)	3.93 (0.97)
6	Use different teaching methods in the online environment (e.g., brainstorming, collaborative activities, discussions, presentations)	4.35 (0.78)	4.33 (0.84)
7	Create online quizzes and tests	3.73 (1.09)	4.41 (0.82)
8	Create online assignments	4.48 (0.73)	4.62 (0.68)
9	Manage grades online	4.49 (0.78)	4.61 (0.72)
	Total	**4.33 (0.50)**	**4.45 (0.60)**
	Course Communication		
10	Send announcements/email reminders to course participants	4.64 (0.59)	4.77 (0.56)
11	Create and moderate discussion forums	4.37 (0.79)	4.51 (0.73)
12	Use email to communicate with the learners	4.35 (0.84)	4.82 (0.41)
13	Respond to student questions promptly (e.g., 24 to 48 hours)	4.70 (0.56)	4.73 (0.51)
14	Provide feedback on assignments (e.g., 7 days from submission)	4.65 (0.63)	4.63 (0.58)
15	Use synchronous web-conferencing tools (e.g., Adobe Connect, Webex, Blackboard Collaborate, Skype)	3.53 (1.06)	4.00 (1.03)
16	Communicate expectations about student behavior (e.g., netiquette)	4.38 (0.74)	4.48 (0.68)
17	Communicate compliance regarding academic integrity policies	4.49 (0.70)	4.56 (0.61)
18	Apply copyright law and fair use guidelines when using copyrighted materials	4.43 (0.82)	4.28 (0.76)
19	Apply accessibility policies to accommodate student needs	4.57 (0.66)	4.13 (0.84)
	Total	**4.41 (0.47)**	**4.50 (0.46)**

	Time management		
20	Schedule time to design the course prior to delivery (e.g., a semester before delivery)	4.56 (0.70)	4.33 (0.75)
21	Schedule weekly hours to facilitate the online course	4.40 (0.77)	4.42 (0.63)
22	Use features in learning management system in order to manage time (e.g., online grading, rubrics, SpeedGrader, calendar)	4.29 (0.85)	4.29 (0.83)
23	Use facilitation strategies to manage time spent on course (e.g., discussion board moderators, collective feedback, grading scales)	4.05 (0.84)	4.07 (0.93)
24	Spend weekly hours to grade assignments	4.44 (0.73)	4.47 (0.57)
25	Allocate time to learn about new strategies or tools	4.12 (0.77)	4.06 (0.85)
	Total	**4.31 (0.56)**	**4.27 (0.57)**
	Technical competence		
26	Complete basic computer operations (e.g., creating and editing documents, managing files and folders)	4.58 (0.65)	4.79 (0.56)
27	Navigate within the course in the learning management system (e.g., Moodle, Canvas, Blackboard, etc.)	4.72 (0.55)	4.62 (0.68)
28	Use course roster in the learning management system to set up teams/groups	3.85 (0.89)	4.25 (0.90)
29	Use online collaborative tools (e.g., Google Drive, Dropbox)	3.85 (0.94)	4.30 (0.88)
30	Create and edit videos (e.g., iMovie, Movie Maker, Kaltura)	3.55 (1.08)	3.79 (1.10)
31	Share open educational resources (e.g., learning websites, Web resources, games and simulations)	3.95 (0.91)	4.23 (0.88)
32	Access online help desk/resources for assistance	4.27 (0.79)	4.48 (0.69)
	Total	**4.11 (0.58)**	**4.35 (0.64)**
	Mean	**4.32 (0.44)**	**4.41 (0.50)**

Figure 3 shows the subscale means for attitude of importance and ability to confidently teach online. For course design, course communication, and technical, faculty rated their attitude higher than their perception of ability, whereas for time management their perception of ability was rated higher than their attitude.

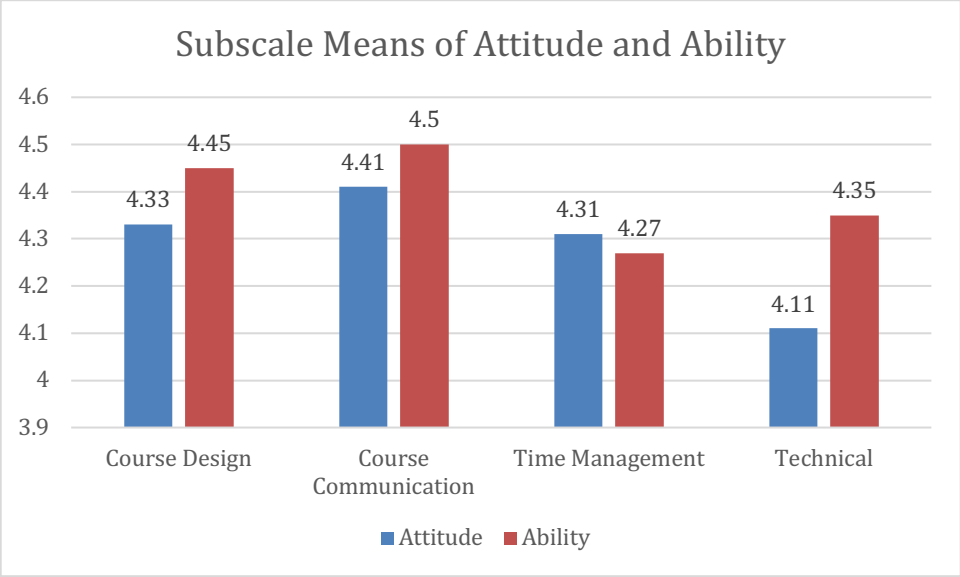

Figure 3. Subscale means of attitude and ability.

Descriptive statistics on attitude and ability scores by demographic characteristics are reported in Table 3.

Table 3
Descriptive Statistics of Attitude (Importance) and Ability (Confidence) Scores by Demographic Characteristics

	Attitude (importance)				Ability (confidence)			
	Course design *M* (*SD*)	Course communication *M* (*SD*)	Time management *M* (*SD*)	Technical competence *M* (*SD*)	Course design *M* (*SD*)	Course communication *M* (*SD*)	Time management *M* (*SD*)	Technical competence *M* (*SD*)
Gender								
Female	4.43 (0.43)	4.56 (0.34)	4.45 (0.51)	4.21 (0.48)	4.51 (0.60)	4.50 (0.49)	4.26 (0.60)	4.36 (0.64)
Male	4.21 (0.41)	4.30 (0.45)	4.25 (0.50)	4.10 (0.59)	4.35 (0.68)	4.48 (0.42)	4.29 (0.53)	4.29 (0.73)
Rank								
Full professor	4.27 (0.39)	4.50 (0.35)	4.34 (0.57)	4.09 (0.67)	4.39 (0.59)	4.43 (0.45)	4.31 (0.49)	4.30 (0.60)
Associate	4.31 (0.50)	4.39 (0.50)	4.39 (0.57)	4.12 (0.52)	4.38 (0.69)	4.48 (0.48)	4.17 (0.62)	4.29 (0.74)
Assistant	4.32 (0.43)	4.49 (0.37)	4.44 (0.50)	4.21 (0.56)	4.56 (0.68)	4.52 (0.56)	4.34 (0.62)	4.39 (0.73)
Instructor/lecturer	4.46 (0.39)	4.52 (0.35)	4.43 (0.50)	4.16 (0.40)	4.53 (0.42)	4.50 (0.37)	4.30 (0.51)	4.39 (0.49)
Clinical professor	4.67 (0.29)	4.71 (0.20)	4.69 (0.54)	4.55 (0.42)	4.19 (0.95)	4.51 (0.47)	4.19 (0.67)	4.00 (0.94)
Delivery method								
Asynchronous	4.31 (0.39)	4.47 (0.33)	4.36 (0.50)	4.07 (0.45)	4.67 (0.40)	4.62 (0.32)	4.42 (0.53)	4.49 (0.46)
Synchronous	4.29 (0.48)	4.53 (0.23)	4.39 (0.63)	4.25 (0.34)	4.60 (0.37)	4.49 (0.34)	4.20 (0.67)	4.40 (0.42)
Hybrid	4.39 (0.50)	4.48 (0.46)	4.40 (0.47)	4.32 (0.52)	4.62 (0.39)	4.58 (0.35)	4.38 (0.45)	4.51 (0.46)
Face-to-face	4.45 (0.43)	4.50 (0.47)	4.42 (0.54)	4.20 (0.62)	4.05 (0.84)	4.26 (0.62)	4.01 (0.61)	3.98 (0.92)
Level								
Undergraduate	4.50 (0.38)	4.62 (0.29)	4.51 (0.41)	4.27 (0.48)	4.54 (0.66)	4.56 (0.42)	4.33 (0.60)	4.42 (0.72)
Masters	4.32 (0.45)	4.43 (0.43)	4.34 (0.54)	4.14 (0.53)	4.44 (0.61)	4.47 (0.48)	4.24 (0.57)	4.30 (0.65)
Years teaching								
0–5 years	4.53 (0.35)	4.57 (0.38)	4.40 (0.51)	4.30 (0.40)	4.59 (0.53)	4.54 (0.38)	4.38 (0.45)	4.47 (0.56)
6–10 years	4.30 (0.53)	4.46 (0.44)	4.27 (0.61)	4.15 (0.55)	4.32 (0.53)	4.32 (0.39)	4.10 (0.62)	4.24 (0.53)
11–15 years	4.42 (0.44)	4.56 (0.40)	4.40 (0.46)	4.22 (0.52)	4.54 (0.76)	4.60 (0.40)	4.42 (0.55)	4.37 (0.84)
More than 15 years	4.35 (0.41)	4.45 (0.40)	4.42 (0.50)	4.14 (0.53)	4.47 (0.62)	4.50 (0.52)	4.25 (0.58)	4.33 (0.67)
Years teaching online								
0–5 years	4.33 (0.44)	4.39 (0.42)	4.34 (0.49)	4.12 (0.58)	4.37 (0.61)	4.39 (0.45)	4.15 (0.58)	4.20 (0.64)
6–10 years	4.32 (0.40)	4.47 (0.41)	4.38 (0.46)	4.19 (0.41)	4.56 (0.44)	4.59 (0.37)	4.36 (0.53)	4.50 (0.46)
11–15 years	4.43 (0.48)	4.56 (0.37)	4.53 (0.48)	4.23 (0.53)	4.73 (0.32)	4.73 (0.30)	4.50 (0.48)	4.56 (0.41)
More than 15 years	4.35 (0.45)	4.56 (0.30)	4.23 (0.71)	4.08 (0.54)	4.68 (0.42)	4.57 (0.33)	4.32 (0.63)	4.45 (0.45)

Demographic Factors and Faculty Perceptions of Attitude of Importance and Ability to Confidently Teach Online

Differences in faculty attitude and ability to teach online with respect to gender, rank, delivery method, level, years teaching, and years teaching online were examined using MANOVA. Statistically significant results of MANOVA (using Wilks' lambda) were followed by ANOVA. Results from ANOVA show significant differences in gender, years teaching online, and delivery method for faculty attitudes on importance of online teaching competencies. Results also showed significant differences in years teaching online and delivery method based on their perception of

ability for online teaching. No significant differences were found between other demographic factors.

Gender. Female faculty attitudes were significantly higher than male faculty attitudes about the importance of course design, course communication, and time management. A significant difference was found between female and male faculty's attitudes about the importance of course design, $F(1, 123) = 9.11$, $p = .003$, partial $\eta^2 = .07$ (moderate effect); course communication, $F(1, 123) = 17.09$, $p < .001$, partial $\eta^2 = .12$ (moderate effect); and time management, $F(1, 123) = 6.59$, $p = .011$, partial $\eta^2 = .05$ (small effect).

No significant difference was found between female and male faculty's attitude on the importance of technical competence and based on the perception of their ability.

Years teaching online. MANOVA showed no statistically significant associations between faculty's years of online teaching experience and a linear combination of all four subscales of attitude towards online teaching, Wilk's lambda = 0.03; $F(12, 594) = 0.47$, $p = .93$. However, MANOVA results suggested statistically significant associations between faculty's years of online teaching experience and a linear combination of the four subscales of their perception of ability to teach online, Wilk's lambda = 0.90; $F(12, 518) = 1.86$, $p = .04$. Specifically, the statistically significant differences were found in course design, $F(3, 199) = 6.01$, $p = .001$, partial $\eta^2 = .08$ (moderate effect); course communication, $F(3, 199) = 5.76$, $p = .001$, partial $\eta^2 = .08$ (moderate effect); and technology skill, $F(3, 199) = 3.93$, $p = .01$, partial $\eta^2 = .06$ (moderate effect).

Perception of ability in course design. Pairwise comparisons show that faculty with 0–5 years of online teaching experience ($M = 4.37$; $SD = 0.61$) have significantly lower perception of ability in course design than faculty with 6–10 years ($M = 4.56$; $SD = 0.44$), 11–15 years ($M = 4.73$; $SD = 0.32$), and more than 15 years ($M = 4.68$; $SD = 0.42$) online teaching experience.

Perception of ability in course communication. Pairwise comparisons show that faculty with 0–5 years of online teaching experience ($M = 4.39$; $SD = 0.45$) have significantly lower perception of ability in course communication than faculty with 6–10 years ($M = 4.59$; $SD = 0.37$), 11–15 years ($M = 4.73$; $SD = 0.30$), and more than 15 years ($M = 4.57$; $SD = 0.33$) online teaching experience.

Perception of ability in technical competence. Pairwise comparisons show that faculty with 0–5 years of online teaching experience ($M = 4.20$; $SD = 0.64$) have significantly lower perception of ability in technical competence than faculty with 6–10 years ($M = 4.50$; $SD = 0.46$) and 11–15 years ($M = 4.56$; $SD = 0.41$) online teaching experience.

Delivery method. Delivery method had a significant difference on faculty attitude on the importance of technical competence, $F(3, 123) = 3.79$, $p = .012$, partial $\eta^2 = .09$ (moderate effect). Pairwise comparisons show that faculty who teach asynchronous courses ($M = 4.07$; $SD = 0.45$) had a significantly lower perception of the importance of technical competence than faculty who teach hybrid courses ($M = 4.32$; $SD = 0.52$).

Delivery method had a significant difference on faculty perception of ability in course design, $F(3, 123) = 3.90$, $p = .011$, partial $\eta^2 = .09$ (moderate effect). Pairwise comparisons show that faculty who teach face-to-face courses ($M = 4.05$; $SD = 0.84$) have a significantly lower perception of ability in course design than faculty who teach asynchronous courses ($M = 4.67$; $SD = 0.40$) and hybrid courses ($M = 4.62$; $SD = 0.39$).

Discussion

Highest Rated Competencies

An important finding from the study is that the competencies that faculty perceive as most important in all competency areas differ from the top competencies that faculty believe they can perform. These are discussed in depth in the next sections.

Designing online learning activities and course orientations. Designing learning activities and creating online course orientation were competencies that faculty rated as very important in online course design. Researchers have recommended that online teaching should focus on engaging learners through activities that facilitate the learning process (Ally, 2004). Course design should focus on learning activities that provide students opportunities for interaction (e.g., discussion forums, wikis), as interaction becomes more important in online learning due to the distance between students and time they spend online (Beldarrain, 2006). In addition to learning activities, starting a course with an effective orientation provides students with a satisfying course experience. Well-designed and effective orientations prepare students to do well in the course (Ko & Rossen, 2001). Ali and Leeds (2009) discuss the value of orientation in online learning settings where the retention of students is lower than face-to-face courses.

Organizing online instructional materials and assessment. For their perception of their ability, faculty rated organizing instructional materials into modules and creating online assignments as the tasks that they can do well. Researchers have found that course design factors, such as organizing instructional materials into modules or units, are an essential aspect of success factors in distance education (Menchaca & Bekele, 2008). In addition to course organizing, faculty perceived their ability to be high with regard to creating online assignments. Faculty need to know whether students have achieved course outcomes expected for the online course, and assignments, quizzes, and tests are a way to measure this. According to Pollanen (2007), keeping students motivated is important, especially in online classes, and well-designed assignments can help with that.

Promptly responding and giving feedback online. Responding to student questions and providing feedback were competencies that faculty rated as very important in online course communication. Providing timely responses is critical in online learning (Eskey & Schulte, 2010; Sheridan & Kelly, 2010), as it facilitates the learning process. Miller (2012) recommended faculty timely response to questions as one of the helpful facilitation strategies and recommended responding to questions within 24 to 48 hours as a best practice. Sheridan and Kelly (2010) discuss the value students attribute to timely feedback on their questions and problems. The faculty teaching presence and timely feedback enable the students to clarify misunderstandings about content and make progress towards learning goals. Thus, instructor feedback is a vital part of online learning and facilitates the learning process and enhances student learning (Cuthrell & Lyon, 2007). Espasa and Meneses (2010) found a significant relationship between instructor feedback on students' assignments and their learning outcomes. Students who received feedback on their assignments had better performance than those who did not receive feedback.

Sending announcements and email communication. On their perception of ability, faculty rated using email to communicate with the learners and sending announcements/email reminders as the tasks they can do well. Communication in online classes takes place in different ways, and email and sending announcements through the learning management system are common ways that faculty communicate with their online students (Eskey & Schulte, 2010).

Regular announcements can be used to get students' attention, encourage them, remind them, and in general update students about the course. They also let students know that they are not alone in the learning process and that the faculty member is there to support them (Kelly, 2014). Ko and Rossen (2017) discuss that emails provide an opportunity to keep a record of the communication during the course. Cuthrell and Lyon (2007) also discuss email as a communication tool in online courses that enables faculty to reach out to all students.

Scheduling time for course design and grading. Scheduling time to design the course prior to delivery and spending weekly hours to grade assignments were competencies that faculty rated as very important in time management. Unlike face-to-face teaching, where faculty can design instructional material week by week, in an online course, the online faculty member is expected to have the course designed before the start of the semester. Hence, it is essential for faculty to realize the time that goes into designing the course and that they should have some time available before the course is offered. In addition, spending weekly hours to grade assignments was also rated as very important by faculty. An online faculty member spends more time grading, especially since all the discussions occur online. It is important that weekly hours are set aside for grading and that assignments be graded promptly so that students receive timely feedback.

For perception of ability, faculty rated spending weekly hours to grade assignments and scheduling weekly hours to facilitate the online course as tasks that they can do well. Faculty not only rated spending weekly hours to grade assignments as very important but also rated it as a task that they can do well. This stresses the importance of setting aside time to grade each week so that students receive feedback promptly. Evidently, our findings reveal that teaching online requires fixed allocation of scheduled time for course design and grading, as opposed to prior studies that suggest that online courses free up blocks of time and promote time shifting and flexibility for faculty (Wright, 2014). Cavanaugh (2005) reports that this happens as a result of high levels of interaction, involvement, and individualized instruction in online learning.

Managing the learning management system and documents. Online courses are delivered via a learning management system, and navigating the learning management system is an important competency. Our study showed that faculty rated navigating the learning management system and basic computer operations as two very important technical competencies. Faculty also rated these two competencies as ones in which they had high levels of ability. Faculty's knowledge about and use of technology tools (Gay, 2016) are very important in online teaching. Online faculty are expected to be proficient with basic computer operations, such as creating and editing documents and managing files and folders, since these make up a major portion of design and facilitation of an online course and are related to learning outcomes (Keramati, Afshari-Mofrad, & Kamrani, 2011). Our findings agree with Wright's (2014) research that showed that faculty had a positive association with their technical skills and high levels of self-efficacy.

Demographic Factors and Competencies

Female faculty place higher importance on online competencies. With women having a greater preference for using technology in instruction than men do (Peluchette & Rust, 2005), it is not surprising that there is a higher rate of female involvement in online teaching and course development (Seaman, 2009). Our sample similarly reflected that the majority of those teaching online are female (72%). Results show that female faculty perceptions were significantly higher than male faculty perceptions about the importance of course design, course communication, and

time management. The results of this study are similar to Briggs's (2005) survey, which found differences between genders in their perceptions of the importance of online teaching roles and competencies, and Chase (2002), who found differences in gender on instructional design practice, particularly on course design. Males and females tend to differ in communication styles, such that males see themselves as more precise, while females see themselves as more animated (Montgomery & Norton, 1981). The differences in male and female communication styles influence how faculty communicate online. Time management is also a greater concern for female faculty than males, especially among those who have families.

Novice online faculty perceive that they are not ready for online teaching. Faculty who teach online can range from novice to expert in their ability. The experience gained from years of teaching online impacts online course design and facilitation. Our findings show that faculty with little to no online teaching experience have lower perceptions of their ability in online teaching than those with more than five years' experience. Most faculty have no formal education training, relying primarily on their experience as a student and face-to-face instructor. With the continuous change with online technologies, readiness to teach online may be in a state of flux (Varvel, 2007). It is not surprising that faculty new to online teaching have lower perceptions of their ability to teach online. The findings of this study are in agreement with Carril, Sanmamed, and Sellés (2013), who found that faculty with more teaching experience online have greater perceived levels of proficiency to perform pedagogical competencies. This indicates the need for faculty with little online teaching experience (i.e., less than five years) to experience high-quality online instruction, perhaps by participating in a course as a student. This will provide a sense of what more experienced faculty are doing in their online classes, which may in turn increase their perceptions of and confidence in their ability to teach online.

Discussion

Faculty attitudes on the importance of online teaching competency and their perception of their ability play a major role in how faculty approach online teaching goals, tasks, and challenges. Studies of online teaching competencies are important, as they provide information about how online faculty might be trained and supported by professional development initiatives in higher education institutions. When online teaching professional development programs are designed, it is important to cover aspects of competencies in this FRTO instrument, such as course design, course communication, technical, and time management, and specific attention should be given to competencies that faculty rated low in terms of importance and their perception of their own ability. The results of this study have implications for (1) faculty who are teaching online or getting prepared to teach online, (2) instructional designers who assist faculty in their preparation to teach online, and (3) administrators who can provide support for the faculty to prepare for online teaching. It is important for the faculty to be prepared in all four areas of online teaching: course design, course communication, time management, and technical.

Limitations

There were some methodological limitations in this study. First, the response rate was low, as we only received 205 complete responses from a 2,763 sampling frame. Although the response rate (7%) was normal for online survey (Fan & Yan, 2010; Manfreda, Bosnjak, Berzelak, Haas, & Vehovar, 2006), the sample does not represent all of the target population who teach online. Cautions should be taken when generalizing the results from this study to all faculty. Second, we

had a majority of the responses from faculty in education. It would have been helpful to have responses from faculty from various disciplines. Third, all data were self-reported due to the nature of the study. Some faculty may not be familiar with all the competencies for online teaching, and there might be a response bias. Finally, this list of competencies is not exhaustive. Readers should interpret the results with caution due to these limitations because results may have limited generalizability in different settings and contexts. Future researchers should consider Saleh and Bista's (2017) suggestions to increase the response rate for online surveys: interests of participants, survey structure, communication methods, and assurance of privacy and confidentiality. Future researchers could examine additional competencies and categories not included in this study. Future research could also examine specific online teaching settings, such as community colleges and K–12.

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Using Social Media as a Platform for a Virtual Professional Learning Community

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Abstract
The Professional Learning Community (PLC) has been used in higher education to provide a platform for faculty members to discuss challenges and build professional skills. While the virtual PLC (VPLC) is becoming a more acceptable delivery mechanism for faculty professional development, successful practices for designing these learning environments have received little attention in the research literature. Social media has been found to provide an environment in which professional learning can occur. It can be a platform which transcends the perceptions and structure of traditional online faculty development courses. However, social media use for professional development has primarily focused on informal learning in unstructured formats. The purpose of this interpretive qualitative study was to provide insight into online faculty members' perceptions and experiences interacting in a VPLC, within a social media environment purposefully designed for networking and learning. Twenty-two doctoral-mentoring faculty members from an online university agreed to participate in a VPLC using a social media platform, facilitated by expert colleagues. Upon completion of the 10-week experience, data was collected using a self-reflective interview strategy. This study confirmed previous research into the benefits of the PLC for professional development in academia and of using social media for professional learning. It extended the research to describe the structured VPLC using a social media platform to engage faculty, build relationships, and foster shared learning.

Keywords: professional learning community, faculty development, remote faculty, social media

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Using Social Media as a Platform for a Virtual Professional Learning Community

Institutions of higher education recognize the relationship between instructional quality and student success (Kane, Shaw, Pany, Salley, & Snider, 2016; Thurlings, & den Brok, 2017). In order to ensure the effectiveness of faculty, organizations view professional development as a critical component of support offered to faculty (Herman, 2012; Pesce, 2015; Saroyan & Trigwell,

2015). Faculty developers often work to offer learning opportunities for faculty through a number of delivery mechanisms including long- and short-term workshops, courses, and seminars. These offerings can include content on a variety of topics to support both individual and institutional goals (Steinert, 2010). However, these types of offerings situate learning in a primarily passive, instructor-centered environment (Dron & Anderson, 2014; Homes & Prieto-Rodriquz, 2018), with little opportunity for interaction or engagement by participants (Krutka, Carpenter, & Trust, 2017; McConnell, Parker, Eberhardt, Koehler, & Lundeberg, 2012; Urquhart et al., 2013).

Contemporary professional development teams need to consider how to best provide opportunities that align with a social constructivist paradigm in which learning is accomplished through the construction of knowledge blended with dialogue, relationships, and self-directed learning (Cartner & Hallas, 2017; Saroyan & Trigwell, 2015). Faculty developers are also challenged with meeting the needs of adult learners by creating trusting learning environments that allow for engagement and interaction. Providing opportunities for the building of skills and confidence through the sharing of effective practices can create a system in which the learning and content are individualized and evolve based on participant needs (Dron & Anderson, 2014; Krutka, Carptenter & Trust, 2017; McConnell, et al., 2012). Professional development in this context allows faculty members to share the unique expertise they bring to the learning environment, to learn from each other (Cox, 2012; Trust, Carpenter, & Krutka, 2017), and to better understand the relationship between new learning and enhanced teaching methods (Zhang & Wong, 2018).

These desired outcomes do not organically happen in a structured course that situates the participant within prescribed parameters of when and how to engage with peers (Dron & Anderson, 2014). Faculty development that supports participants as producers of knowledge based on their own experience rather than passive consumers has become more attractive in recent higher education trends (Sullivan, Neu, & Yang, 2018). The PLC has been identified as a means to meet these needs and to provide a platform for faculty members to discuss challenges and build professional skills (Wegner, McDermott, & Snyder, 2002) that result in the improvement of student learning (Cândida Müller & Lucchesi de Carvalho, 2014; Valle & Fuchs, 2015). While the PLC is emphasized as a platform for learning (Dufour, 2004), because interactions and engagement are an important part of the PLC experience (Wegner, McDermott, & Snyder, 2002), discourse within the PLC can also facilitate networking and relationship building (Krutka, Carpenter, & Trust, 2017; Van Waes, De Maeyer, Moolanaar, Van Petegem, & Van Den Bossche, 2018). Through discussion and discourse, these relationships can result in a heightened sharing of effective techniques and instructional strategies in a collegial environment (McAllister, Oprescu, & Jones, 2014; Valle & Fuchs, 2015). According to Thurlings and den Brok (2017), these benefits move the participant beyond the personal, classroom, student and institutional context to create a synergetic effect with the goal of increased faculty effectiveness.

The Virtual PLC

In recent years, the virtual PLC (VPLC) has become an option for faculty who are dispersed or cannot meet face-to-face for other reasons (Brooks, 2010; Lewis & Ewing, 2016; McAllister et al., 2012; Valle & Fuchs, 2015). Atkins, Koroluk, and Stranach (2017) posit that a PLC is a "multifaceted network" drawing on a combination of salient components that transcend resources, geography, and individuals (p. 4). Ford, Branch, and Moore's (2008) description of the VPLC further clarifies this definition by stating that it uses Internet technology to facilitate engagement and interaction among faculty for the purposes of relationship building and learning. Because the

learning is experienced digitally, the VPLC has the potential to mitigate biases and limitations that may exist in face-to-face or synchronous settings (Trust, Carpenter, & Krutka, 2017).

VPLCs draw on a variety of technology tools to provide social and dispersed learning opportunities, as described by Atkins, Koroluk, and Stranach (2017). For example, many VPLC delivery models use online blogs or discussion board features supported by email and document sharing to facilitate conversation among colleagues using an asynchronous design (for example, Bedford & Rossow, 2017). As an alternative, synchronous VPLCs can also be designed using videoconferencing software, such as Skype or Google Hangouts. In addition, these platforms can be combined for a blended format, offering flexible delivery of content and conversation (Hodes & Cady, 2013; Matzat, 2013).

Outcomes as a result of participation in the VPLC are similar to those resulting from traditional PLC delivery methods and include changes in cognition, knowledge, and beliefs (Blitz, 2013; Mintzes et al., 2013). Other benefits include the discovery of innovative ideas, currency in research and data, an expanded repertoire of instructional strategies, and updated discipline-specific knowledge (Atkins, Koroluk, & Stronach, 2017). In turn, these shifts in understanding and perspective can result in changes in professional behavior manifested in the classroom as innovative pedagogical techniques (Valle & Fuchs, 2015).

Professional Development Using Social Media

Nearly two thirds of adults in the United States regularly engage with some type of social media (Smith & Anderson, 2018). Following this trend, faculty developers have begun to focus on how these environments can be used for professional learning. Most recent literature indicates that social media has primarily been used by institutions of higher education for recruitment and marketing (Atkins, Koroluk, & Stranach, 2017; Peruta & Shields, 2017). In limited instances, the platforms have been capitalized upon to engage faculty and other stakeholders in informal learning with mixed results. For example, Sari-Motlah, Ebrahimi, Nikfallah, and Hajebrahimi (2016) found social media to be an effective means to share resources and communicate informally with remote colleagues. Similarly, Moorley and Chinn (2014) and Yee (2015) suggested ways platforms such as Twitter, YouTube, and Facebook could be used for just-in-time learning and for one-way communication with faculty. Conversely, Veletsianos (2017) found that the use of hashtags to promote professional learning resulted in unequal participation and outcomes.

Little attention has been given to the structure of the social media environment or commitment to participation within these informal settings. Without structure, learning within the social media environment can be manipulated by the dominant voices, the needs of the institution, and the technology being used (Robson, 2016; Veletsianos, 2017). In these cases, the interaction and engagement by certain community members can be inhibited and can subsequently impact learning outcomes (Thurlings & den Brok, 2017). However, the negative impacts of these forces may be minimized through design that considers the individual user. For example, according to Constantinides (2012), an emphasis on individual user characteristics can be used to shape interaction and guide the narrative of the community.

Social media as a platform for professional learning can also be used as a mechanism to mitigate challenges with other delivery methods, such as formal courses delivered via a learning management system (LMS). For example, a formal course is often associated with a passive learning role for the participant, as when and how to engage with peers is usually structured and prescribed. In addition, content is often predetermined with parameters around context (Dron &

Anderson, 2014). In contrast, a social media platform may provide for an environment that overcomes preconceived perceptions about learner role (Krutka, Carpenter, & Trust, 2017). Advantages of a social media platform for professional learning include that it supports learners in being producers of information rather than passive consumers, promotes the learning through the understanding of others' experiences, and embraces a desire to continue learning with a social community of peers (Sullivan, Neu, & Yang, 2018).

Building features into the social media environment that capitalize on the diverse engagement preferences and communication styles of the participants is one example of how the individual can be nurtured within the social media learning environment (Constantinides, 2012). Recent contributions to the literature offer other suggestions to address situational and design features that may inhibit participation. Kind and Evans (2015) recommend embedding features into the social media site that include opportunities for participants to respond, question, and contribute as well as be easily updated to provide interactive, time-sensitive information. Participants in social media for learning report enhanced self-improvement through purposeful design, such as building a platform embedded into the user's regular work routine (Donelan, 2016). Participants also appreciate being able to draw on shared beliefs and find this can create a sense of community. These shared beliefs, according to Belange, Bluvshtein, and Haugen (2015), can include an understanding of the importance of connectedness in all aspects of life, including learning that cannot easily be supported in other modes.

Methods

While the VPLC is becoming a more acceptable delivery mechanism for faculty professional development (Brooks, 2010; Lewis & Ewing, 2016: McAllister, Oprescu, & Jones, 2014; Trust, Carpenter, & Krutka, 2017), successful practices for designing these learning environments have received little attention in the research literature (Meyer & Murrell, 2014; Meyer, 2018). While it is clear that interaction and engagement are necessary for successful learning outcomes (Cartner & Hallas, 2017; Sullivan, Neu, & Yang, 2017; Thurlings & den Brok, 2017), it is not clear what design features best support it. Social media has been found to provide learning opportunities and may also prove to be a supportive learning environment for a VPLC (Moorley & Chinn, 2014; Sari-Motlah et al., 2016; Yee, 2015). While Trust, Carpenter, and Krutka (2017) suggest that social media platforms can serve as the center of interaction and an "affinity" space for learning (p. 2), little guidance has been provided in how to design the environment to meet learning and networking goals.

The purpose of this study was to provide insight into online faculty members' perceptions and experiences interacting in a VPLC, within a purposefully designed social media environment for the purposes of networking and learning. While other platforms, such as an online classroom, were considered to host a VPLC, it was disregarded because of its association with passive, formal learning that rarely fosters interaction, collaboration, and networking (Dron & Anderson, 2014). Given that the spirit of this study was to consider contemporary professional development learning strategies in which learning is conceived as a social endeavor (Atkins, Koroluk, & Stanach, 2017), and given the popularity of the medium (Smith & Anderson, 2018), a social media platform was considered the most suitable fit.

An interpretive or generic qualitative approach, as described by Thorne (2016), was used to examine the following research question: What are online faculty members' perceptions and

experiences interacting in a VPLC, within a purposefully designed social media environment for the purposes of learning and networking? An interpretive qualitative approach was identified as being most appropriate to explore this question, as the individual experiences were shaped within the context of a virtual environment, creating a situation in which data were evaluated through individual insight rather than the testing of a hypothesis (Caelli, Ray, & Mill, 2003).

The institution in which this study was conducted is a for-profit entity serving bachelor-, master-, and doctoral-level students. The faculty body consists of approximately 2,500 individuals with 90% being part-time. Faculty development is provided by a centralized department primarily through passive strategies, such as webinars, self-paced modules, and face-to-face lectures. A few opportunities for engagement through a VPLC have been offered through a variety of programs, but no institution-wide program existed. Therefore, the extent of the understanding and prior knowledge of the faculty and staff who participated in the VPLC was unknown.

The environment in which the participants interacted can be described as a social media platform, unfamiliar to participants, designed for collaboration and networking. The decision to use a lesser known product was to avoid value judgments associated with more commonly used social media platforms based on the prior experiences of participants. With similarities to Facebook, the platform's main feature was a center column "feed" that managed discussions, updates, and announcements. Other features of the social media platform used in this study included

- tools for virtual meetings with audio and video components,
- a shared calendar,
- a polling and survey feature,
- email and text capabilities, and
- a document-sharing file manager.

Drawing on Pesce's (2015) and Coswatte Mohr and Shelton's (2017) recommendations, the VPLC was purposefully designed to balance the faculty involvement in the learning process with an institutional presence to underscore its support. The VPLC was further designed to recognize the faculty members' multiple roles as instructor, researcher, and scholar by providing for five staff members who were recruited to serve as expert leaders. Each expert leader was asked to provide information and facilitate dialogue in a specified area of doctoral mentoring expertise over a two-week period. However, as suggested by Yee (2015), the expert leaders situated themselves as a colleague to avoid the implication that faculty members were novices. Topics were identified based on institutional need and included writing, library research, methodology, institutional review board issues, and effective communication with students.

The environment was designed so that the expert leader created a post, replied to a comment, shared a resource, or provided other evidence that they had been in the virtual environment each day. This allowed the participants to feel the presence of at least one other participant at any given time. A synchronous design feature was also incorporated, which provided opportunities for participants to interact through the virtual meeting space around content designed by the expert leader or participant contributions. After the two weeks designated to be focused on a topic concluded, another expert leader would commence facilitation on a different topic.

My role as the researcher within this study was that of both an insider and outsider, as described by Hellawell (2006). As a faculty development professional, I had insider knowledge about the issues, challenges, and resources available to the participants. As an outsider, I was not

employed in the same department or reporting authority as the participants. However, because of my leadership role with the institution, care was taken to maximize the outsider role by assigning other support individuals, faculty, and staff to interact with participants in the VPLC. This situated me as a nonparticipant, and I was not a visible player in the community. Furthermore, I engaged in purposeful reflexivity through self-reflection and critique (Dowling, 2006) to minimize the influence of my own experiences on the research process.

Upon institutional approval, email invitations were sent to a cohort of faculty from one program serving professional doctoral candidates. Purposive sampling, as described by Welman and Kruger (1999) was identified as the most appropriate strategy for this research undertaking. Consideration for the purpose of the research as well as researcher judgement guided the selection of the sample (Babbie, 1995; Schwandt, 1997). Ultimately, selection was based on the faculty member's role in in the online university as well as their willingness to participate in VPLC using a social media platform. In addition, all participants agreed to participate in a self-reflective interview with me at the end of the 10-week experience. Twenty-two doctoral mentoring faculty members agreed to participate in the VPLC as well as engage in follow up interviews. Upon completion of the 10-week experience, data was collected using an interview strategy to afford participants an opportunity for self-reflection and for the researchers to collect data that went beyond the surface of the phenomena (Kvale, 1996). The interview structure was based on recommendations by Jacob (2012) and included provisions for consent, recording, and focused interchange using a protocol (see Appendix A).

The interview protocol was developed based on the initial review of the literature as well as themes and issues that emerged during the project execution. Interview questions served to stimulate a conversation between the interviewer and the participant and were framed to elicit as much detail as possible (Carlson & McCaslin, 2003). Given that the participants were dispersed faculty for an online university, telephone interviews were conducted. Interviews were recorded and transcribed by a commercial conference call vendor. Of the 19 participants who were actively engaged at the conclusion of the project, 17 agreed to complete the interview. One interview transcript was unable to be retrieved; thus, 16 participant interview transcripts were available for analysis. Interviews lasted between 60 and 70 minutes.

Data analysis consisted of a cyclical technique, drawing on repetition and recurring processes. I embedded elements such as searching, comparing, verifying, confirming, and evaluating to further support the analysis (Shin, Kim, & Chung, 2009). To begin the process, initial coding was conducted through inductive analysis of the raw data (Patton, 2002). Once the initial coding was complete, I categorized the individual comments and concepts into units as described by Garrison, Cleveland-Innes, Koole, and Kappelan (2006). During this process, I was purposeful in my attempts to avoid collapsing codes into themes that demonstrated didactic perspectives. Rather, I allowed for purposeful consideration of divergent cases that, in the end, provided greater insight into the phenomena (Antin, Constantine, & Hunt, 2015).

Results

The research question examined in this study sought to provide insight into online faculty members' perceptions and experiences interacting in a VPLC, within a purposefully designed social media environment for the purposes of networking and learning. Analysis of the data resulted in the identification of four themes: *technology*, *contributions*, *relationships*, and *design*.

Technology

The first theme, *technology*, dealt with how the participants described their use of the social medial platform as well as how it enhanced or created challenges in their ability to form relationships and learn from their peers. Initially, the researcher and the participants experienced technological challenges with the social media environment that included participants not being able to log on, features not working as described, and confusion regarding navigation. Once these initial challenges were resolved, participants reported an ease of use that aided in their ability to participate. Specifically, they appreciated that the tools that they used (which was primarily the discussion feed) were prominent on the page and organized in a logical manner. In addition, as described by Sack-Min (2017), the participants cited the ability to personalize their page as helpful in the building of relationships. The participants felt that the inclusion of photos and other personal information enhanced their feelings of connection and cultivated bonding. One participant summarized this sentiment by saying,

> Another little piece with that, it actually gave me a picture, so it wasn't just this generic typing, texting, keyboarding- whatever you want to call it, it was actually a face that I could relate to so that hopefully down the line … I could recognize them should I ever be in a meeting and see them.

An initial challenge identified by participants was to remember to log on to the platform and participate, as the social media system was separate from those associated with day-to-day job responsibilities. While inconsistent with Donelan's (2016) recommendation, the lure of the interaction with peers and the email reminders appeared to be enough to ensure participation. One participant shared the following: "I looked forward to logging in and seeing what everyone was saying. I went to the social network, and although it wouldn't bring it up initially, if I hit it twice or three times it did." Another stated, "We got the message from [the researcher] and I logged on, put it on a favorite and that way I could just click on it and just go right in."

Contributions

Contributions was the second emergent theme within the data. The most significant of the data related to this theme revealed that participants felt that their learnings far exceeded their contributions. As one participant commented, "I don't think that I brought a lot to this particular table in terms of things that were going on. … But, I … certainly have gotten a lot of material and information." Another commented, "It wasn't as much as what I brought to the table … as what I gained from the table."

Specifically, participants indicated that they developed mentoring skills and increased confidence through affirmation of their feelings and experiences within the online classroom. One participant stated, "It reaffirms your confidence level in yourself and it makes you feel good that other people are experiencing the same frustrations you are." Another added,

> It's a problem, but I found out it was everyone's problem, which kind of made me feel better, because we pushed the candidates to do it, to do it, to do it, and after a while you start thinking, maybe it's me.

While the participants learned from their peers, the resources provided by leaders appeared to be a primary source of learning. One participant exemplified this sentiment by saying, "There are just so many resources and websites that, as a faculty member, you can't know everything. In

this setting, where we can all find out about these things and bring up issues, problems, concerns, it's advantageous to everyone."

Participants also cited improved mentoring skills and the ability to better support students as an outcome of their learning. This was reflected in a variety of ways. For example, one participant noted,

> Teaching classes and learning online is a challenge for everybody, but I'm open to that and open to ways of interacting with all students, regardless of what they bring to the learning environment. The discussions here gave me so many new things to think about and try.

Another participant gave specific examples of new skills learned, stating, "From a student perspective, I'm learning about phrasing, being accurate, listening." Another shared, "As a new mentor, I had no idea how to help a student proceed to the IRB. [The expert leader] gave me exactly what I needed." A third reported that

> I mentor them through the doctoral study and so her resources that she offered us, the Capstone, all of those that deal with APA and the templates for the doctoral study, and all the writing resources were definitely applicable to me and my needs.

Relationships

Not surprisingly, *relationships*, a key result of community building (McAllister, Oprescu, & Jones, 2014) prominently emerged. Relationship building among participants was described as resulting from increased confidence, confirmation of experiences, networking, and feelings of safety. Participants reported feelings of camaraderie with their colleagues in their efforts to identify best practices related to mentoring their students. Participants described this as manifesting in the form of encouragement, sharing of diverse perspectives, and an interest in continuing the community after the end of the project period. In addition to forming new relationships with their peers, several participants described building relationships with the expert leaders, expressing that they would likely reach out to these individuals later if the need arises. One participant commented,

> I felt very comfortable asking or responding to my peers and in doing so they responded positively back to me. Even when we may not have agreed on a particular subject, it was a give and take, you know, like a comradery.

This, however, was not true of all participants. While participants felt like part of a community, relationships did not necessarily always form, as articulated by one participant:

> I think what it did was that now I recognize some more names. I see them again. For example, there was one woman who I was a second committee member with her so now oh I know who that is and other names that I now see. It's really just if in other circumstances these names came up, I could say oh I remember chatting with that person in the study. … In terms of getting to know them better or being more connected I don't think it did that. But, I also don't think maybe it was designed to do that. From my side it didn't do that. I don't have any new BFFs or whatever, but I don't think it was that kind of a [community].

Design

Design as a theme was an important outcome of the research, as many of the aspects of the VPLC were designed to ensure structure and broad participant engagement. This was important to the project, as current research has been limited to the examination of informal environments (e.g.,

Brock et al., 2014; Donelan, 2016; Robson, 2016; Sari-Motlah et al., 2016). The 10-week time frame for participation in the VPLC was incorporated to allow for a time-limited approach during which participants could reflect on and work toward their goals. Similarly, the use of the expert leaders to facilitate discussion was to ensure continued opportunities for interaction within the environment regardless of individual participant engagement, as described by Lorenzo-Romero, Alacrcon-del-Amo, and Constantinides (2012). Finally, discussion topics were designed with both the needs of the university and the faculty responsibilities of the participants in mind (Coswatte Mohr & Shelton, 2017).

Ultimately, these three design features proved to be a valuable part of the experience for the participants. In general, the structured nature of the community allowed participants to be self-directed in their learning but still be part of the group. For example, one participant described her involvement in this way:

> I was glad for the division of the ten weeks by topic. There were some topics that I was just more interested in than others. That gave me the opportunity to contribute and participate as much as I felt I needed to…. I didn't have to worry about "doing my part" as I knew the … [leader] was there to communicate with the others.

Another participant responded, "Because the … [leader] was there, we were always on task and we didn't go off task, but yet there was a lot of extracurricular discussions that just enhanced the entire experience."

Other participants felt more available to participate, as they knew their commitment would only last 10 weeks. One commented, "Ten weeks was a good amount of time for me to get the information I needed to improve my mentoring. … After that, I felt I would have the opportunity to move on without further expectations to engage in this way."

Discussion

While coded and categorized separately, as the themes emerged, it became clear that all four were intertwined, as comments from participants transcended individual ideas. As the analysis progressed into interpretation, my ability to separate issues of technology from those of relationships or contribution became increasingly difficult. For example, the participants described their experiences of building community as related to their learning, but also dependent upon their experiences with the technology and their satisfaction with the design. In essence, the data revealed that these phenomena worked in harmony to create a positive experience for the participants that resulted in a sense of both learning and networking.

This study was limited in scope because of the small number of faculty participants from a single program of study at an online, for-profit institution. The similarity in professional experiences may have impacted the perceptions of participants as well as influenced how they interacted. Another limitation was that the participants were volunteers for the professional development activity. According to Chen, Lowenthal, Bauer, Heaps, and Nielsen (2017), participants view professional development with higher satisfaction when it is not required. Finally, while efforts were made to situate the expert leaders and researcher as colleagues, participants may have felt compelled to overstate their satisfaction to appease organizational expectations.

Despite these limitations, this study confirmed previous research into the benefits of the PLC for professional development in academia (Krutka, Carpenter, & Trust, 2017; Mintzes, Marcu, Messerchmidt-Yates, & Mark, 2013; Valle & Fuchs, 2015) and of using social media for professional learning (Dron & Anderson, 2014; Moorley & Chinn, 2014; Sari-Motlah et al., 2016; Yee, 2015). It extended the research to describe the structured, VPLC using a social media platform as a potentially effective way to engage faculty, build relationships, and foster shared learning. Finally, this study also expanded the understanding of using a VPLC for learning and networking through insight into design features that provided for a time-limited, facilitated approach that focused on narrow topics of mutual interest to participants.

As described by Wegner, McDermott, and Snyder (2002), interaction and engagement among participants emerged as an important aspect of the community. This interaction and engagement led to the development of relationships that transcended participant roles (Coswatte Mohr, & Shelton, 2017; Dron & Anderson, 2014; McAllister, Oprescu, & Jones, 2014). Relationships among participants were supported by trusting, collegial conversations, which allowed for the building of skills and practices through the sharing of instructional strategies (McConnell et al., 2012; Sullivan, Neu, & Yang, 2018). Subsequent reported actions on the part of individual participants included the incorporation of those strategies into the classroom experience for students.

The use of a social media platform helped form the learning community among this group of remote faculty. Fostering a sense of community among a small number of faculty had demonstrable effects, as faculty had an opportunity to establish relationships with their peers and better understand what they "bring to the table" in terms of mentoring skills and abilities, as described by Charnigo and Barnett-Ellis (2007), Dron and Anderson (2014), and Murphy and Simonds (2007). In addition, purposeful, flexible opportunities to engage in learning within the social media environment led to similar outcomes as in traditional PLCs (Blitz, 2013; Mintzes et al., 2013; Sack-Min, 2017). These outcomes include skills needed to be successful in an academic environment, such as building a sense of confidence, being able to collaborate, demonstrating accountability, and increasing proficiency with technology (Brock et al., 2014; Cândida Müller & Lucchesi de Carvalho, 2014; Valle & Fuchs, 2015).

Conclusion

Professional development in higher education continues to be viewed as an important component of faculty support (Kane et al., 2016; Thurlings & den Brok, 2017). Faculty developers work to create opportunities for faculty to engage in learning situated in a social constructivist paradigm (Cartner & Hallas, 2017) with the goal of supporting participants as producers of knowledge based on their own experience and that of their peers (Sullivan, Neu, & Yang, 2018). The PLC and the VPLC for dispersed faculty have been found useful to address contemporary faculty learning needs (Cândida Müller & Lucchesi de Carvalho, 2014; Sullivan, Neu, & Yang, 2018; Valle & Fuchs, 2015; Wegner, McDermott, & Snyder, 2002).

Social media can be a tool to support the environment in which a VPLC exists. In this case, the use of the structured social media platform proved to be a supportive learning environment for a VPLC in that it resulted in the development of professional networks as well as interpersonal skills, such as collaboration and self-improvement (Brock et al., 2014; Donelan, 2016). The features of the social media platform, particularly the discussion feed and the ability to personalize

the environment, as described by Sack-Min (2017), created an atmosphere that encouraged contributions from all participants. However, data analysis did not provide clear insight into nuances of relationship building, such as whether the participants held shared beliefs relating to the importance of connectedness, as described by Belange, Bluvshtein, and Haugen (2015). Further research into the value and significance of establishing connections within the PLC as it relates to academic learning could provide insight into this phenomenon.

This study was conducted under the premise that the use of media itself does not facilitate learning (Cartner & Hallas, 2017). Rather, the social media platform served as a way to cultivate learning through the understanding of others' experiences within a social community of peers (Sullivan, Neu, & Yang, 2018). It also incorporated institutional strategies that support professional development activities for online faculty, including clarification of institutional expectations and staff support (Coswatte Mohr & Shelton 2017). Findings filled an important gap in the literature described by Meyer (2018) in that they provided design specifications for a VPLC that can be replicated in other settings. These design considerations include provisions for facilitation, a time-limited commitment, and focused content. However, it is only a single example of how a social media environment can be designed as an effective tool to facilitate the PLC in academia. Further qualitative research within other disciplines and for other purposes is needed to provide insight into its potential effectiveness with populations from differing educational levels and diverse disciplines. In addition, quantitative research may provide insight into the relationships between outcomes, such as learning transfer, sense of community, and engagement.

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Appendix A
Interview Protocol

1. What influenced your decision to join this group?
2. What did you hope to gain from your participation in this community?
3. What do you feel you "brought to the table" in terms of sharing skills and resources with the group?
4. In what ways do you feel your participation in the community affect mentoring students at this University?
5. In what ways did the technology make a difference in your ability to participate in the community?
6. How did the learning community structure influence your participation?
7. What features of the learning community did you find most useful and/or that you used the most?
8. What was your experience with the social media interfaces in building community with your peers?
9. Describe how your relationships with the individuals in the community evolved over the project period?
10. What do you anticipate your relationships to be with your peers after the community closes?

What Is an ID? A Survey Study

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Abstract
Instructional design positions in higher education require greater depth and breadth of knowledge, skill, and general competencies than the qualifications found in typical job descriptions and published industry competency sets (e.g., ibstpi). The eDesign Collaborative Research Team, a part of the University Professional Continuing Education Association (UPCEA), wished to explore the discrepancies that exist between commonly identified competencies and those deemed necessary by instructional designers (IDs) actively working in higher education, as results could be informative for administrators, managers, and designers alike as the design field expands.
The major competencies found in the literature and coded by the researchers after collecting survey responses included collaboration, communication, theoretical knowledge, problem-solving, course design and development, management (i.e., project management), research and analysis, technological expertise, ongoing learning, leadership, relationship management, evaluation, marketing, ethical and legal considerations of design, faculty development, and editing/proofreading. The participants rated these competencies and explored the relationship of the highly rated competencies with the actual work performed by the participants. Likewise, the study sought to explore the participants' career plans, goals, and access to professional development.
The results showed that a majority (56%) described the ID role as a mix of both faculty and content development. When asked what they would rather be doing with their time, an even mix between working more with faculty and working more on content development was observed. Many individuals also mentioned an interest in working more with technology and innovative projects. Collaboration with subject matter experts (SMEs), content experts, faculty, and instructors was by far the most valuable competency, both in importance and time spent. Research and marketing seemed to be least important and garnered the least amount of employee time.

Keywords: instructional design, competencies, career, higher education

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What Is an ID? A Survey Study

In March 2017, the University Professional and Continuing Education Association (UPCEA) published a white paper entitled "Instructional Design and Technology Teams: Work Experiences and Professional Development." Several opportunities for further exploration were identified after the UPCEA community engaged with the white paper. This included the observation that the role of an instructional designer (ID) seems to vary greatly between institutions and workspaces.

As a result, in June 2017, UPCEA's eDesign Collaborative research group designed and delivered a survey focused on the "Roles and Competencies of Current Instructional Designers" to answer the question, "What is an Instructional Designer?" This survey was conducted, in part, to examine differences between identified competencies and the regular work performed by IDs. A key element of this study was the development of a list of commonly referenced competencies that one could aggregate into a baseline definition of an ID. This fulfilled a critical need in the field, as the title *instructional designer* often includes a variety of subroles and duties under one commonly used position title. The roles of IDs are as varied as the institutions that employ them. An ID is typically thought of as a course builder who provides faculty and technology support along with other responsibilities. This study presents a comprehensive view of the regular duties and tasks of IDs working at UPCEA member institutions, which is presumed to be a representative sample of four-year institutions in the United States and Canada.

Employers and IDs alike will be interested to know about the work performed by IDs on a regular basis, as this information will influence future job descriptions, design team composition, and the expectations of design professionals seeking employment. The survey results inform all of these things, and can assist hiring managers in determining job-function questions, such as "What should an ID job description list?" and "What is an appropriate salary for an ID?" in addition to in-house explorations of what IDs are being asked to do and why.

Background and Context

Instructional design, as a field, found its roots in the midst of World War II (Reiser, 2012). Psychologists and educators, such as Robert Gagne, were recruited by the military to utilize educational and psychological research to develop training materials based upon the known principles of instruction. Assessment and evaluation, informed by psychological perspectives, were also used to identify skills and to improve training of military personnel (Reiser, 2012). After the war, the psychologists and educators continued the work of instructional problems. The development of instructional design models and theories continued over the next several decades, informing computer-based instruction and job performance. These models and theories have been useful in many different educational contexts, from human performance to K–12 to higher education.

In the early part of the 21st century, instructional design as a field boomed with increased access to the Internet and the influx of online instruction (Reiser, 2012). A recent study on instructional design in higher education found that 13,000 IDs are working in the United States alone (Instructional Design in Higher Education, 2016). As the field has grown, so have the needs of employers and the demand for employees. However, the contexts and needs of a Fortune 500 company, a K–12 school district, and a higher education institution vary greatly, as do the skill sets of employees in these contexts (Sugar, Hoard, Brown, & Daniels, 2012). Likewise, within

these different contexts, competencies are often based on organizational culture (Larson & Lockee, 2009).

The research team members found this to be true when comparing the three different institutions where we work. Our respective views on the roles and competencies of an ID varied dependent upon our institutional cultures. The following descriptions of the four individual authors provide a view of how varied the positions can be across institutions that serve similar demographics (i.e., higher education for undergraduate, graduate, and professional studies).

One author is an instructional designer in a school that is decentralized from the private research university as a whole. While university-wide decisions are made on a large scale (i.e., choice of learning management system is a university-wide decision), the school has autonomy to make decisions for its programs and implement changes as it sees fit. The instructional design team supports specific faculty to create online courses, either from scratch or to convert a face-to-face course to an online course. IDs work with individual faculty in a cohort-based schedule from the planning stages to when a course is launched, typically over nine months. The skills IDs need in this setting include collaboration, consultation, technology expertise, project management, problem-solving, and editing/proofreading to name a few. The faculty-to-ID relationship is an integral part of the job, and relationship building is a top priority.

Two other authors at a public doctoral university have the roles of director and support manager. The support manager's responsibilities vary from running the learning management system help desk, counseling faculty on the principles of effective course design, and testing new technologies. There are no full-time employees dedicated solely to instructional design—just two employees with ID backgrounds. Faculty are not required to work with either of them even if they have no previous experience teaching online. The top priority, in this case, is to teach faculty how to be their own builders of quality online content.

Finally, the author team includes a lead designer at a public land-grant institution. The instructional design team is largely centralized, with the primary focus of increasing online opportunities and access for learners in both for-credit and noncredit environments. The development process is typically a 16-week schedule wherein each designer is their own project manager and works directly with the course representative (often, but not always, the teaching faculty). This particular design team has grown exponentially in the past two years, even pulling in individual designers from other schools and departments within the university to create an innovative learning group which collaborates with face-to-face instructional support groups to drive strategic growth and change. Due to this growth, administrative goals have shifted, which may require the doubling of each designer's workload going forward.

After discussing the differences of each institution's instructional design model, and even the variety among schools and colleges within the institutions, we determined that a study on the major competencies used across many institutions would not only be an interesting research project, but also the results could be informative for administrators, managers, and designers alike as the design field expands. A review of the literature on the competencies of IDs was the first step in the project.

Review of Literature

We completed a literature review on instructional design competencies by searching several databases using a Boolean search. Search terms included *instructional design*, *instructional designers*, *roles*, *competencies*, *skills*, *knowledge*, and *higher education*. After an initial literature sweep, we found and reviewed over 25 peer-reviewed journal articles. Seven of the articles were eliminated because they did not focus on the topic of ID competencies and were found to be outside of the scope of this research project. Additionally, any references to Association of Talent Development (ATD) Talent Development Area of Expertise of Instructional Design, were eliminated as their work (as exemplified by their mission "Empower Professionals to Develop Talent in the Workplace") lies outside of the higher educational lens of this study (ATD Competency Model, 2014).

After the initial sweep and review, we then focused on creating a list of competencies in the literature. The competencies we found then guided the survey design. We further refined the competencies based on coding and findings in the survey responses (see Table 1). The top-cited competency found in the literature was *collaboration* followed closely by *communication* and *theoretical knowledge*, *course design*, and *problem-solving*. The following review first establishes a definition for instructional design and then discusses the most frequently cited competencies found in the literature as well as other less frequently cited competencies.

Definition of Instructional Design

As expected, the literature offered a variety of definitions for instructional design, and those who carry it out in their job roles. Some of the key definitions used in this study originate from Sims and Koszella (2008) who define instructional design as a "purposeful activity that results in a combination of strategies, activities, and resources to facilitate learning" and an ID as "a person with the competencies to design instruction" (p. 570). Absent in both definitions is an actual list of instructional design competencies. We utilized these definitions as a framework to cull the literature found on instructional design and IDs to construct a list of the competencies necessary to design instruction.

Collaboration

The most frequently cited competency for instructional design and designers in the literature is collaboration. Collaboration is a complex skill that requires IDs to carefully interact with a variety of stakeholders to accomplish a shared goal. This competency may occur with subject-matter experts (SMEs), content experts, faculty, or instructors, all of whom we refer to as SMEs in this paper.

IDs must consider multiple factors when working with SMEs, such as academic freedom for faculty in higher education institutions, consensus building among multiple stakeholders, and difficult decision-making based on resources and time (Brigance, 2011; Gray et al., 2015; Kelly, 2016). Solomonson (2008) suggests that IDs act as consultants, navigating and developing relationships with SMEs. Relationship building occurs, in part, through effective communication.

While the collaborative nature of the ID role is cited frequently in the literature, the tension between designer and faculty is also described. In a recent survey of faculty attitudes, under half of respondents who teach online have worked with an ID. These faculty did not believe that IDs could help them, and some did not have an interest in working with an ID (Jashick & Lederman, 2018). The Instructional Design in Higher Education (2016) report found that IDs consider lack of

faculty buy-in as the number one barrier to success. The lack of understanding of the ID role in higher education has contributed to tension between faculty and IDs. Clarity on the ID role and its competencies can decrease the barriers to successful ID–faculty collaboration.

Communication

Communication is widely cited as imperative to successful instructional design since the primary goal of an ID is to work with others to facilitate learning. Communication includes written and verbal communication, as well as asynchronous (i.e., email) and synchronous (i.e., web conference) interactions. Kenny, Zhang, Schwier, and Campbell (2005) rate communication as one of the four main competencies for IDs. The International Board of Standards for Training, Performance and Instruction (ibstpi) rates communication as an essential competency (Instructional Design Competencies, 2012).

Yet Sims and Koszalka (2008) state that

> the designer's communication skills must extend to combinations of asynchronous and synchronous interactions, and their ability to present instructional information must integrate key factors pertinent to the virtual environment. Even more frequently, instructional designers will have to rely on podcasts, wikis, and mobile phones to receive and respond to information; the traditional modes will be superseded by those underpinned by these emerging digital technologies. (p. 572)

Thus, IDs must be comfortable communicating with others as well as adapting to new ways of communicating. Additionally, good communication skills facilitate the explanation of instructional design frameworks, models, and/or theories to key stakeholders.

Theoretical Knowledge

The literature cites knowledge and application of instructional design theory and models as necessary to the ID role. Instructional design theories and models include, but are not limited to, the Analyze, Design, Develop, Implement, and Evaluate (ADDIE) model, adult learning models based on adult learning theory (i.e., andragogy), teaching theory, and learning theory. IDs may use theoretical knowledge to assist in decisions about projects and instructional problems (Sugar & Luterbach, 2015). While recognized as important to the ID role, it is interesting to note that there is some debate on how often and how effectively theory is applied in practice, such as in day-to-day activities like course design and development that require IDs to constantly engage in problem-solving (Thompson-Sellers & Calandra, 2012).

Problem-Solving

Many of the authors describe the instructional design process as one of problem-solving. Ertmer and Stepich (2005) define an ID as someone who can solve ill-defined problems. The design process requires an ID to find solutions to multiple instructional problems (Kenny et al., 2005). IDs make multiple, complex judgements based on situational factors when collaborating with SMEs and designing instruction and courses (Gray et al., 2015).

Course Design

IDs spend time designing instruction to facilitate learning. This is a key focus for the ID role. Course design may include crafting learning objectives, developing instructional strategies, developing assessment strategies, and finding resources for SMEs to use in instruction. Course development may include creating multimedia objects and other instructional activities

(Instructional Design Competencies, 2012; Villachica, Marker, & Taylor, 2010). Within the course design competency, there are other skills that are significant but varied in ID roles.

Other Cited Competencies

Other frequently cited ID competencies that were commonly cited, but not as frequently as the previous five, include project management, research and analysis, and technical expertise. Skills like leadership, relationship management, faculty development, and editing were cited but even less frequently. Table 1 lists these competencies and the citations in which they appear. The vast number of competencies cited in the literature illustrate the multifaceted nature of instructional design, which is one of many reasons why this study is important for the field. Table 1 notes the 16 most frequently identified competencies out of the 21 found in the literature review.

Table 1

Competencies Cited in the Literature

Competencies in the literature	Reference	Frequency
Collaboration	Brigance (2011) Gray et al. (2015) International Board of Standards for Training, Performance and Instruction (2012) Kelly (2016) Kenny et al. (2005) Sims & Koszalka (2008) Solomonson (2008) Sugar & Lue vbbrbach (2015) Sugar et al. (2012)	9
Communication	Brigance (2011) International Board of Standards for Training, Performance and Instruction (2012) Kelly (2016) Kenny et al. (2005) Sims & Koszalka (2008) Solomonson (2008) Sugar et al. (2012)	7
Theoretical knowledge	International Board of Standards for Training, Performance and Instruction (2012) Sugar & Luterbach (2015) Kenny et al. (2005) Thompson-Sellers & Calandra (2012) Sims & Koszalka (2008)	6
Problem-solving/solving ill-structured problems	Ertmer & Stepich (2005) Ertmer et al. (2008) Ertmer et al. (2009) Kenny et al. (2005) Tracey & Boling (2014) Gray et al. (2015)	6
Course design and development	International Board of Standards for Training, Performance and Instruction (2012) Kelly (2016) Sugar & Luterbach (2015) Villachica, Marker, & Taylor (2010) Gray et al. (2015)	5

Competencies in the literature	Reference	Frequency
Management/ project management	International Board of Standards for Training, Performance and Instruction (2012) Kelly (2016) Kenny et al. (2005) Sugar & Luterbach (2015)	4
Research and analysis	International Board of Standards for Training, Performance and Instruction (2012) Kenny et al. (2005) Sims & Koszalka (2008) Villachica, Marker, & Taylor (2010)	4
Technical/ technology expertise	Kelly (2016) Kenny et al. (2005) Gray et al. (2015)	3
Ongoing learning/adaptation	International Board of Standards for Training, Performance and Instruction (2012) Sims & Koszalka (2008) Thompson-Sellers & Calandra (2012)	3
Leadership	Ashbaugh (2013) Brigance (2011)	2
Relationship management	International Board of Standards for Training, Performance and Instruction (2012) Solomonson (2008)	2
Evaluation	International Board of Standards for Training, Performance and Instruction (2012) Villachica, Marker, & Taylor (2010)	2
Marketing	Kenny et al. (2005) Villachica, Marker, & Taylor (2010)	2
Identify and resolve ethical and legal implications of design in the workplace	International Board of Standards for Training, Performance and Instruction (2012) Sims & Koszalka (2008)	2
Faculty development	Kenny et al. (2005)	1
Editing/proofreading	Kenny et al. (2005)	1

Methods

We employed a convergent mixed-parallel mixed-methods approach for this study. With this approach, quantitative and qualitative data are collected simultaneously yet analyzed independently. Both sets of data are synthesized collectively to create an interpretation of the results (Creswell & Plano, 2011).

Participants

The researchers used a non-probability-sampling technique to obtain participants. The survey was sent to a purposive sample with a targeted population of professionals, all associated with an organization involved in professional learning, including the fields of online and distance education. The survey was emailed to members of the UPCEA organization and posted on a UPCEA online discussion forum. However, the survey link could have been forwarded to colleagues, people outside of the organization, or other audiences.

Instrumentation

Data for this study was collected using a survey (Appendix A) that drew upon the list of competencies discovered in the literature review. The survey was designed to explore the relationships between and among ID roles, demographics, workplace, team makeup, actual work completed, the preferred work of IDs, and career goals of IDs. The survey began with an ID-specific section to rule out anyone who was not currently serving as an ID or in an ID-related role, which helped to increase the external validity of this study.

Data Collection

The survey was hosted through SurveyMonkey. The survey opened for response collection between July 20 and August 14, 2017. There were 139 respondents with a total of 104 qualified respondents, for a margin of error of ±9%.

Data Analysis

To determine whether the items in the survey, specifically Questions 17 and 18 (Appendix A), did in fact correspond to our hypothesized constructs, the authors ran a principal components factor analysis using varimax rotation after first standardizing each item to the sample to reduce the differences in metrics. This analysis uses the covariance among items to estimate the potential solutions to a system of complex equations with the maximum number of distinct solutions corresponding to the number of items under consideration. The researchers applied the Kaiser rule and considered only eigenvalues greater than one, and the analysis determined the correspondence of each item to the underlying composite construct associated with each of these estimated solutions. These considerations, in turn, helped to determine empirically the likely content of that construct. For this process, the researchers considered only correlations of $r = .40$ or greater as evidence that an item correlated with a given construct, as this is common in social science studies that use factor analysis.

Along with the quantitative analysis, specific write-in text questions required qualitative analysis of the data. The responses from each qualitative question were brought into a collaborative document to allow for peer-to-peer coding collaboration. One researcher made an initial pass through the open-ended responses, organizing them into a priori and in vivo codes to capture emerging patterns and themes. After the initial round of coding was complete, a second researcher reviewed the codes to improve the analysis.

Results

Demographics

Demographics data showed that nearly 70% of all respondents were female. Additionally, 75% of respondents had one to 10 years of ID experience, and 97% of that experience came from a higher education background. Nearly 88% had a graduate degree, with 49% of respondents stating that their respective degrees came from either an instructional design or educational technology program.

From an organizational perspective, 61% of respondents came from public higher education institutions. Nearly half (48%) stated that ID services are centralized at their institution, while 38% reported decentralized services. When looking at this information by institution type, nearly half of all public, private, and for-profit ID departments were centralized. Less than half

(45%) of all departments, regardless of institution type, had three or fewer IDs on staff. From this group, 27% had two to three IDs, and 22% had eight or more. Sixty-seven percent of for-profit private institutions had zero to one IDs, and 37% of private nonprofits had two to three IDs. Twenty-five percent of public institutions had eight or more IDs, while 60% had 20 or fewer team members. Overall, 56% of respondents do a mix of faculty and content development.

Quantitative Findings

The results on Question 17 revealed seven underlying constructs, labeled Program Evaluation, Theory, Top Down Leadership, Bottom-Up Leadership, Faculty Problems, Course Design/Editing, and Technology/Media. Table 2 shows the correlation of each item with these underlying constructs.

Table 2
Correlations Between Question 17 Items and Underlying Constructs Derived From Factor Analysis

	Constructs						
Item	**Evaluation and Analysis**	**Theory**	**Top-Down Leadership**	**Bottom-Up Leadership**	**Faculty Expertise**	**Course Design/ Editing**	**Technology/ Media**
Conduct needs analysis	.851						
Conduct task analysis	.828						
Evaluation	.662						
Research	.639						
Theory application		.906					
Theoretical knowledge		.888					
Teaching/ learning experience		.764					
Relationship management			.732				
Problem-solving			.674				
Management/ project management			.622				
Collaboration w/SME			.581				

	Constructs						
Item	**Evaluation and Analysis**	**Theory**	**Top-Down Leadership**	**Bottom-Up Leadership**	**Faculty Expertise**	**Course Design/ Editing**	**Technology/ Media**
Written/ verbal communication			.535				
Ethics				.719			
Marketing				.678			
Leadership				.601			
Conduct pilot tests				.596			
Technical expertise					.861		
Multimedia expertise					.833		
Editing/ proofreading						.812	
Design						.663	
Faculty development							.801
Learning/ adaptation to new situations							.696

The strongest construct, Evaluation and Analysis, is consistent with the literature, as the individual items within that construct speak to the observation, evaluation, and planning skills often employed by IDs as they begin the design process (Kenny et al., 2005). The Theory construct, which includes items mentioned prominently in the literature, is the second-strongest construct, presumably due to the influence of learning theory on the profession. The next two constructs center on the multidirectional nature of leadership: Top-Down Leadership and Bottom-Up Leadership.

While Table 2 helps explain *if* different constructs were deemed important by IDs, Table 3 illustrates *how* important IDs felt each item was. Table 3 shows the correlation of each item listed in Question 18 of the survey, with the exception of Marketing and Piloting, as no respondents listed either item in their top five.

Table 3

Correlations Between Question 18 Items and Underlying Constructs Derived From Factor Analysis

	Constructs							
Item	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
TheoryKnow18	.704							
ProjMgmt18	-.679							.406
TheoryApp18	.621							.443
Comm18	-.487							
ProbSolv18		.734						
Tech18		-.651						
Collab18		-.530		-.414				
MultiMed18			.755					
AnalNA18			.585					
Design18			-.556		-.409			
Ldrship18				.836				
AnalTA18				.625				
FacDev18					.832			
Research18								
TLExp18						-.792		
EditProof18						.658		
RelatMgmt18							-.739	
Ethic18							-.631	
Eval18								
Adapt18								-.744

It is interesting to note that there are patterns of opposition within Construct 1 on Table 3. For Construct 1, the researchers took the four identified components. Most noticeably, the two theory items are working in opposition to each other. As shown in Table 4, when an additional factor analysis is conducted solely on the four items in Construct 1, it is shown that people who are likely to pick *management/project management* are very strongly not likely to pick *knowledge of theoretical foundations and instructional design models*.

Table 4
Correlations Between Question 18 Construct 1 Items Derived From Factor Analysis

	Construct	
Item	**1**	**2**
ProjMgmt18	-.867	
TheoryKnow18	.744	
Comm18		-.862
TheoryApp18		.721

Further, it appears as though IDs picked one of the theory items at random. Had they not, the two theory items would have aligned with each other after the exploratory factor analysis.

The final factor analysis (Table 5) shows the importance of items that comprised Top-Down Leadership and Bottom-Up Leadership in Question 18.

Table 5
Correlations Between Top-Down Leadership and Bottom-Up Leadership Items Derived From Factor Analysis on Question 18

	Construct			
Item	**1**	**2**	**3**	**4**
Ldrship18	.841			
Collab18	-.775			
RelatMgmt18		.789		
Ethic18		.673	.479	
ProjMgmt18			.891	
Comm18				.974

It is interesting to note that when IDs pick *relationship management* as important, they are also more likely to pick *identify and resolve ethical and legal implications of design in the workplace* as important. If they pick it, they also are more likely to pick *management/project management*. Even though this ethically tied item was part of the Top-Down Leadership construct in Table 2, when picking items of importance, ethical and legal implications corresponded to the importance they placed on management. The participants who picked management items were more likely to pick *ethical and legal implications* as an important item. Additionally, the participants who cared about leadership were in direct contrast to those who cared about collaboration. Picking one substantially reduced the likelihood to pick the other. The participants who identified

communication as important had no relationship to identifying any of the other leadership components as important, as participants were no less or more likely to pick any of the other items within that construct.

Qualitative Findings

Question 4 asked, "How do you define your role as an instructional designer or what an instructional designer does?" The data can be broken down into 10 categories, in order of highest to lowest responses: (1) collaborating, (2) content creating, (3) consulting, (4) support, (5) theory, (6) designing, (7) training, (8) project management, (9) reviewing, and (10) policy. The first five categories were the largest represented answers, with 170 instances of IDs supplying evidence for those roles. The last five categories made up only 50 different examples from IDs. The following section describes the open-ended answers from these respondents.

Collaboration, content, and consulting. The highest responses for the top three competencies of collaborating, content creating, and consulting all focused on working with faculty and creating or giving advice on course content. Being a collaborator was one of the most described roles, with emphasis on ways in which IDs collaborate with faculty or SMEs. Going along with that competency, and overlapping it a bit, IDs described their role as that of course content creator. When not creating content, many IDs detailed their roles as consultants who coach faculty on best practices to use in their courses. One respondent described the relationship as such:

> An instructional designer bridges the gap between an instructor and the learner - closely identifying objectives and content and aligning that with best practices for activities and assessments to help the learners and instructors in the best methods possible for maximum learning.

Despite the emphasis on collaboration and consulting, the faculty–ID relationship is not always easy. As one participant mentioned,

> I wish I was spending time working with faculty to help them come up with new and innovative ways to teach online that use the latest technology and research to make the highest quality course. … Faculty who do not adhere to an agreed-upon timeline prevents me from spending my time this way. Faculty are often submitting content for review far past the due date to the point that I'm scrambling to get their content prepared for student availability and there's no time for back-and-forth negotiation on how things could be improved.

Another ID said, "Right now I train and support faculty through the design and building process. There is a lot of nagging people to get things done which I don't really like."

The data show that the collaborative relationship between IDs and faculty can be challenging. Many of the respondents wished to be creative and innovative while perceiving faculty as resistant to change. As one ID described, "Most faculty are too busy or stuck in 'their way' of doing things to be creative and think outside the box." Another ID put it simply that, "Faculty have their own way of creating content." One ID felt that they were unable to actually design because they are "forced to do what the prof wants." Similarly, one respondent thought they couldn't design learning modules because "faculty think they can do it better."

Support and theory. Instructional designers also described their support roles and the ID theory they used. There were 27 participants that gave examples of the support they give to users and the assistance they provide to faculty with their technology usage. Part of this support was

helping faculty understand not only how to use the technology but also how to apply best practices and teaching theory, as evidenced by many participants who mentioned using the ADDIE model, backward design, pedagogy, andragogy, learning theory, universal design for learning (UDL), and scholarship of teaching and learning (SoTL). Many of the respondents consider themselves experts in teaching and learning. One suggested the following:

> I act as the SME for adult learning and teaching theories and provide a structure and process for an instructor or SME on specific topics. They may know their topic well, but instructional designers know the best way to teach and how people best learn and incorporate that in an instructor/SMEs courses.

Another ID said, "When I explain to other people what an ID does, I explain that my expertise is knowing how people learn and using that to help faculty develop meaningful online classes." The focus on support and theory is a matter of pride for some IDs. One ID described the most exciting part of the job as "when you actually get to design a course or a program, from the learning objectives on, where you're involved in the philosophy and the pedagogy and the building."

Other competencies. The authors wished to ensure that the competencies cited in the survey encompassed the competencies the respondents considered important. For the most part, the respondents agreed that the list of competencies was reflective of what they considered critical in their role. Of the lesser identified roles, designing and training were mentioned the most, with examples of how IDs help faculty understand how to design courses or how they lead workshops, departmental trainings, or one-on-one trainings to guide faculty. Only nine participants shared that they have an element of project management in their job. Another nine shared that they have elements of reviewing and quality control in their job, one in particular citing Quality Matters, an organization devoted to online course-quality review. Five of the respondents mentioned their work with policy, enforcing existing policy, and working with standards.

IDs described additional competencies in response to Question 22, "Are there competencies not listed that you think are important in your role?" These included such things as being "forward-thinking," "translat[ing] theory and design principles to academics," "being humble," "having an open mind," possessing "knowledge and skills related to accessibility," and being able to conduct "negotiation" as well as qualities such as "diplomacy," "patience," "flexibility," and "strategic thinking."

Time Spent

Questions 20 and 21 asked, "What do you wish you were spending your time at work on?" and "What prevents you from spending your time in this way?" Many of the IDs discussed issues with having tasks outside the collaboration/consultation role that prevent them from doing what they consider ID work. One individual related that they wish they could spend more time, "working on longer-term projects to improve processes and course development" but instead are "putting out fires and faculty-perceived emergencies and fixing existing issues in courses designed several years before I arrived here."

Another ID said they wish they were able to spend more time "collaborating with and development of faculty and SMEs to produce higher quality online courses; researching new technologies, developing ways for use of the tech in an online environment and passing that information along to faculty" and that "[the] university's lack of structure, direction and leadership for online education; being woefully understaffed; lack of specialization within the units that

support online learning" prevent them from being able to do so. One ID mentioned that they are expected to provide tech support, which eats up their time, saying, "I support the CMS [content management system] and [wish to have] more time working with faculty to improve the quality of their courses online." The response to what prevents this individual from doing so was simply stated, "Department stove pipes."

Others wished they were applying theoretical knowledge, researching, working more with faculty, innovating, applying new technologies, designing more, being more creative, developing relationships with leadership, and managing projects. The main things that are getting in the way include faculty misunderstanding of ID roles, email and administrative tasks, lack of resources and IDs, organization culture that impedes design, innovation, and relationship building.

Only a couple of respondents who answered Questions 20 and 21 had a more positive outlook regarding their role. For example, one ID said that they wish they were "[working on] everything that I currently work on. It is a dynamic mix of activities, courses, programs and initiatives. Never a dull moment. Not necessarily all ID, but I prefer it that way." Another participant responded that they are "doing what I want to be doing, for the most part" but that "administrative" items can get in the way of doing what they wish. Another ID said, "No two days are ever the same and the skillset is very wide ranging."

Goals of IDs

When asked about career plans in the next three to five years, 41% of individuals responded that they were planning on staying put and continuing what they're doing. An additional 22% mentioned an interest in moving up in positions within their institution, with over half (53%) of individuals expressing interest in becoming administrators in the future.

To attain these goals, 71% of those individuals felt that access to professional development will help. In addition, just under half (43%) of individuals were interested in continuing their education in the future, with 10% already doing so.

Discussion and Implications

Quantitatively, the responses to Question 17, wherein IDs were asked to rank the importance of each competency based upon how they each operated in their role, revealed seven underlying constructs: Program Evaluation, Theory, Top-Down Leadership, Bottom-Up Leadership, Faculty Problems, Course Design/Editing, and Technology/Media. The findings show that IDs believed skills related to program evaluation and theory were the most important competencies.

The results suggest that the ability to evaluate programs, coupled with incorporating learning theories, are the most critical competencies for the profession. These items additionally make sense in the top positions because framing learning in an effective and organized manner is at the forefront of learning development. It is not a surprising finding considering nearly half of respondents with graduate degrees (49%) completed programs in instructional or learning design.

While responses to Question 17 explained whether different constructs were important to IDs, Question 18 showed how important IDs perceived each item. IDs responded that they preferred more autonomy to do the things they want to do and less being told what to do, behavior more commonly associated with the collaborative aspects of bottom-up leadership. Collaboration

was the most frequently cited item in the literature, supporting the idea that IDs prefer to work with others collaboratively while having the ability to make decisions independently.

They responded unfavorably to top-down leadership and its penchant for more structured lines of authority. This finding does not imply that IDs do not like top-down leadership or even structured authority lines. Rather, it sheds light on what competencies they see as important or unimportant to do their job. The qualitative responses demonstrate that often the IDs are bogged down by administrative tasks that prevent them from using their ID skills on a regular basis.

The implications of the findings have the potential to contribute to discussions about the basic knowledge, skills, and abilities, or competencies IDs need to possess to be successful in the field. These findings alone can be used when creating a job description that accurately outlines employment expectations at the onset of the job. Further, leadership can use these competencies to identify potential employee knowledge gaps, which in turn can be used to identify the most pertinent professional development opportunities. With regard to leadership, these findings also provide insight to leaders that helps them understand how IDs best work with leaders and followers. For example, the qualitative results suggest that IDs are often unable to apply basic ID skills (i.e., working with faculty, collaborating, providing theoretical knowledge) during their normal routine because they are often putting out fires, emailing, or attending meetings. Managers of IDs may benefit from the knowledge that IDs typically wish to employ their higher level skills but do not have the time or capacity to do so. Eliminating some of these barriers may increase the productivity of IDs while also improving job satisfaction.

While the findings showed how IDs define their role and the varying ways they approach their work, some clear patterns emerge. The highest commonality in the responses was the work of collaborating, creating content, and consulting. Specifically, participants in the study work with faculty, either creating content for them or giving advice on how to create content. This is further supported by noting the frequency of roles such as support, theory, designing, training, and reviewing. The findings demonstrate that it is important for IDs to have competencies in learning design and theory, which will cover many of the tasks they will be asked to do on the job, and that IDs are often proud of their expertise in this area and wish to use this expertise frequently.

Given that 88% of respondents had a graduate degree, with 49% of respondents' degrees focused on instructional design or educational technology, it is clear that IDs come into the collaborative space with a great deal of knowledge and expertise in teaching and learning. However, IDs consistently described the relationship with faculty as strained. IDs reported having to wait for faculty to complete work outside of agreed upon timelines. Some reported working with faculty who simply did not value or understand the ID role in the design process. Three main points in the Instructonal Design in Higher Education (2016) report state that there is a lack of understanding of the ID role, little enticement from administration to work with IDs, and a lack of motivation for faculty to change their teaching practices to adapt to the online environment. More research is needed on the relationship and tensions that ID and faculty experience, as the success of one is the success of the other and ultimately—and arguably most important—the learner.

Because there is a gap between what IDs stated they do on a regular basis and what their goals are, with barriers to attaining those goals, it would be beneficial to conduct research on employers' expectations of the ID role, and how an ID's skill set changes depending on the type of institution or job he or she holds. It would be also be interesting to explore how an ID's job satisfaction and career path are impacted when juggling many responsibilities and when wearing

many hats. Employers would benefit from such research when crafting job descriptions, onboarding new IDs, and evaluating an institution's overall culture and goals and how instructional design fits into it.

Furthermore, additional study could be conducted into the fact that IDs who selected *management/project management* and *communication* as top-five competencies were very unlikely to pick *knowledge of theoretical foundations and instructional design models* and *application of theory*, respectively. Is this because those who manage instructional design teams do not need to know theoretical foundations and design models to lead? If so, how do IDs feel about having leaders who cannot do what they must?

It is interesting to note that a smaller subset of IDs reported having project management and policy-reviewing responsibilities. This may be explained by the role, such as a lead ID who has other IDs working under them, but it may also point to a needed skill for IDs. Even if they are not supervising other IDs, it is important to have well-thought-out project management techniques to ensure projects are finished on time.

Further research on these gaps will also inform professional development for IDs. Many of the IDs in this study were happy to remain in their role over the next three to five years (41%), and indeed only 22% of respondents stated that they wished to "climb the ladder." However, 53% of respondents are looking to move into an administrative role as their next career step. Managers of IDs may consider surveying their IDs to find out if this is something they are interested in pursuing. IDs who wish to move into a leadership role will benefit from professional development centered around leadership skills and project management over technical or instructional design skills. This may address some of the concerns regarding those who manage IDs (i.e., lack of theoretical knowledge or application of theory) and the IDs who perform the day-to-day ID role. With thoughtful planning and professional development, future ID managers will have both leadership and management skills as well as the foundational ID skills.

Limitations

The main limitations in the study include the recruitment of participants, the response rate, the short-term nature of the project, and the potential biases of the researchers. The survey was distributed to members within the UPCEA professional organization. There was no way to know if the members who received notice of the study distributed the survey link to participants outside UPCEA. A further concern is that the number of IDs within the UPCEA is unknown. The survey was sent out to 577 registered eDesign Collaborative members, the group within the UPCEA likely to contain ID membership. There were 134 responses, but only 104 of those were usable, based on the criteria of the survey.

The study was a snapshot of the IDs' thoughts on their practice rather than longitudinal study distributed over a long period. It would be interesting to conduct a cohort study of a group of IDs over time to understand how their roles change and/or if their roles change based on the nature of projects assigned. Despite the short-term nature of this study, the ID responses are valuable for those interested in what IDs do in their daily practice.

Finally, we are all working in the field of instructional design at different institutions. As mentioned previously, one of the researchers holds a leadership position and supervises IDs, including one of the other research team members. The other two researchers are IDs. At the onset of the study, each of the researchers held preconceived notions of what an ID's role and

competencies were. We conducted peer checks among the team with all qualitative data to decrease likelihood of bias. We could have sent the data to outside peer reviewers to further decrease bias but were not able to within the time frame of the study.

Conclusion

The state of higher education, online learning, and instructional design is constantly, and rapidly, changing. This study shows that IDs generally know what they need to know and are interested in knowing more, including being willing to level up not only their skills but their roles. More importantly, IDs know what does not work in their profession, and cite that the time they spend on other projects and administrative tasks is a barrier to skill development and career growth. For example, there is a gap between what they are required to do on a daily basis and what they wish they were spending time on—namely, content development, new/innovative strategies and technologies, working with faculty, and research/analysis. This illustrates that the professionals in this field are prepared to adapt to the needs of their employer, and it is important for employers to adapt the changing field of instructional design as well.

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Appendix A
Roles and Competencies of Current Instructional Designers Survey

ID specific

1. Is your current job title or role focused on instructional design or similar (*The Association for Educational Communications and Technology (AECT) defines this as "a system of procedures for developing education and training curricula in a consistent and reliable fashion" (Branch & Merrill, 2012, p.8)*)?
2. Yes No
3. Survey logic note:
    a. If yes
        i. What is your title and role (text response)
        ii. move to #4 (How many years…) question
    b. If no,
        i. What is your title and role? (text response)
    c. Do you consider what you do instructional design work, based upon the AECT definition? Yes No
        i. (If no, ask) Do you manage IDs? Yes No
            1. (If no, ask) Are you a multimedia designer?

        (If yes, to all of the above, send to "Thank you for your input. We plan to reach out to multimedia designers. If you are interested in either taking the survey or helping craft it, please input your name and contact email below." message.
4. How do you define your role as an instructional designer or what an instructional designer does? (text response)
5. How many years have you been employed as an instructional designer?
    a. Years: 0, <1, 1-5, 6-10, 11-15, 16-20, >20
6. Which of the following fields are you currently employed?
   K-12, Higher Education, Private Industry (select one)
7. Select each of the sectors have you have done instructional design work in prior to your current position.
    a. Fields: K-12, Higher Education, Private Industry (select as many as necessary)
8. What is your highest completed degree?
    a. None, Bachelor's, Master's, Doctorate
9. What is the Major/Field of your highest completed degree? Text box for answer

Demographics:

10. Gender: Male, female, other, wish not to say
11. Age range: 18-25, 26-35, 36-45, 46-55, 56-65, 66 or older

Workplace

12. What best describes the institution where you are currently employed?
    a. Public, Private (non-profit), Private (for-profit), Government, Industry
13. Are instructional designers at your institution centralized, decentralized on-site, or decentralized remote (i.e. institutional wide office vs. individual college or program office)?
    a. Decentralized
    b. Centralized
    c. Other - describe (e.g. only designer for institution) (open comment)

Team make-up

14. How many IDs do you have in your department?
    a. 0-1; 2-3; 4-5; 6-8; 8 or more
15. How many total employees do you have in your department? Text box answer

16. Which of the following best describes your development role: (select one)
    a. Primarily faculty development
    b. Primarily content development
    c. Mix of both faculty development and content development

Ratings of Competencies

17. The following list represents the most frequently mentioned competencies in the literature on the ID field. Thinking of how you operate in your ID role, please indicate the importance of **each** item using the provided scale. (1 = least important; 5 = most important).
    a. Collaboration with SMEs/content experts/faculty/instructors
    b. Course design/development/design judgements; Write learning objectives
    c. Technical/technology expertise
    d. Multimedia expertise (graphic design)
    e. Knowledge of theoretical foundations and instructional design models
    f. Applying theoretical foundations and instructional design models
    g. Teaching and Learning expertise; Applying theory to teaching practice and student learning experience
    h. Leadership
    i. Written/verbal communication; Asynchronous, synchronous
    j. Problem-solving/solving ill-structured problems
    k. Relationship management
    l. Management/Project management
    m. Research
    n. Analysis - Conduct needs assessment
    o. Analysis - Conduct task analysis
    p. Evaluation
    q. Faculty Development
    r. Marketing
    s. Conduct pilot tests
    t. Editing/proofreading
    u. Ongoing learning and adaptation to new situations
    v. Identify and resolve ethical and legal implications of design in the workplace
    w. Competencies
    x. Other, not listed text field
18. Based on your professional experience, what do you think are the top five competencies for an ID? Please indicate in no particular order your top five competencies from the following list. (check boxes; max five choices).
    a. Collaboration with SMEs/content experts/faculty/instructors
    b. Course design/development/design judgements; Write learning objectives
    c. Technical/technology expertise

d. Multimedia expertise (graphic design)
e. Knowledge of theoretical foundations and instructional design models
f. Applying theoretical foundations and instructional design models
g. Teaching and Learning expertise; Applying theory to teaching practice and student learning experience
h. Leadership
i. Written/verbal communication; Asynchronous, synchronous
j. Problem-solving/solving ill-structured problems
k. Relationship management
l. Management/Project management
m. Research
n. Analysis - Conduct needs assessment
o. Analysis - Conduct task analysis
p. Evaluation
q. Faculty Development
r. Marketing
s. Conduct pilot tests
t. Editing/proofreading
u. Ongoing learning and adaptation to new situations
v. Identify and resolve ethical and legal implications of design in the workplace
w. Competencies
x. Other, not listed (Text field)

19. The following nine competencies were most frequently listed in the literature. Rate the hours per work week you spend employing each of these competencies.

Competency	Average hours spent each week
Collaborating with SMEs/content experts/faculty/instructors	Dropdown with 0, 1-5, 6-10, 11-15, 16-20, 21-30, 31+
Communicating through written, verbal, asynchronous, and synchronous formats	
Knowledge of ID models; Applying theory and models; Teaching and Learning expertise; Applying theory to teaching practice and student learning experience	
Course design/development; Writing learning objectives	
Problem-solving; solving ill-structured problems	
Project management	
Research and Analysis	

Competency	Average hours spent each week
(including conducting needs assessments or task analysis)	
Technical/technology expertise	
Ongoing learning and adaptation to new situations	

20. What do you wish you were spending your time at work on? (text response)
21. What prevents you from spending your time in this way? (text response)
22. Are there competencies not listed that you think are important in your role? (text response)

ID Goals

23. a. Do you wish to become an administrator or manager in the future?
    a. Yes, No, Not sure
        i. If yes:
        ii. What competencies do you think you need to reach this goal? (text response)
        iii. Do you feel that you have access to professional development that will help you achieve this goal?
    b. If no or not sure:
        i. What are your career plans in the next 3-5 years? (text response)
        ii. Do you plan to continue your education (if you aren't already pursuing a degree, certificate or micro-credential)? Yes No
            1. What competencies do you think you need to reach your goals? (text response)

Well Begun Is Half Done: Using Online Orientation to Foster Online Students' Academic Self-Efficacy

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Abstract
Past research suggests that the use of an online learning orientation is an effective proactive strategy to ease online students' transition into online learning. Based on a sample of 3,888 online students from an urban public university, we used ordinal logistic regression to understand the influence of students' satisfaction with an online learning orientation (OLO), their prior level of online learning experience, and their demographics on their academic self-efficacy (ASE). Consistent with prior research, our findings confirmed the influence of students' satisfaction with OLO, their prior online learning experience, and their gender on their ASE. Unsatisfied students were 85% less likely than satisfied students to express a high level of self-efficacy. In contrast, students' age and enrollment status proved not to be significant. Overall, our findings provide strong evidence about how the use of an OLO as proactive support strategy can boost online students' academic self-efficacy.

Keywords: orientation, survey, academic self-efficacy, higher education

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Well Begun Is Half Done: Using Online Orientation to Foster Online Students' Academic Self-Efficacy

Given the individual, institutional, and social costs associated with student attrition in online courses (Simpson, 2013), it is becoming crucial, for the future of online education, to develop an understanding of what factors drive students to persist. Just as it is for students in face-to-face courses, persistence among students in online courses is a complex phenomenon shaped by an interaction of academic, nonacademic, and socio-individual factors (Hart, 2012; Lee & Choi, 2013). While both academic and nonacademic factors (such as course design, faculty expertise, and work and family responsibilities) influence online students' persistence and success (Glazier, 2016; McGee, Windes, & Torres, 2017; Park & Choi, 2009), socio-individual factors also seem to weigh heavily on online students' decisions to persist (Cochran, Campbell, Baker, & Leeds, 2014). More specifically, students' characteristics, such as their high school GPA (Harrell & Bower, 2011),

their satisfaction (Levy, 2007; Müller, 2008; Park & Choi, 2009), their academic preparedness and experience (Aragon & Johnson, 2008; Cochran et al., 2014), and their self-efficacy (Müller, 2008; Park & Choi, 2009), play a decisive role in students' persistence and success.

Indeed, the role played by students' characteristics is amplified by the fact that most online students are nontraditional students who juggle family, work, and study obligations. In support of this idea, Bocchi, Eastman, and Swift (2004) and Rovai and Downey (2010) attribute attrition, in part, to students' inability to embrace a self-directed learning approach, misconceptions about course difficulty and workload, and lack of experience and preparedness for online learning. Students' unpreparedness to take courses online hampers their ability to cope with the demands of their new learning environment.

In an attempt to mitigate these individual attrition rates, higher education institutions (HEIs) are increasingly offering a self-paced online learning orientation (OLO) as a proactive support strategy to build students' self-confidence and preparedness, to clarify course expectations and requirements, and to help to dispel student misconceptions about online learning (Bawa, 2016; Clay, Rowland, & Packard, 2008; Gilmore & Lyons, 2012; Russo-Gleicher, 2014). By offering an early positive encounter with the online learning environment, an OLO can lessen online students' anxiety and increase their confidence and readiness (Gilmore & Lyons, 2012; Kanuka & Jugdev, 2006; Motteram & Forrester, 2005; Cho & Heron, 2015).

However, despite the fact that OLO is positively associated with improving students' preparedness and self-efficacy, and even reducing their likelihood of dropout (Brewer & Yucedag-Ozcan, 2013; Scheitler, 2015; Shen, Cho, Tsai, & Marra, 2013), only a handful of studies have examined the influence of an OLO on ASE. Even researchers who have explored self-efficacy have focused on its computer- and technology-related dimensions (Jan, 2015; Shen et al., 2013; Zimmerman & Kulikowich, 2016). While computer self-efficacy is undoubtedly important, this narrow focus misses the opportunity to explore the multidimensional facets of ASE, such as student confidence, both in completing course tasks and in interacting with their instructor and their classmates.

Taking this into account, this paper attempts to fill the gap in the literature by examining the influence of an embedded OLO on online students' ASE. More specifically, our study, unlike most of the earlier studies, explores the impact of an OLO on five ASE dimensions: confidence to complete online course activities, interaction with classmates, interaction with the instructor, use of a learning management system (LMS), and socialization with classmates. The outcomes associated with ASE, such as students' self-regulation and achievement, are not explored in this study.

Given the positive role played by prior online learning experience in influencing students' success (Hachey, Wladis, & Conway, 2014), it is critical to examine the interplay of an OLO with online students' ASE. As one of the strongest predictors of success in online learning (Prior, Mazanov, Meacheam, Heaslip, & Hanson, 2016), self-efficacy plays an influential role in online students' success and retention. Hence, exploring the influence of an OLO on students' ASE is likely to support institutional efforts to bolster their retention and, ultimately, their success.

In light of this, this paper is divided into four sections. First, we present the theoretical framework underpinning this study. We follow it by a literature review of studies associated with various factors influencing ASE. Next, we describe the context of our study and our

methodological approach. Finally, we present and discuss our findings and limits, and we conclude by offering a few recommendations.

Theoretical Framework

Informed by Bandura's social cognitive theory, this study is framed around the interaction of students' ASE with an OLO, prior online learning experience, and demographics. Defined as "belief in one's own capacity to perform tasks successfully" (Bandura, 1977), self-efficacy is based on the interplay of cognitive, motivational, affective, and selection processes. The cognitive process drives students' goal setting and commitment, while motivational factors guide students' actions and shape their beliefs as to what they can accomplish. The affective processes touch students' perceived efficacy to manage feelings such as anxiety and depression, whereas the selection processes influence students' choices and decision-making process (Bandura, 1993, 2012).

Applying this framework, Wäschle, Allgaier, Lachner, Fink, and Nückles (2014) argued that an increase in self-efficacy has a positive impact on students' motivation to tackle new tasks. Students' self-confidence to complete tasks will enhance their self-efficacy, which in turn will increase their motivation, and will reduce their feelings of anxiety. In contrast, a low level of self-efficacy is associated with negative emotions, such as anxiety, and with lower performance (Marchand & Gutierrez, 2012). By influencing students' judgment about their own ability to succeed, self-efficacy predicts and mediates students' achievement, motivation, and learning (Elias & MacDonald, 2007; Shea & Bidjerano, 2010; van Dinther et al., 2011). Students with a higher level of self-efficacy are more motivated to perform well academically than those with a lower level of self-efficacy. Therefore, self-efficacy is a powerful construct capable of exerting considerable influence on students' motivation, as well as on their willingness to learn, to persist, and to succeed. From this perspective, exploring the influence of OLO on students' ASE, as a narrower form of self-efficacy focusing on one's perceived ability to perform given academic tasks, can inform and guide support efforts aiming to boost their confidence, motivation, and success.

Review of Literature

While ASE has been widely investigated in the literature, very little research exists on the influence of OLO on ASE. Similarly, except for a few descriptive and anecdotal studies, there are virtually no studies on the influence of past online learning experience on ASE. For this reason, we expanded our literature review to include traditional face-to-face learning studies. Organized around five themes, this review explores the interplay of various factors influencing online students' ASE, including the use of OLO, ASE, computer self-efficacy, past online learning experience, and students' demographics.

Online Learning Orientation

The use of an OLO is widely viewed as one of the most effective proactive support strategies for easing students' transition into online learning. Intended to prepare students to take online courses and clarify expectations, OLOs are also used to lessen support needs during course implementation (McGee, Valdes, & Bullis, 2016). By enhancing students' study skills, such as their motivation, time management, self-discipline, and technical skills, OLOs have the potential to increase students' preparedness, retention, and success.

Bozarth, Chapman, and LaMonica (2004) proposed that all online students complete a mandatory one-credit orientation as a preparedness tool. To ease students' transition, reduce their misconceptions, and increase their chances of success, the authors proposed an orientation focused on developing students' technical skills, knowledge, and attitudes (such as time management and personal commitment).

As a retention strategy, completion of an OLO increases students' likelihood to persist by reducing their confusion and by addressing their misconceptions early in the process (Morris & Finnegan, 2008; Smyth & Lodge, 2012). To this end, Russo-Gleicher (2014) recommended the inclusion of an online orientation as a powerful retention strategy, offered alongside the screening of students and the support and empowerment of the faculty. Using qualitative data from semi-structured, in-depth faculty interviews, Russo-Gleicher (2014) suggested using a mandatory orientation not only to clarify students' online learning misconceptions but also to provide a realistic purview of course expectations and to discuss time-management skills. In the same way, Lee and Choi (2011) suggested the offering of an online orientation as one of the institutional strategies designed to improve students' persistence. This recommendation was later reiterated by Shen, Cho, Tsai, and Marra (2013), who suggested the offering of an orientation to enhance students' self-efficacy to handle tools in a content management system. For their part, Ali and Leeds (2009), Lee and Choi (2011), and Cho (2012) argued that a freshman orientation improves online students' retention, while Cho and Heron (2015) recommended using a course orientation as one of the strategies to help students succeed in remedial online mathematics courses.

Dupin-Bryant (2004) argues that, as a student success strategy, orientation programs focused on advancing students' technological skills are likely to help students gain the experience that they need to succeed in online courses. Likewise, Wojciechowski and Palmer (2005) identified orientation completion as the "second greatest factor," following a student's GPA, in predicting his or her success in an online course. Hachey et al. (2014) contended that offering targeted support to students who are taking their first online course is a critical factor in their success in future online courses. However, to soften this conclusion, we must note, along with Dray, Lowenthal, Miszkiewicz, Ruiz-Primo, and Marczynski (2011), that student success in online programs hinges partially on the complex mesh of their learning characteristics and their level of engagement with the technology.

In conclusion, it is clear from the literature that the use of an online orientation increases students' preparedness, retention, and success. By easing students' transition into online learning, by dispelling their misconceptions, and by clarifying course expectations and requirements, an online orientation is likely to boost their ASE and to help them progress successfully. However, we caution that an OLO is not a magic recipe to resolve either the students' lack of motivation and preparedness, the faculty's lack of presence, or the institution's lack of support. While the value of an online orientation in easing students' apprehension and preparing them for online learning is undeniable, its impact does not single-handedly address the developmental and social issues that can impede students' learning (Tinto, 2010).

Having looked at the some of the benefits of an OLO on fostering students' preparedness, retention, and success, let's turn our attention to the influence of ASE on students' motivation and academic performance.

Academic Self-Efficacy

As another specific domain of self-efficacy, ASE refers to a student's perception regarding his or her competence in learning and in performing academic tasks (Schunk & Pajares, 2002). Building on Bandura's seminal framework regarding the role of self-efficacy in regulating human behavior (Bandura, 1977), several studies have examined the influence of academic self-efficacy on traditional students' motivation and academic performance.

With respect to motivation, Pajares and Usher (2008) argued that "in school, self-efficacy beliefs provide the foundations for academic motivation, well-being, and achievement" (p. 396). As an outcome of this interaction, Wäschle et al. (2014) concluded that an increase in self-efficacy has a positive impact on students' motivation to tackle new tasks. Students' self-confidence to complete tasks enhances their self-efficacy, which in turn increases their motivation. The authors describe this positive feedback loop as the "virtuous circle of self-efficacy." Likewise, Tseng and Tsai (2010) uncovered a reciprocal relationship between self-efficacy and motivation on the one side and learning and performance on the other side. In other words, a stronger self-efficacy is likely to foster online students' intrinsic motivation, which, in turn, will lead to better performance and better learning.

Indeed, in terms of performance, several studies have confirmed the predictive nature of the ASE on students' achievement, as measured by their GPA. The conclusions, from a meta-analysis of 109 studies, found ASE to be the best predictor of GPA and a moderate predictor of student retention (Robbins et al., 2004). Backing this finding, evidence from another meta-analysis of 13 years of research showed that performance self-efficacy has a strong correlation with student performance, followed closely by the student's high school GPA (Richardson et al., 2012). More recently, Honicke and Broadbent (2016) concluded in their meta-analysis that ASE is moderately correlated with academic performance. In this relationship, self-efficacy exerts a strong positive effect on students' performance through goal setting, effort, and persistence (Hixon et al., 2016). Moreover, even perceived self-efficacy in an academic setting will positively affect students' quality of studying and performance (Caprara et al., 2008; Wäschle et al., 2014).

In online learning settings, the influence of an OLO on students' self-efficacy has not yet been the focus of scholarly research. Among the very few studies we uncovered, Brewer and Yucedag-Ozcan (2013) argued that a well-structured and timely OLO improves students' ASE and preparedness while reducing their likelihood of dropout. Along the same lines, after reviewing 26 orientation programs used by community colleges in the United States, Scheitler (2015) concluded that students' participation in an online orientation positively influenced their self-efficacy.

Bearing in mind the correlation of ASE with student learning and achievement, let's examine the influence of computer self-efficacy on students' learning.

Computer Self-Efficacy in Online Learning Settings

In online learning settings, much of the literature is focused on computer and technology-related self-efficacy. Defined as the user's perception of efficacy in performing computer-related tasks, computer self-efficacy (CSE) is closely associated with a "wide range of cognitive, attitudinal and behavioral outcomes," including computer use, skills, and attitudes toward computers (Rex, Atul, & Dennis, 2012). As a result, CSE is credited with positively influencing students' confidence and abilities to use and learn with technology, (Celik & Yesilyurt, 2013). More specifically, students with a high level of Internet self-efficacy not only outperformed

students with lower self-efficacy on the final exam but also expressed a higher confidence in their ability to complete an online course (Chang et al., 2014). In this way, CSE has also been reported to play a significant role in online students' learning (Simmering, Posey, & Piccoli, 2009), satisfaction (Jan, 2015; Shen et al., 2013), performance and persistence (Wu, Tennyson, & Hsia, 2010), grades (Wang, Shannon, & Ross, 2013), and achievement (Joo, Lim, & Kim, 2013). Because of this positive influence, Wu et al. (2010) recommended, among other things, that institutions work to support students' efforts to enhance their computer literacy. In their review of research on online course dropout, Lee and Choi (2011) identified "computer skills confidence" as one of the psychological attributes that influence students' retention, along with self-efficacy, motivation, and satisfaction. Correlated with this, Wilfong (2006) and Saade and Kira (2009) concluded that CSE had a significant impact on computer anxiety.

In opposition to these conclusions, Hodges (2008) cited studies that refute a positive correlation between self-efficacy and online students' performance (DeTure, 2004; Wang & Newlin, 2002). However, this negative relation is attributed, by the author, to a self-selection bias introduced by the use of self-selected online students as subjects. With these nuanced conclusions about the influence of CSE on students' performance, let's turn our focus to the relationship between students' prior online learning experience and ASE.

Prior Online Learning Experience

While ASE is not a mere reflection of past online learning experience, Jan (2015) showed a positive relationship between ASE and any prior experience with online learning. This relationship between ASE and past learning experience was emphasized by Shen et al. (2013) who reported, along with Zimmerman and Kulikowich (2016), that students with prior online learning experience express a high online learning self-efficacy. This conclusion is aligned with the underlying assumption that self-efficacy is shaped by students' interpretation of and reflection on past experiences (Shea & Bidjerano, 2010). Correlatively, online students with past online experience are likely to use more effective learning strategies, which in turn can lead to a higher level of motivation and better grades (Wang et al., 2013). Indeed, Hachey et al. (2014) reported that prior online experience is strongly correlated with students' success and retention, regardless of their GPA. After reviewing 26 OLO programs, Scheitler (2015) concluded that participation in online programs boosted students' self-efficacy for online classes. By improving the skills and attributes needed for online learning, online students gain self-confidence—a confidence that transforms their disposition toward online learning.

By and large, self-confidence and the belief in one's ability to succeed are critical in students' ability to self-regulate their online learning study habits. In addition to influencing students' cognitive processes and actions, academic self-efficacy fuels students' motivation and their ability to succeed. Students with a higher ASE are more motivated to perform academically than those with a lower level of ASE. For this reason, ASE is a powerful construct capable of exerting a significant influence on students' motivation, as well as on their willingness to learn, persist, and succeed. Understanding the interaction of an OLO with students' ASE can inform and guide support efforts that aim to boost students' confidence, motivation, and success. In the same manner, students' demographic factors are crucial in unpacking the intricacies of the online student experience.

Demographics Factors: Age, Gender, Academic Year, and Enrollment Status

Age. Online students' learning experience is shaped by various factors, including age, gender, academic year, and enrollment status. Cochran, Campbell, Baker, and Leeds (2014) argued that individual characteristics of students are strongly related to student retention in online classes. Following Stratton et al. (2007), Cochran et al. (2014) used demographic variables to explain the variance in student retention in institutions of higher education. According to these authors, cumulative GPA and being a senior are the strongest determinants of students' retention.

With regard to age, Vella, Turesky, and Hebert (2016) identified older age and gender as two of the predictors of both higher course grades and successful course completion. Along with this line, Carbanaro, Dawber, and Arav (2006) showed that older online students outperformed their younger counterparts. However, Ekwunife-Orakwue and Teng (2014a) reported that age did not predict student learning outcomes and satisfaction.

In related research Chu (2003) claimed that age influenced preservice teachers' CSE, while Wyatt (2005) contended that age influenced online students' satisfaction. Contrary to these conclusions, Ke and Xie (2009) stated that age did not predict online "adult students' self-reported time or effort spent on learning tasks" (p. 140). Chung, Park, Wang, Fulk, and McLaughlin (2010) pointed out that age did not influence either perceived ease of use and usefulness or intention to take part in online learning communities. It is clear that age plays some role in student self-efficacy, satisfaction, learning, and related constructs of interest. The nature of these relationships requires additional study.

Gender. Regarding the influence of gender on self-efficacy, past research findings are nuanced and mixed. While it is well established that female students outnumber male students, their online learning experience is different, since they often juggle multiple roles and responsibilities (e.g., employee, mother, and/or wife). Exhibiting stronger self-efficacy and confidence than their male counterparts (Chyung, 2007; Shen et al., 2013), female students are not only more receptive to online learning (Selwyn, 2007) but also more engaged with its content (Ekwunife-Orakwue & Teng, 2014b). Moreover, female students are more active and more satisfied with the online learning process than their male counterparts (González-Gómez, Guardiola, Martín Rodríguez, & Montero Alonso, 2012). Consequently, Vella et al. (2016) suggested that female students are more likely to earn higher grades in online courses than their male counterparts.

Against these conclusions, Zembylas (2008) argued that females taking online courses struggle to respond adequately to the demands and pressures exerted by these multiple roles and responsibilities. For their part, Cai, Fan, and Du (2017) and He and Freeman (2010) argued that female students are more anxious when using computers and present a lower level of CSE, mainly when using specific Web 2.0 applications. These findings are corroborated by Chang et al. (2014), who reported that online male students exhibited a higher degree of Internet self-efficacy and confidence than female students.

Between these two opposing views, Hung, Chou, Chen, and Own (2010) concluded that gender did not influence online students' learning readiness, as measured by self-directed learning, motivation for learning, computer/Internet self-efficacy, learner control, and online communication self-efficacy. In the same manner, the Chu (2003) study did not reveal any significant relationship between gender and computer self-efficacy among preservice teachers.

These mixed findings about the influence of gender on computer self-efficacy are reflective of the inconsistent findings reported about the interplay of gender and technology (Cai, Fan, & Du, 2017).

Academic year. Research on the influence of academic year on ASE is scarce. One of the few studies, conducted by Hung et al. (2010), suggested that junior and senior students are more prepared in terms of self-directed learning and learner control than are freshman and sophomores. Building on this common-sense conclusion, Cochran, Campbell, Baker, and Leeds (2014) claimed that, because of their academic experience, seniors are less likely to withdraw from online courses than non-seniors. According to Hung et al. (2010), junior and senior students demonstrate a greater preparedness for self-directed learning, online communication self-efficacy, motivation for learning, and learner control than freshman and sophomore students do.

Enrollment status. With a renewed interest in part-time students as a potential source for expanding access to higher education, it is valuable to understand the relationship between students' enrollment status and their achievement. Part-time online students are typically confronted with competing family and professional priorities (MacCann, Fogarty, & Roberts, 2012; Ortagus, 2017; Shea & Bidjerano, 2014). Despite these challenges, Cummings, Chaffin, and Cockerham (2015) suggested that online part-time students' ratings on social work practice skills were significantly higher than those of traditional campus students. In a similar vein, Vella et al. (2016) argued that part-time students earned higher grades and rates of course completion than full-time students. In contrast, drawing from face-to-face research, we maintain that part-time students are more prone to attrition (O'Keeffe, 2013). The Stratton et al. (2007) study suggested that part-time students (37%) face a more serious risk for attrition than full-time students (13%) do. Related to this, MacCann et al. (2012) argued that part-timers' GPAs are firmly connected with their time-management skills.

In sum, although some of the findings are inconclusive, past research has provided a substantial body of evidence to show that demographic factors influence online course experience, hence their inclusion in this study. In the next section, we discuss the purpose of, as well as the questions raised in, this study.

Purpose of the Study

By building students' sense of efficacy and their confidence in their ability to complete online courses, the use of an OLO is likely to reduce students' (particularly new online students') frustrations and apprehensions and promote their academic persistence and success. Yet the influence of an OLO on students' ASE has rarely been a topic of scholarly research. Most of the studies, when not descriptive and anecdotal, have been limited to one semester in length, with small samples. Also, none of the previous studies explored the influence of satisfaction with an OLO on students' ASE.

Taking these gaps into account, this study attempts to examine the influence of students' satisfaction with an OLO, their prior level of the online learning experience, and their demographics on their ASE. To address these aims, we asked the following three research questions (RQ):

RQ1. How does students' satisfaction with the OLO predict their ASE?

RQ2. How does students' prior online course experience (i.e., the number of online courses taken before) predict their ASE?

RQ3. How do students' demographics (age, gender, academic year, and enrollment status) predict their ASE?

Figure 1 summarizes the different variables under study.

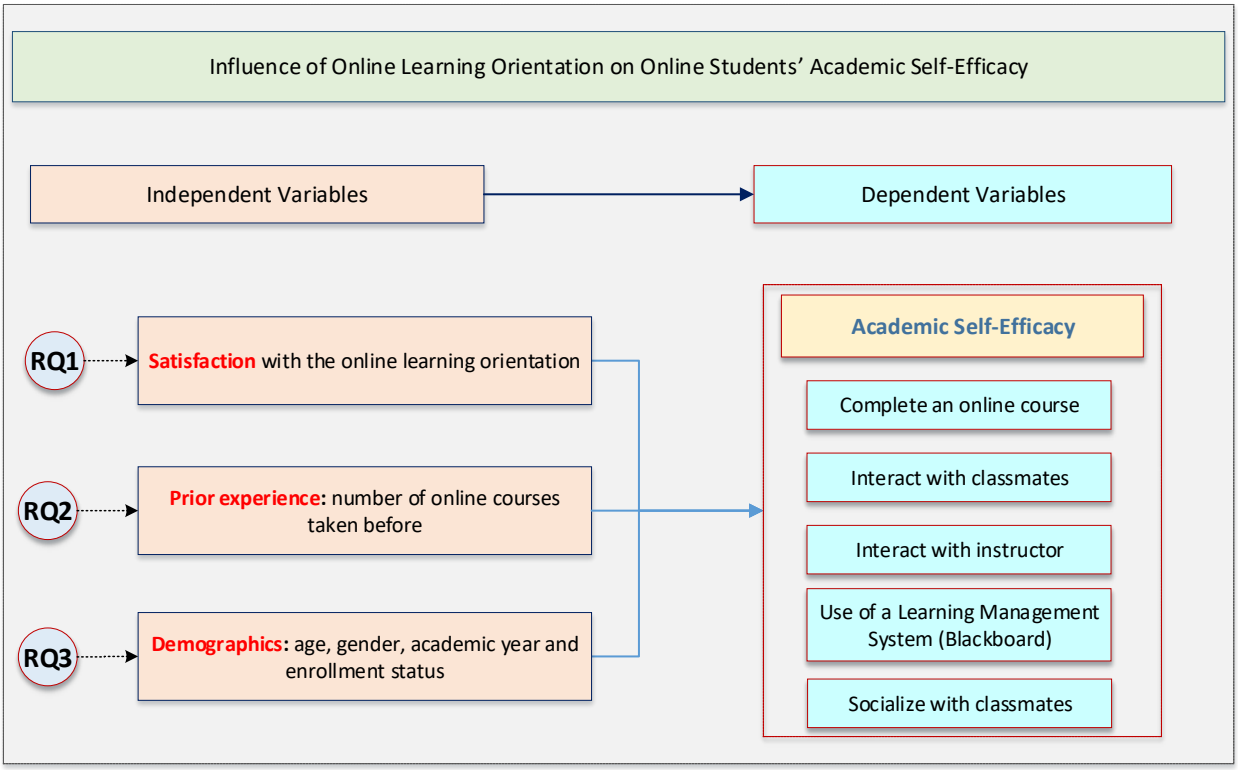

Figure 1. Summary of study variables.

In line with past research conclusions, we expected that students' satisfaction with the OLO would predict their level of ASE. A higher level of satisfaction will yield a stronger sense of ASE. Second, we anticipated that a student's past online learning experience, measured by the number of online courses taken previously, would be positively related to their ASE. Third, we believed that students' demographics were likely to be predictive of their ASE. We anticipated that older students would be more apt to have a higher ASE than younger students. In contrast, we expected that younger students would be likely to have a lower ASE. Regarding gender and status, we expected that freshman (first-year) male students would be more likely to have a lower ASE than freshman (first-year) female students. As for the enrollment status, we anticipated that nontraditional students (part-time students) would be more likely to have a higher ASE than traditional full-time students, even as they juggled course requirements with work and family. Because of their workplace experience, we anticipated that part-time students would be most likely to exhibit a strong self-efficacy.

By conducting this study, we aimed to accomplish three goals: (1) to explore the role of an OLO in fostering various facets of students' ASE (by including multiple dimensions of ASE, we aimed to transcend the narrow focus of past studies on technology-related self-efficacy); (2) to offer an in-depth understanding of the importance of an OLO in encouraging students' preparedness and readiness to take responsibility for their learning (as stated before, engaging students early in the course builds their self-confidence and their readiness to persist and to

succeed); and (3) to share our successful experience with other HEIs interested in designing effective online learning orientations. We aimed to show that a custom-based online learning orientation, as part of an integrated support approach, is an effective proactive strategy in advancing online students' confidence and ASE.

Methods

Background

This study was conducted in a moderate-sized, urban, public university that has been involved in technology-delivered distance learning since the mid-1980s. Between fall 2016 and summer 2017, more than 1,300 courses were offered in an online format. Of these courses, 28% were offered through its Personal Learning Environment (PLE), a proprietary learning management system designed to provide a student-centered learning environment.

Recognizing the need to engage online students early in the process of their coursework, we developed an online learning orientation to enhance students' readiness and confidence in taking online courses. Designed and positioned as the first assignment and embedded as a part of each course offered via the PLE, the orientation's intent is to ease students' transitions into becoming self-directed learners by clarifying the expectations, roles, and responsibilities of online learning. To this end, the orientation offers students multiple opportunities to (1) acquire online study and time-management skills; (2) familiarize themselves with the learning environment (both PLE and Blackboard); (3) assess their computer and technology skills in a risk-free environment; and (4) learn how to seek help and to access resources, all while reflecting on their online learning readiness. Furthermore, the orientation addresses many of the commonly reported misconceptions associated with online courses, such as easiness, low faculty expectations, and low time requirements (Li & Akins, 2005; Mortagy & Boghikian-Whitby, 2010; Waldman, Perreault, Alexander, & Zhao, 2009).

After several iterations of feedback and testing from students, faculty, and staff, the online orientation's content was grouped into topics that contain learning resources, checklists, testimonials from prior students, and videos that describe ease of use. More specifically, the content was organized into two main topics with subtopics:

- Succeeding in an Online Class: Learn how to study online, manage your time, complete assignments and tests, participate and collaborate online, and update technology; and
- Familiarizing Yourself With the Course: Know your faculty, review the syllabus, stay organized, make the most of each module, ask for help, and complete the readiness checklist.

Unlike traditional orientations, our orientation is task oriented, mimicking the online student learning experience. Grounded in effective design practices, such as chunking, diversifying, and highlighting content relevance, the orientation's activities are designed to expose students to the different instructional materials that they will encounter in their online courses. These activities range from simple tasks (such as navigation) to complex tasks (such as time management, planning, and studying techniques). While these activities' authenticity levels might be lower than those in an actual online course regarding expectations and time to completion, they provide students with an opportunity to familiarize themselves with ways to access course content while they acquaint themselves with the use of the online learning environment.

As part of this orientation, students complete a summary checklist to assess their level of preparedness, to determine their ability to use the course's technology appropriately, and to ascertain whether they possess the self-discipline needed to succeed in an online course. This checklist includes seven items on how to succeed in an online class (e.g., "I have reviewed the time management tips and am ready to develop a study routine") and on how to get familiar with the PLE course (e.g., "I can locate each module's assignment instructions"). Taking the time to gain self-awareness and reflect on their readiness strengthens students' time-management skills and their commitment to and engagement with the course. This type of self-assessment is reported to have a positive influence on students' self-regulated learning strategies and self-efficacy (Panadero, Jonsson, & Botella, 2017).

As they conclude the orientation, students rate their satisfaction with its usefulness and design. To maintain the orientation's relevance and effectiveness, respondents' feedback is reviewed and integrated each semester.

Instrument

Our instrument includes the following sections:

1. Demographics information about gender (i.e., male or female), age (i.e., ≤ 21, 22–34, 35–44, 45–54 or 55 & over), academic year (i.e., freshman, sophomore, junior, senior, and graduate), and enrollment status (i.e., traditional or nontraditional).
2. Online course experience. The number of online courses taken before, with the options of 0, 1–5, 6–10, and more than 10.
3. OLO satisfaction. Adapted from past surveys used to measure online students' satisfaction (Waldman et al., 2009; Parkes, Stein, & Reading, 2015; Dray, Lowenthal, Miszkiewicz, Ruiz-Primo, & Marczynski, 2011), this section includes six questions. Using a five-point Likert scale that ranges from 1 (*strongly disagree*) to 5 (*strongly agree*), the questions ask the students how useful, comprehensive, easy, and worthy of their time they deemed the orientation; whether the orientation clarified some of their misconceptions about online learning; and overall, how satisfied they were with the orientation. To measure the student satisfaction scale items' homogeneity, we conducted an internal consistency analysis. With a Cronbach's alpha coefficient of (0.932), this analysis confirmed the reliability of the OLO satisfaction scale.
4. Academic self-efficacy. This section on ASE was adopted from the self-efficacy survey referenced by Shen et al. (2013) and Cho (2012). Reused by Prior et al. (2016), this well-established and validated survey includes five dimensions. Using a 10-point Likert scale ranging from 1 (*not at all confident*) to 10 (*totally confident*), participants are asked to report their confidence on five different self-efficacy subcategories: student's confidence to complete an online course (eight questions), to interact with his or her classmates (six questions), to interact with the instructor (six questions), to use an LMS (six questions), and to socialize with his or her classmates (five questions).

To measure the ASE subcategories items' homogeneity, we performed an internal consistency analysis for each subcategory. The total scale internal consistency of Cronbach's alpha coefficients ranged between 0.976 for using an LMS to 0.921 for social interaction. The Cronbach's values were equally high for students' confidence to complete an online course (0.972) and for students' interaction with both their instructor and their classmates (0.969). (See Table 3 for more details.)

In addition to validating the reliability of the survey scale items, a peer group of professional educators, actively involved in designing, facilitating, and supporting online courses, reviewed our survey. Their feedback cross-validated our survey and led to some minor tweaking of the survey's questions.

Data Analysis

With an alpha level set at .05 for all significance tests, we used IBM SPSS Statistics 25 to analyze our data. For open-ended questions, we used QDA Miner 5, a qualitative data analysis tool, to identify the words most frequently used by the students. To analyze the data, we first conducted a descriptive analysis to describe the demographic profile of the respondents, after which we used multiple response frequencies to characterize the factors associated with self-efficacy. Second, we used cross-tabulation to explore the interaction of our dependent variable with various independent variables. Third, we conducted an ordinal logistic regression to examine the influence of each predictor on its own, followed by a full model that included only significant predictors.

Participants

Between fall 2016 and summer 2017, a total of 4,333 students from six different colleges at the university completed a survey about (a) their satisfaction with the completion of their online learning orientation and (b) their sense of self-efficacy in completing various online learning tasks. Of this diverse population, 3,880 cases with complete data were included in our analysis. Among these respondents, there were more female students (n = 2,518, 64.9%) than male students. Half of the students were between 22 and 34 years of age (n = 1,959, 50.5%) and self-identified as nontraditional part-time college students (n = 2,006, 51.7%). Participants were typically seniors (n = 1,581, 40.7%), followed by juniors (n = 1,172, 30.2%), and then graduate students (n = 452, 11.6%). As to their online learning experience, 45.4% of the students reported having taken from one to five prior online courses (n = 1,763), while 16.8% (n = 650) of the respondents reported that they had never taken an online course before taking this one. More detailed background information is presented in Table 1.

Table 1
Participant Demographics

Variable	*n*	%	Variable	*n*	%
Gender			Enrollment status		
Male	2,518	64.9	Traditional	1,832	47.2
Female	1,308	33.7	Nontraditional	2,006	51.7
Age			Number of online courses taken before		
21 & under	993	25.6	0	650	16.8
22–34	1,959	50.5	1–5	1,763	45.4
35–44	509	13.1	6–10	776	20.0
45–54	270	7.0	11 & over	691	17.8
55 & over	85	2.2			

Academic year		
Freshman	126	3.2
Sophomore	340	8.8
Junior	1,172	30.2
Senior	1,581	40.7
Graduate	452	11.6

Note. (*N* = 3,880)

Results

Descriptive Statistics

As shown in Table 2, with a mean of 4.08 on a 5-point Likert scale, participants expressed a high level of satisfaction with the OLO, particularly with the content usefulness (*M* = 4.21), and ease (*M* = 4.21). These findings were confirmed by the open-ended questions related to students' satisfaction. Students conveyed their satisfaction with the OLO content's helpfulness, ease, and organization. They particularly appreciated the short videos offering self-study strategies presented by past online students. These students' testimonies reinforced the authenticity and the relevance of the OLO content.

Table 2
Descriptive Statistics for Students' Satisfaction With OLO

Satisfaction with OLO and sense of preparedness survey questions	*n*	*M*	*SD*	Min.	Max.
The orientation content is useful.	3,878	4.21	0.748	1	5
The orientation content is comprehensive (answered all my questions).	3,864	4.15	0.783	1	5
The orientation content is easy to complete.	3,874	4.21	0.789	1	5
The orientation content clarified some of my misconceptions about online learning.	3,869	3.94	0.884	1	5
It was worth my time to complete this online orientation.	3,872	3.93	0.95	1	5
Overall, I am very satisfied with the online learning orientation.	3,867	4.08	0.84	1	5

Note. (*N* = 3,888)

In the same vein, students revealed a high level of ASE and confidence. As shown in Table 3, the students' overall ASE mean was 8.46. Among the five aspects of academic self-efficacy, participants felt most confident in using the LMS tools (*M* = 9.03), followed by feeling confident in interacting with their instructor (*M* = 8.77) and with their classmates (*M* = 8.46). Students felt slightly less confident in socializing with classmates (*M* = 7.53), although this confidence level was still high, given the 10-point Likert scale of relevant survey items.

Table 3
Descriptive Statistics of Research Variables: OLO and ASE

Variable	Measure	No. of questions	Min. and max. values	*M*	M/NofQ*	Mdn	*SD*	Cronbach's alpha
OLO satisfaction	(Waldman et al., 2009; Parkes, Stein, & Reading, 2015)	6	6, 30	24.27	4.08	24	4.33	0.932
Complete an online course	(Shen et al. 2013; Cho, 2012)	8	8, 80	67.25	8.41	71	13.1	0.972
Interact with classmates	(Shen et al. 2013; Cho, 2012)	6	6, 60	50.80	8.46	54	10.87	0.969
Interact with instructor	(Shen et al. 2013; Cho, 2012)	6	6, 60	52.62	8.77	57	9.86	0.969
Use of an LMS	(Shen et al. 2013; Cho, 2012)	6	6, 60	54.21	9.03	60	9.17	0.976
Socialize with classmates	(Shen et al. 2013; Cho, 2012)	5	5, 50	37.63	7.53	40	10.57	0.921
Overall ASE		37	8, 80	262.92	8.46	276	46.83	

Note. (N = 3,888). OLO satisfaction is based a 5-point Likert scale (*strongly disagree* to *strongly agree*). ASE is based a 10-point Likert scale (*not at all confident* to *totally confident*).
*M/NofQ: Mean divided by the number of questions.

Contingency Tables

To provide initial insights into our data, we conducted a 2x2 contingency table analysis to look for associations between the self-efficacy and the explanatory variables: satisfaction with the online learning orientation, prior online learning experience, and gender, age, academic year, and enrollment status.

Table 4
Self-Efficacy by Gender, Age, Academic Year, Enrollment Status, Online Learning Experience, and Satisfaction: Cell Counts and Percentages

		1–3 (1 = *not at all confident*)		**4–7 (5 = *moderately confident*)**		**8–10 (10 = *totally confident*)**		**Total**	
		n	**%**	***n***	**%**	***n***	**%**	***n***	**%**
Online students' satisfaction with the online learning orientation	Strongly disagree	4	9.10	7	15.9	33	75.00	44	100
	Disagree	3	2.90	46	45.10	53	52.00	102	100
	Neither agree nor disagree	9	1.00	277	32.10	577	66.90	863	100
	Agree	6	0.40	239	15.40	1,309	84.20	1,554	100
	Strongly agree	0	0.00	26	3.20	778	96.80	804	100
	Total	22	0.70	595	17.70	2,750	81.70	3,367	100
Online learning experience	0 courses	9	1.70	144	27.00	381	71.30	534	100
	1–5 courses	9	0.60	295	19.60	1,203	79.80	1,507	100
	6–10 courses	3	0.40	86	12.40	604	87.20	693	100
	> 10 courses	1	0.20	70	11.00	564	88.80	635	100
	Total	22	0.70	595	17.70	2,752	81.70	3,369	100
Gender	Male	3	0.30	244	22.10	856	77.60	1,103	100
	Female	16	0.70	338	15.20	1,865	84.00	2,219	100
	Total	19	0.60	582	17.50	2,721	81.90	3,322	100

Age	21 and under	5	0.60	197	23.20	646	76.72	848	100
	22–34	11	0.60	273	16.10	1,416	83.30	1,700	100
	35–44	3	0.70	65	14.40	383	84.90	451	100
	45–54	1	0.40	31	13.00	207	86.60	239	100
	55 & over	1	1.30	13	17.30	61	81.30	75	100
	Total	21	0.60	579	17.50	2,713	81.90	3,313	100
Academic year	Freshman	2	2.00	30	30.30	67	67.70	99	100
	Sophomore	3	1.00	52	17.30	246	81.70	301	100
	Junior	3	0.30	168	16.50	847	83.20	1,018	100
	Senior	9	0.70	245	17.8	1,123	81.60	1,377	100
	Graduate	1	0.30	67	17.10	323	82.60	391	100
	Total	18	0.60	562	17.60	2,606	81.80	3,186	100
Enrollment status	Full-time student	12	0.80	307	19.50	1,254	79.70	1,573	100
	Part-time student	9	0.50	277	15.70	1,476	83.80	1,762	100
	Total	21	0.60	584	17.50	2,730	81.90	3,335	100

As we read Table 4 horizontally, we noted the following points:

- Only 3.2% (86) of self-confident students were strongly dissatisfied or dissatisfied with the online learning orientation. In contrast, 75.9% (2,089) of strongly satisfied and satisfied students were highly self-confident. Between these two groups, 21% (577) of strongly satisfied and satisfied students expressed a moderate level of self-efficacy.
- Unsurprisingly, with a result of 71.3%, inexperienced online students (those who have taken zero online courses) were the least self-confident group. In contrast, 88.80% of the students who had completed more than 10 courses felt self-confident. In between these two groups were the 87.7% of students who had completed between six and 10 courses, followed by students who had completed one to five courses (79.8%).
- Regarding gender, female online students showed a somewhat stronger self-efficacy (84%) than their male counterparts (77.6%). Otherwise, the majority of respondents (81.9%, 3,322) felt entirely confident in tackling online course tasks, while only 17.5% of the students felt moderately confident.
- The expression of self-efficacy fluctuated slightly among age groups, between 86.6% for 45–54 years old to 76.72% for students aged 21 and younger. The rest of the age groups expressed the same level of self-efficacy.
- With 67.7%, first-year students expressed the lowest level of self-efficacy among the academic-year group. Sophomore students (81.7%), junior students (83.2%), senior students (81.6%), and graduate students (82.6%) conveyed nearly the same level of confidence in their self-efficacy.
- With 83.8%, the percentage of part-time students' self-efficacy was higher than full-time students (79.7%). In contrast, more full-time students (19.50%) were moderately more confident than part-time students (15.7%).

In summary, descriptive analysis and the two-way tables show a strong relationship between the feelings of self-efficacy and the various explanatory variables. In the next section, we use ordinal logistic regression to examine more closely the influence of each predictor on online students' academic self-efficacy.

Multivariate Analysis: Ordinal Logistic Regression

Since the dependent variable (ASE) is measured at the ordinal level, we used ordinal logistic regression (OLR) to identify which independent variable had a statistically significant effect on our dependent variable (see Figure 1). Deemed as a suitable procedure to analyze the influence of categorical predictors on an ordinal dependent variable, OLR requires two main assumptions: (1) absence of multicollinearity and (2) proportional odds (Osborne, 2016). For the absence-of-multicollinearity assumption, we verified that our predictors were not correlated with each other, by dummy coding our categorical variables (experience, satisfaction, age, and academic year) and by running a linear regression including all the independent variables. The variance inflation factor (VIF) values ranged between .368 and 2.71, which is far below the accepted level of 10. For the proportional odds assumption, we used SPSS's PLUM "Test of parallel lines" procedure to ensure that the effect of each independent variable would be constant across all groups. This assumption was validated for all the predictors except for gender (p = .010). The rejection of this assumption for gender is likely due to the large size of our data set (Osborne, 2016).

Unadjusted effect of predictors. To examine the unadjusted effect of each predictor, we began by including one explanatory variable at a time into the model (Landau & Everitt, 2004). For the sake of brevity, the individual models are summarized in Table 5. Our findings are reported in terms of an odds ratio, Exp(B), which denotes the factor change in the odds of an outcome associated with a one-unit change in the independent variable.

Table 5

Ordinal Logistic Regression Models for the Online Students' Self-Efficacy by Gender, Age, Academic Year, Enrollment Status, Online Learning Experience, and Satisfaction

		B	*SE*	Wald	*df*	Sig.	Exp(B)
Online student satisfaction	Strongly disagree–disagree	-1.735	0.1786	94.338	1	0.000	0.176
	Neither agree nor disagree	-1.338	0.0969	190.670	1	0.000	0.262
	Agree–strongly agree	0*					1
Online learning experience	0 online courses	-1.170	0.1580	54.813	1	0.000	0.310
	1–5 online courses	-0.698	0.1414	24.337	1	0.000	0.498
	6–10 online courses	-0.160	0.1696	0.888	1	0.346	0.852
	> 10 courses	0*					1
Gender	Male	-0.410	.0926	19.607	1	0.000	.664
	Female	0*					1
Age	21 and under	-0.297	0.3062	0.941	1	0.332	0.743
	22–34	0.142	0.3024	0.221	1	0.638	1.153
	35–44	0.263	0.3233	0.663	1	0.416	1.301
	45–54	0.404	0.3511	1.323	1	0.250	1.498
	55 & over	0*					1

Academic year	Freshman	-0.835	0.2521	10.963	1	0.001	0.434
	Sophomore	-0.069	0.1999	0.118	1	0.731	0.934
	Junior	0.041	0.1577	0.068	1	0.794	1.042
	Senior	-0.076	0.1505	0.256	1	0.613	0.927
	Graduate	0*					1
Enrollment status	Full-time	-.273	.0900	9.220	1	0.002	.761
	Part-time	0*					

0*: Reference group.

As reported in Table 5, the odds ratio for unsatisfied students (*strongly disagree–disagree*) to feel self-efficacious was 83% less than that of satisfied students (OR = 0.176, p = .000). Likewise, neutral students' (*neither agree nor disagree*) odds of feeling self-efficacious were 0.26 times the odds of satisfied students (OR = 0.262, p = .000).

Similarly, our data suggested the strong influence of online students' experience on their self-efficacy. Inexperienced online students were 69% less likely to express a high level of self-efficacy than experienced online students who had taken more than 10 online courses (OR = 0.310, p = .000). On a similar note, the odds of feeling self-efficacious among students who took one to five courses was 0.49 times less than that of experienced students (OR = 0.489, p = .000). In contrast, the result of students who had completed six to 10 courses was not significative (OR = 0.852, p = .346).

The influence of gender on students' self-efficacy was found to be significant (OR = .664, p = .000). When compared to online female students, the odds of a student expressing a high level of self-efficacy were 34% lower for online male students. In contrast, when compared to the age group 55 and over, none of the age groups was significative. Overall, online students' age did not predict their academic self-efficacy.

For the academic year, results indicated that freshman students (OR = 0.434, p < .001) were less likely to express a high level of self-efficacy. Contrasted against graduate students, freshman were 57% less likely to feel self-efficacious in completing their online course activities. The remaining students' groups were not significative.

The influence of the students' enrollment status was very significant, as well (OR = .761, p = .002). The odds of expressing a high level of self-efficacy decreased by 26% for full-time students in comparison to part-time students. Hence, part-time students were more prone to express a high level of self-efficacy than their full-time counterparts.

In sum, the individual models reveal that satisfaction, online learning experience, gender, academic year, and enrollment status significantly contribute to the probability of students' expressing a higher level of self-efficacy. Satisfaction appears to firmly influence students' self-efficacy (OR = 0.176, p = .000), followed by experience (OR = 0.310, p = .000) and enrollment status (OR = 0.761, p =.002). In contrast, only the freshman category (OR = 0.434, p =.001) influenced ASE, while none of the age categories exerted any influence on online students' self-efficacy.

Full model. As a follow-up to the individual models, we built a full OLR model with all of the significant predictors (satisfaction, experience, gender, academic year, and enrollment status). The deviance goodness-of-fit test indicated that the ordinal logistic regression model was a good fit to the observed data, $\chi 2(200) = 160.770$, p = .981; however, 35.8% of the cells had zero frequencies (although the Nagelkerke R-square shows that this model explains 15% of the dependent variable variation).

Table 6

Full Logistic Regression Model for Online Students' Self-Efficacy by Gender, Academic Year, Enrollment Status, Online Learning Experience, and Preparedness

		B	*SE*	Wald	*df*	Sig.	Exp(B)
Online student satisfaction	Strongly disagree–disagree	-1.854	0.1933	91.911	1	0.000	0.157
	Neither agree nor disagree	-1.371	0.1030	177.162	1	0.000	0.254
	Agree–strongly agree	0*					1
Online learning experience	0 online courses	-1.295	0.1847	49.159	1	0.000	0.274
	1–5 online courses	-0.778	0.1569	24.579	1	0.000	0.459
	6–10 online courses	-0.189	0.1836	1.059	1	0.303	0.828
	> 10 courses	0*					1
Gender	Male	-0.282	0.1012	7.741	1	0.005	0.755
	Female	0*					1
Academic year	Freshman	-0.633	0.2737	5.348	1	0.021	0.531
	Sophomore	0.054	0.2174	0.061	1	0.804	1.055
	Junior	-0.073	0.1700	0.184	1	0.668	0.930
	Senior	-0.205	0.1630	1.582	1	0.208	0.815
	Graduate	0*					1
Enrollment status	Full-time	-0.028	0.1054	0.072	1	0.788	0.972
	Part-time	0*					1

0*: Reference group.

To flesh out these findings further, let's examine the coefficients reported in Table 6, following the order of our research questions.

RQ1: How does students' satisfaction with the online learning orientation predict their academic self-efficacy? Students' satisfaction with the OLO was predictive of their ASE, thus supporting our first assumption. With all variables held constant, the odds of expressing a high level of self-efficacy by unsatisfied students (strongly disagree and disagree) were .15 times greater than online students who expressed a high level of satisfaction with the OLO (strongly agree and agree). Expressed differently, unsatisfied students were 85% less likely than satisfied students to express a high level of self-efficacy (OR = 0.157, p = .000). Likewise, students who remained neutral about their satisfaction with the OLO (*neither agree nor disagree*) were 75% less likely to express a high level of self-efficacy.

RQ2: How does students' prior online course experience (i.e., the number of online courses taken before) predict their academic self-efficacy? As a whole, students' prior online learning experience predicted their ASE (see Table 6), hence confirming our second research assumption. The full-model data showed a strong influence of online students' experience on their self-efficacy. The greater the number of online courses taken before, the higher the students' academic self-efficacy. Inexperienced online students were 73% less likely to express a high level of self-efficacy than experienced online students who had taken more than 10 online courses (OR = 0.274, p = .000). Similarly, the odds of feeling self-efficacious among students who had taken one to five courses were 0.45 times less than experienced (more than 10 courses taken) students

(*OR* = 0.459, *p* = .000). In contrast, the result for students who had completed six to 10 courses was not significant (*OR* = 0.828, *p* = .303).

RQ3: How do students' demographics (age, gender, academic year, enrollment status) predict their academic self-efficacy? As stated previously, the influence of age and enrollment status on student's academic self-efficacy was not statistically significant. Age was excluded from the full model, while enrollment status was found to be not significant (*OR* = 0.972, *p* = .788).

Gender

As reported in Table 6, gender was found to be statistically predictive of the students' overall academic self-efficacy. For male online students, the odds of having a higher self-efficacy were .755 lower than for female students, a statistically significant effect (*OR* = 0.755, *p* = .005). In line with our initial assumption, the odds of a male student having a high self-efficacy were 25% less than those odds for a female student.

Academic year

In general, students' academic year predicted their overall self-efficacy. The full-model results showed that freshman students (*OR* = 0.531, *p* = .021) were less likely to express a high level of self-efficacy. Contrasted against graduate students, freshmen were 47% less likely to convey a high level of ASE. Findings for sophomore, junior, and senior students were not significant.

Discussion

Considering the role of an online learning orientation in fostering students' readiness, confidence, and ASE, this study examined the predictive utility of three items—students' satisfaction with an OLO, their prior level of online learning experience, and their demographics—on their ASE.

The first question explored the predictive utility of students' satisfaction with the OLO for their ASE. Our findings echo previous studies on the influence of an OLO on ASE (Bawa, 2016; Brewer & Yucedag-Ozcan, 2013; Russo-Gleicher, 2014; Scheitler, 2015; Wäschle et al., 2014). As indicated by both the full and the individual models, students who felt highly satisfied with the online learning orientation conveyed a strong sense of ASE. More specifically, satisfaction with the OLO strongly predicted students' self-confidence to use the LMS online tools (*OR* = 0.144, *p* = .000), followed by their self-confidence to interact with their classmates and instructor (*OR* = 0.179, *p* = .000), and to socialize with their classmates (*OR* = 0.190, *p* = .000). Students' confidence to complete the online learning tasks registered a slightly higher ratio (*OR* = 0.218, *p* = .000). These findings validate the full model as well as the descriptive statistics displayed in Table 3.

Otherwise, the stronger the students' satisfaction with online learning, the stronger their ASE in completing various tasks associated with online learning. These findings emphasize the role of an OLO in preparing and engaging online students to progress successfully in their online courses (Bawa, 2016; Wozniak et al., 2012). Therefore, the use of a learner-centered OLO, with authentic learning activities that mimic course activities, is crucial to online students' success. Offering students multiple opportunities to clarify their course expectations and to become familiar with the online learning course environment, logistics, and technology should increase their

confidence in completing their course successfully. To sum up, we contend that the inclusion of an OLO is one of the best strategies to build students' ASE and to avoid thwarting their initial enthusiasm for online learning (Motteram & Forrester, 2005; Scheitler, 2015).

Our second question examined the influence of prior online course experience (i.e., the number of online courses taken before) on students' ASE. Again, our conclusions support past studies in underlining the role of experience in fostering ASE. In line with Dupin-Bryant (2004), Shea and Bidjerano (2010, 2014), and Zimmerman and Kulikowich (2016), our results indicate that prior experience with online learning mediates students' ASE. The higher the number of online courses taken previously, the higher the ASE, particularly for completing online course activities. In fact, the odds of having a higher self-efficacy for completing online course activities are .26 times lower for inexperienced students (OR = 0.268, p = .000). The remaining ASE dimensions had similar odds, ranging between .344 for confidence in using the LMS tools to .404 for socializing with classmates. Again, the predictive utility of the prior experience for ASE categories shows a positive relationship between prior online course experience and ASE. Online students seem to use their experience as a booster for their confidence and their ASE. These conclusions are consistent with past research that underscores the role of prior learning experience in expressing a high ASE (Scheitler, 2015; Shen et al., 2013; Zimmerman & Kulikowich, 2016); hence, there is a need to ensure a positive and satisfying first online learning experience.

Our third question explored the influence of students' demographics (age, gender, academic year, and enrollment status) on their ASE. While our findings corroborate past research about the influence of gender on ASE (Chyung, 2007; Shen et al., 2013), academic year revealed that only the freshmen category influenced students' ASE. On the contrary, our full model's findings failed to provide evidence for the influence of age and enrollment status on ASE. While the coefficient was not significant for age, the odds ratio values showed that students aged 21 years and younger were .74 times less likely to feel self-efficacious, when compared to students older than 54 years old. As for the student type, full-time students expressed almost the same level of self-efficacy as part-time students (OR = 1.098, p = .431).

In sum, the descriptive and multivariate analysis provides additional evidence reinforcing the use of an OLO as a proactive support strategy that fosters students' confidence and academic self-efficacy. Given the active role played by ASE in students' success and persistence, it is safe to contend that use of an OLO could increase the odds of students' success and persistence as well.

Limits and Future Research

Despite our research findings, we must acknowledge at least two limitations. First, by relying exclusively on self-reported data, we run the risk that participants are likely to overestimate their ASE and confidence. Thus, students may be prone to overestimate their ASE and their technological skills. Nevertheless, objective testing of ASE is onerous and burdensome to implement. Also, self-reports are widely used and trusted in institutional research if the instruments used are designed according to research standards (Gonyea, 2005).

Second, while ASE is a strong predictor of students' academic success and persistence, an exploration of the relationship between OLO and ASE does not inform us about students' persistence and success. While past research confirms the existence of a positive correlation between ASE and students' performance and success (Honicke & Broadbent, 2016; Richardson et

al., 2012), the relationship between OLO and students' performance and persistence remains unexplored.

To address this second limitation, further research exploring the influence of OLO on students' learning outcomes and persistence is needed. More specifically, researchers should conduct a longitudinal study to gain an in-depth understanding of the way in which the use of an OLO affects students' learning outcomes and persistence. Using data from various online learning programs, future research should track the way in which this relationship changes over time. These studies should provide empirical evidence that the inclusion of an OLO can be a significant driver in the success of online students.

Seen from another angle, future research will benefit from following up with the students surveyed in this study and asking them specifically how the orientation helped them to learn how to learn online. Such follow-up will also allow us to adjust the orientation to students' needs and learning experience.

Conclusion and Recommendations

This study was conducted to assess the predictive utility of the students' satisfaction with the OLO, their level of prior learning experience, and demographic factors on online students' ASE. By reinforcing past evidence about the role of an OLO in preparing online students to persist and succeed, our study reiterates the need for designing an effective and student-centered OLO. Our findings highlight the importance of an OLO in strengthening ASE and students' self-directed learning abilities, while it provides additional evidence about the role of prior learning experience and gender. To this end, we offer the following recommendations:

- Provide students with a well-designed and timely OLO to ease their transition to online learning and to foster their preparedness, persistence, and success. As a proactive strategy intended to build students' confidence, motivation, and skills, the OLO should focus on clarifying course expectations while clearing out misconceptions and helping students develop the habit of self-regulated study skills. Together, these elements should enable students, particularly newcomers, to learn how to learn online, and eventually to be able to use these skills in future online courses.
- Use analytics to track students' interaction with the OLO from one semester to another to detect patterns in study habits, and then use the data gathered to provide responsive, targeted, and ongoing support throughout the semester. Using students' feedback to refine the OLO is likely to strengthen the relevance and the usefulness of the orientation while helping students to develop self-regulatory learning strategies.
- Design course content and activities with clear guidelines and instructions, both to clarify course expectations and to ease students' apprehensions and worries. Doing this should help HEIs avoid thwarting students' initial enthusiasm for online learning, which often leads to students' dissatisfaction and attrition. Answering simple questions, such as "what do I do now?" can go a long way toward helping an online student persist and succeed.

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One Size Does Not Fit All: Toward an Evidence-Based Framework for Determining Online Course Enrollment Sizes in Higher Education

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Abstract
Class enrollment sizes for online learning in higher education, a topic of persistent interest in the academic literature, impact student learning, pedagogical strategies, school finances, and faculty workload. Yet in the research literature, class size is addressed with insufficient specificity to provide enrollment direction. Seeking guidelines for determining online class sizes, the authors conducted a qualitative research synthesis from 43 recent higher education journals, yielding 58 evidence-based articles. It is clear that no one size fits all. Findings reflect that large classes (≥ 40 students) are effective for foundational and factual knowledge acquisition requiring less individualized faculty–student interaction. Small classes (≤ 15 students) are indicated for courses intending to develop higher order thinking, mastery of complex knowledge, and student skill development. Pedagogical intent should dictate class size. Using well-established learning theories, the authors describe current understandings of online enrollments and propose an analytical framework for pedagogically driven, numerically specific class sizes.

Highlights:

- There is academic interest in online course sizes in higher education.
- Research indicates "no one size fits all" online classes.
- Class sizes should be based on learning level and identified pedagogical intent.
- Large classes are appropriate for foundation-level learning.
- Small classes are appropriate for learning requiring higher order thinking.

Keywords: class size, online pedagogy, objectivism, constructivism, Bloom's taxonomy, community of inquiry

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One Size Does Not Fit All: Toward an Evidence-Based Framework for Determining Online Course Enrollment Sizes in Higher Education

> A few years ago, I [was] trying to come to grips with the implications of Massive Open Online Courses (or MOOCs). They were supposed to be the innovation that would not only make most college professors obsolete, but force countless colleges to close as every student would prefer to hear Harvard's best lecture rather than get their course content from the community-college professor in their neighborhood. Of course, any college professor who cares one whit about teaching understands that education involves a lot more than just conveying information…. If we automated learning, information would still travel from the brain of the professor to the brain of the student, but we'd never know exactly how well students understood it. You might as well just hit 'play' on a tape of someone else's lecture, then leave the room to do something else. (Rees, 2017, paras. 7–10)

In the past 15 years, many higher education institutions have been transformed by the adoption and implementation of distance learning programs. Choices for students now range among going to a traditional college and taking all courses face-to-face, taking some courses face-to-face and others online, not stepping onto a college campus and taking courses online, and acquiring an entire degree online. Online learning in universities has come of age and, with its developing maturity, has triggered a need to understand factors influencing how effectively students learn via distance education. Policies on online learning and class sizes are among those that college faculty view as overdue for examination (Richardson, Koehler, Besser, Caskurlu, Lim, & Mueller, 2015).

Class size is a recurring and perennial issue in the economics of education. It invokes an evaluation of education *production* versus education *costs*, consequential implications for resource generation and allocation (Russell & Curtis, 2013). The effects of class size on the degree and quality of learning have been debated and studied for decades at the K-12 level of formal education (e.g., Blatchford, Bassett, & Brown, 2011; Sapelli & Illanes, 2016), and, more recently, in higher education (Chapman & Ludlow, 2010; Richardson et al., 2015; Tynan, Ryan, & Lamont-Mills, 2015; Watson, Handel, & Maher, 2016). To this day, however, there has been no conclusive evidence by which university administrators determine enrollment sizes for online courses (Udermann, 2015). This article presents the accumulated research evidence on online education class size, examines relevant theories of pedagogical intent and methods for college courses, presents an analytical framework for enrollment decisions, and proposes specific numbers to stabilize class-size categories from small to large.

Background

New learning technologies developed in the early 21st century prompted universities to develop distance learning strategies. Many university administrators pursued market expansion through the development of online courses, and with them an increase in student enrollment for purposes of revenue generation and/or cost reduction (Benton & Pallett, 2013; Chapman & Ludlow, 2010; Chen, deNoyelles, Zydney, & Patton, 2017; Colwell & Jenks, 2004; Diette & Raghav, 2015; Jones, 2015; Maringe & Sing, 2014; Mupinga & Maughan, 2008; Pelech et al., 2013; Russell & Curtis, 2013). In the rapidly changing technology-driven conditions within universities, an upward creep of online class sizes emerged and began to raise faculty concerns that educational effectiveness could be threatened (Jones, 2015; Ravenna, 2012; Seethamraju,

2014; Smith, Brashen, Minor, & Anthony, 2015; Snowball, 2014). Indeed, throughout this period of online growth there appears to have been little systematic application of learning theory principles to decisions on a cluster of issues arising for online courses: class sizes, effective pedagogical methods, rising university costs and revenues, faculty workload, and accommodating diverse student learning needs (Tynan et al., 2015; Mupinga & Maughan, 2008).

There is an acknowledged lack of consensus on how class size affects learning in online university courses (Gleason, 2012; Haynie, 2014; Maringe & Sing, 2014; Udermann, 2015). In class size research, the lack of consensus likely results from there being too many relevant variables to capture, measure, and control consistently across settings (e.g., Arias & Walker, 2004; Arzt, 2011; Kingma & Keefe, 2006; Lai, 2015; Lindley, Ashwill, Cipher, & Mancini, 2017; Mandel & Sussmuth, 2011; Maringe & Sing, 2014; Monks & Schmidt, 2011; Morrison, 2015; Palmer & Smith, 2013; Richardson et al., 2015; Walls, 2016). Alternatively, perhaps findings on class sizes could lead to implications that would be perceived as a threat to university finances, or pique political sensitivities regarding varying populations' access to equal educational opportunity (Colwell & Jenks, 2004; Curriculum Committee, 2011–2012; Diette & Raghav, 2015; Maringe & Sing, 2014; Russell & Curtis, 2013). Whatever the reasons, no existing convergence of research evidence provides guidance for determining optimal online class sizes at different educational levels and under varying contextual conditions—that is, *no one size fits all* (Beattie & Thiele, 2016; Bettinger, Doss, Loeb, Rogers, & Taylor, 2017; Bristol & Kyarsgaard, 2012; Chapman & Ludlow, 2010; Cheng, 2011; Colwell & Jenks, 2004; Curriculum Committee, 2012; Freeman, 2015; Haynie, 2014; Hewitt & Brett, 2007; Horning, 2007; Johnson, 2010; Kim, 2013; Lee, Dapremont, & Sasser, 2011; Liu, 2012; Mandernach & Holbeck, 2016; Morrison, 2015; Mupinga & Maughan, 2008; Parks-Stamm, Zafonte, & Palenque, 2016; Qiu, Hewitt, & Brett, 2012; Ravenna, 2012; Roby, Ashe, Singh, & Clark, 2013; Russell & Curtis, 2013; Seaton & Schwier, 2014; Shaw, 2013; Sorensen, 2014, 2015; Taft, Perkowski, & Martin, 2011; Tynan et al., 2015; Walls, 2016; Watson et al., 2016).

An extensive research base supports the efficacy of both in-person and online instruction across university academic disciplines and for many, if not all, types of learning (e.g., Benbunan-Fich, Hiltz, & Harasim, 2005; Means, Toyama, Murphy, Bakia, & Jones, 2010; Xu & Jaggars, 2014). The equivalence of learning online versus face-to-face in the cognitive domain is well-supported by research. Learning efficacy is less established for skills learning, role modeling, or student socialization into a discipline, and for lower performing students (Artemiou, Adams, Vallevand, Violato, & Hecker, 2013; Benton & Pallett, 2013; Bettinger & Loeb, 2017; Jones, 2015).

In a relatively short period, methods of effective online instruction/course delivery and student learning have been explored and documented by educational researchers, but no consistent results exist on practices associated with class size decisions. By eliminating the constraints of brick-and-mortar spaces, the rise of distance learning has revealed that college courses have *no inherent or clear class size parameters* (Pelech et al., 2013; Sorensen, 2014), nor have universities developed a *framework* for examining relevant parameters and making educationally informed decisions on online class size.

We define *class size* in universities as the number of students assigned to a single teacher in any given college or postgraduate course. Determining whether a course has one teacher or more is complicated by the presence of a professor and support staff, such as teaching assistants or facilitators. Some degree of skilled support may be efficient for a professor handling a large lecture

course, but there will be elements of the teaching task—designing the course, possessing deep subject matter knowledge, addressing complex issues, grading advanced work, giving expert feedback—that require the professor's singular knowledge and experience. To keep the calculations in this article simple, we adhere to the definition of class size as number of students assigned to a single instructor. Yet in enrollment decisions, each institution and each researcher that hopes to think clearly about class size needs to seek a consistent way to address the nexus of student numbers, staffing, and pedagogical methods.

Traditionally, universities have followed an implicit set of assumptions about the "right" class size. Lower division undergraduate courses have tended to be lecture based and large, often intended for the transmission of factual and foundational information to students (Maringe & Sing, 2014). As students progress into upper division courses in their major and minor fields of study, class sizes have tended to fall; by senior year, medium-sized and smaller seminar-sized courses become more common. Graduate programs follow a parallel trend, with early courses tending toward a medium size and later courses reducing enrollments to smaller seminars (Holzweiss, Joyner, Fuller, Henderson, & Young, 2014). Doctoral courses are typically taught in small seminars. While the reasoning behind these course size patterns is rarely made explicit, educational theories suggest that varying class size based on level of student educational development is an inherently sound approach (Taft et al., 2011).

As demonstrated in these established college course enrollment practices, undergraduate and graduate courses are implicitly assigned different sizes across the 4-year undergraduate and the 2- to 5-year graduate learning cycles. Different sizes have persisted across learning levels, are normative, and reflect longevity. That is, undergraduate and graduate courses decline in size as learning level rises, while learning that moves beyond factual knowledge to the development of students' abilities to exercise critical thinking and judgment, often in the face of complexity, calls for smaller student–faculty ratios (Walls, 2016).

With the growth of online learning, new demands have caused the faculty role to expand. While maintaining mastery of the subject matter and pedagogy, faculty now are challenged to learn and apply ever-changing course technologies, maintain currency in emerging learning media, assume new teaching role tasks, and adapt course structures to online learning environments using current instructional designs (Jones, 2015). Additionally, across disciplines many faculty do not have a sound understanding of current learning theories that guide optimal student learning online. In their pedagogical choices, faculty tend to rely on personal experience—how *they* have been taught, trial and error, and intuition—rather than evidence-based pedagogical research. There is rising consensus that becoming an effective online teacher requires the integration of knowledge of subject matter content, learning theory pedagogy, and digital technologies. To these ends, faculty must become lifelong learners in areas outside their disciplinary expertise (Mbati & Minnaar, 2015; Tynan et al., 2015).

A sizeable research literature exists on methods of effective online education. Multiple factors are reported to mediate the relationship between acts of teaching and actual student learning, including course level and subject matter complexity; the extent and nature of student diversity in courses; number of course-specific intensive grading assignments necessitating faculty feedback; faculty experience teaching online; adequacy of university information technology support services; user-friendliness and technical stability of the online platform; faculty workload policy; and course enrollment sizes. While research results are somewhat mixed, teaching online has generally been acknowledged to be *more time-consuming and labor-intensive* than face-to-

face teaching (Freeman, 2015; Jones, 2015; Maringe & Sing, 2014; Mupinga & Maughan, 2008; Sorensen, 2014, 2015; Sword, 2012; Taft et al., 2011; Tomei, 2006; Tynan et al., 2015). Greater labor intensity in teaching online combined with expanded role responsibilities heighten faculty frustrations associated with large class sizes.

Additional support for the relevance of class size comes from the *U.S. News and World Report* college rankings scoring system that, under the category of faculty resources, ranks colleges' quality by awarding credit for undergraduate classes with fewer than 20 students. It assigns minimal to no scoring credit for classes with 40 or more students (Morse, Brooks, & Mason, 2018; Udermann, 2015).

As faculty members from two different colleges of nursing, the authors have ridden the wave of distance learning inception and growth at their universities, and in the process have observed the need to bring sound learning theory principles to bear on course enrollment decisions (cf. Benton & Pallett, 2013; Salley & Shaw, 2015). We have experienced the push and pull of revenue pressures conflicting with faculty-perceived goals of quality student learning. University administrators can—and in some settings do—raise enrollment numbers in courses without examining the impact on students' attainment of learning objectives (Maringe & Sing, 2014; Mupinga & Maughan, 2008; Qiu et al., 2012; Russell & Curtis, 2013; Snowball, 2014; Tynan et al., 2015). In talking with peers from across the United States, the authors heard the echo of a question that education researchers have asked for decades: *What is the right balance between an institution's financial goals in online education courses (i.e., raising enrollment levels) and the quality of the education experience for online students* (Colwell & Jenks, 2004)? What are enrollment best practices? How do we objectively determine whether classes are too big or too small? Policy decisions about appropriate class sizes have engaged the authors personally, and been recognized by faculty in other college settings, as a potentially charged issue between university administration and faculty. Our research found that university practices justifying online course sizes are virtually unsupported by educational theory or evidence.

According to the Curriculum Committee of the Academic Senate for California Community Colleges (2012), course enrollment sizes are important academic concerns. The Committee concluded that

> appropriate course enrollment maximums are an essential aspect of guaranteeing the quality of instructional programs. Colleges must consider many factors in establishing these enrollment limits, including … instructor workload, and the fiscal viability of the institution. However, the primary basis of any determination regarding enrollment maximums should be the *pedagogical factors that influence the success of the students in the course* [emphases added]. …
>
> In the end, the goal is to find the right balance between maximizing learning opportunities for students and assuring program and college viability. While these two perspectives are not always in conflict, when they do conflict, finding the right ratio should be based first on the pedagogical factors that facilitate student success. (pp. 1, 3)

Indeed, attaining both educational effectiveness and fiscal responsibility in universities are goals to be honored. The authors of this article fully respect the need for schools to generate revenues in excess of their expenditures. We recognize that there are justifiable reasons for courses that can accommodate large enrollments even while others require small ones.

Literature Review

Given the financial and educational impacts of class sizes on universities, this study explored recently published research from 43 online education journals for guidance on establishing online class sizes. We identified 58 articles relevant to the topic. (Please note that the Methods section describes journal and article selection procedures.)

The 58 reviewed studies on class size displayed considerable variation in research purpose, contexts, and theory. Study foci, for example, spanned variables such as the relationship between class size and student achievement; student perceptions of the learning experience; student communication and participation behaviors; skill development; differentials in student learning levels; and how diverse student bodies were affected by class size. Others considered size relative to course design features and differences among selected learning technologies. Additionally, some articles focused on the time expenditures of faculty workloads, pedagogical choices, and students' evaluation of instruction in small versus large courses. Across studies, little attention was paid to class size differentiation between undergraduate and graduate courses. While the selected articles commonly used terminology such as "small," "medium," and "large" to describe class sizes, only 18 provided specific recommendations for numbers of students, and even these were not consistent with each other. For readers interested in details of the reviewed studies, annotated summaries are displayed in Table 1.

Table 1.

Summary of Reviewed Articles Addressing class Size (n =58)*

Author(s), Date, Title, and Journal	Focus	Recommendations [Related Educational Theory]
Artemiou, E., Adams, C.L., Vallevand, A., Violato, C., & Hecker, K. G. (2013). Measuring the effectiveness of small-group and web-based training methods in teaching clinical communication: A case comparison study. *Journal of Veterinary Medical Education, 40*(3).	Study's objectives were to (1) assess the effectiveness of small-group face-to-face and web-based methods for teaching communication skills, and (2) identify which training method is more effective in helping students to develop communication skills.	Study results showed that (1) small-group training was the most effective teaching approach in enhancing communication skills and resulted in students scoring significantly higher on the postintervention measure of skills. "Small-group" size not identified. [Objectivism–constructivism, CoI]
Batts, D. (2008, December). Comparison of student and instructor perceptions of best practices in online technology courses. *Merlot Journal of Online Teaching and Learning, 4*(4).	Applied to online environments, study investigated the perception of students and instructors re: the use of Chickering & Gamson's (1987) "Seven Principles for Good Practice in Undergraduate Education." Principles with high scores in the courses included student–faculty contact and prompt feedback; low scores on 4 of the 7 principles: active learning, cooperation among students, time on task, and diverse talents and ways of learning.	Only 3 of the 7 principles had perceived course means of medium to high. Administrators should consider institutionalizing the principles by training, assessment, and course design. An area where administrators can assist faculty is to keep online class size low enough to create a sense of community. "Low enough" not designated. [Objectivism–constructivism, CoI]
Beattie, I. R. & Thiele, M. (2016). Connecting in class? College class size and inequality in academic social capital. *The Journal of Higher Education, 87*(3).	At a public research university, researchers studied college students' interactions with professors and peers about academic matters. Such interactions create social capital and result in better student outcomes. Larger classes were found to hinder a key type of beneficial student engagement: student-initiated discussions with professors and peers across campus about academic and career matters. Classes were all face-to-face.	Compared to students enrolled in smaller classes, those in larger classes had significantly fewer interactions with professors about course material and with peers about course-related ideas. Class size negatively influenced first-generation students' likelihood of talking to professors or TAs about ideas from class. For Black and Latino students, larger classes also had profound negative effects on initiating discussions of future careers. [CoI]

*Unless noted in first column, all articles are from peer-reviewed journals.

Author(s), Date, Title, and Journal	Focus	Recommendations [Related Educational Theory]
Bedard, K., & Kuhn, P. (2008). Where class size really matters: Class size and student ratings of instructor effectiveness. *Economics of Education Review, 27*(3).	Examined the impact of class size on student evaluations of instructor performance using data on all economics classes offered over 7 years at a large western university; controlled for both instructor and course fixed effects.	Found a consistently large negative impact of class size on student evaluations of instructor effectiveness.
Benton, S. L., & Pallett, W. H. (2013). Class size matters. *Inside Higher Education*. Retrieved from https://www.insidehighered.com/views/2013/01/29/essay-importance-class-size-higher-education Not research-based or peer-reviewed.	Correlates of smaller class sizes are more creativity and communication skills; more challenge; higher levels of thinking on Bloom's taxonomy; more inspiration from instructor, more motivation, enthusiasm; more effort by students and better study/work habits; higher student satisfaction and ratings of instructor; positive attitudes about the discipline; and greater student average progress on course objectives.	Categorized class size as small (10–14), medium (15–34), large (35–49), and very large (50+). Instructors vary course objectives based on class size: In very large classes they are more likely to emphasize learning factual knowledge, low on Bloom's taxonomy, and less likely to stress research projects, developing oral & written communication skills, and creativity than are those in small & medium classes. [Objectivism–constructivism, Bloom's taxonomy, CoI]
Bettinger, E., Doss, C., Loeb, S., Rogers, E., & Taylor, E. (2017). The effects of class size in online college courses: Experimental evidence. *Economics of Education Review, 58*.	Study used a large sample; examined class size effects on student success in the course and on student persistence in college. Found little evidence of class size effects for a range of course types. Study could only estimate the short-term—not the long-term–effects of increasing class size.	For online classes with an average of 30 students, increasing the class size 10% did not significantly affect student grades, enrollment in the next term, or credits attempted the next term. Tested only small changes in class sizes, and thus results unlikely to be applicable to large changes in class size, such as increasing numbers ≥ 25%.
Bettinger, E., & Loeb, S. (2017). Promises and pitfalls of online education (Forthcoming publication in a peer-reviewed journal). Brookings. Retrieved from https://www.brookings.edu/research/promises-and-pitfalls-of-online-education/	Study comparing students in online vs. face-to-face courses used data from DeVry University, a large for-profit college with an undergraduate enrollment of more than 100,000 students. Courses were offered largely identically, online, and in-person. Included data from over 230,000 students enrolled in 168,000 sections of more than 750 different courses. Equivalence of student population characteristics online vs. face-to-face not clarified in methodology.	Found that students in online courses performed substantially worse than students in traditional courses; experience in the online courses impacted students' future class performance while increasing the likelihood of dropping out of college. The negative effects of taking online courses were concentrated in the lowest-performing students. Concluded that online courses yielded worse average outcomes than in-person courses.
Betts, K. (2008). Online Human Touch (OHT) instruction and programming: A conceptual framework to increase student engagement and retention in on-line education, Part 1. *MERLOT Journal of Online Learning and Teaching, 4*(3).	Implemented an interactive and personalized approach to online education at one university program, resulting in high student retention rates and high levels of student satisfaction.	The graduate level academic program in this study typically did not have more than 20–25 students in an online course, and less than 20 students in specialization courses.
Bristol, T. J., & Kyarsgaard, V. (2012). Asynchronous discussion: A comparison of larger and smaller discussion group size. *Nursing Education Perspectives, 33*(6).	Studied differences in student outcomes for class sizes of 12 vs. 23. Mixed results.	No statistically significant difference in student outcomes for group size or strategy. But the data suggested that smaller group size would help students "dig deeper" into the content being explored. Recommends studies on class size and students' critical thinking abilities. [Objectivism–constructivism, Bloom's taxonomy]

Author(s), Date, Title, and Journal	Focus	Recommendations [Related Educational Theory]
Chapman, L., & Ludlow, L. (2010). Can downsizing college class sizes augment student outcomes? An investigation of the effects of class size on student learning. *The Journal of General Education, 59*(2).	After student effort and instructor quality were controlled, study used student course evaluations to examine the relationship between class size and perceived student learning. Data provided through student ratings of instruction from a single university instructor's courses of a total of 109 classes, taught for over 20 years. In classes ranging from 3–52 students, 2,360 students filled out the evaluations. The courses ranged from undergraduate to doctoral-level seminars. Many instructors were aware that course and instructor ratings have been found to be negatively related to their class sizes. Class size influences how instructors design their pedagogies.	For each additional 10 students in an undergraduate or graduate class, this study found a 4% statistically significant negative relationship between class size and perceived student learning, and between class size and students' ratings of the instructor. Student engagement was positively associated with students' perceived learning. Neither student nor instructor variables individually or collectively offset the negative effects of larger classes. While increasing class sizes during times of increased education costs presents a relatively seductive way to save money, it introduces a burden to learning that is difficult for students and instructors to overcome, despite their best efforts.
Cheng, D. A. (2011). Effects of class size on alternative educational outcomes across disciplines. *Economics of Education Review, 30*(5).	Study used self-reported ratings of student learning and instructor and course recommendations as the outcome measure to estimate class size effects across 24 disciplines. Different disciplines had highly variable class sizes, some into the hundreds. The data spanned 24 departments, 2,110 courses, 1,914 instructors, and 10,357 observations from fall 2004 to spring 2009.	Overall, this study found that greater class size had negative and significant effects on student satisfaction in 4 disciplines, statistically insignificant effects on outcomes in 10 disciplines, and inconclusive or mixed effects in 10 disciplines. Author's view is that no discipline benefits from increasing course enrollments.
Colwell, J., & Jenks, C. (2004). The upper limit: The issues for faculty in setting class size in online courses. *Teaching Online in Higher Education 2004 (TOHE) Conference Proceedings*. Retrieved from: https://www.utm.edus/departments/ncate/ documents/015__ theupperlimit.pdf	This presentation asks the question, What is the right balance between the economic issues of online instruction and the quality of the education experience for the asynchronous online student? Faculty can face pressures from administrators to maximize class sizes in online courses to make them more efficient or profitable. It is the authors' opinion that this is an opportunity for profit only at the expense of educational quality or professors. There is consensus that higher order thinking in online courses requires both much more development and interaction time than do traditional courses. Some researchers agree that distance education is not cost-efficient.	Class size is inconsistent from department to department within a university, as well as between higher education institutions. Anecdotally, class size for online courses varies. From survey data, size varies from 1–100 to many hundreds of students. Often, there is no standard on class size limits for online courses within an institution. Too few students in a course often yield difficulty generating meaningful discussions; too many create an excessive number of messages, causing frustration for group members who cannot keep up. Group size must be sufficiently large to encourage activity but not so large that the sense of group connectedness is lost. This presumes that communication is occurring between the instructor and the students *and* among the students themselves. Authors recommend a maximum course size of 20 students for undergraduate courses and 8–15 for graduate courses. [Bloom's taxonomy]

Author(s), Date, Title, and Journal	Focus	Recommendations [Related Educational Theory]
Curriculum Committee, The Academic Senate for California Community Colleges. (2012). Setting course enrollment maximums: Process, roles, and principles. Retrieved from http://www.asccc.org/sites/default/files/ClassCapsS12_0.pdf Not a peer-reviewed source	Appropriate course enrollment maximums are an essential aspect of guaranteeing the quality of instructional programs. Colleges must consider many factors in establishing these enrollment limits, but the primary basis of any determination regarding enrollment maximums should be the pedagogical factors that influence the success of the students in the course, including the following: • faculty time spent assessing/evaluating student work, • volume of written work, • volume of discussions, and • course outcomes demanding more higher order, complex thinking skills from students. Class size determinations should be shared with the bargaining unit and included in the faculty union contract. Courses addressed were face-to-face.	The number of students in the class should be appropriate to the method of teaching used in the class (e.g., lecture, lab, discussion); conducive to the use of a variety of effective grading processes (e.g., writing assignments, discussions, exams); aligned with course outcomes demanding more higher order, complex thinking skills from students; and expected faculty time spent assessing/evaluating student work. Students should receive timely and constructive feedback (formative and summative) on assignments in as many ways as possible. The National Council of Teachers of English (NCTE) recommends a class size of 20 for college English courses and 15 for basic skills courses. The American Mathematics Association of Two Year Colleges recommends a ratio of 30 students for one teacher. [Objectivism–constructivism, Bloom's taxonomy, CoI]
De Giorgi, G., Pellizzari, M., & Woolston, W.G. (2012). Class size and class heterogeneity. *Journal of the European Economic Association, 10*(4).	Study of a single university's 1,100 undergraduate students in management, finance, and economics. Classes large: 64–172, with an overall mean of 135 and a standard deviation of 28. Courses were face-to-face.	Study found that class size had a small but substantial impact on student academic performance. A reduction in class size by 20 students increased the average grade by 0.1 standard deviations; the effect of class size on student performance was larger for men and for lower income students.
Diette, T. M., & Raghav, M. (2015). Class size matters: Heterogeneous effects of larger classes on college student learning. *Eastern Economic Journal, 41*(2).	Study examined the relationship between class size and student achievement at a selective liberal arts college. Classes had a mean of 20.2 and a standard deviation of 11 students. Findings suggested that attempts to control costs harm students, particularly those least likely to graduate.	Study found that grades of students decrease as class size increases. Relatively vulnerable students, such as first years or those with low SAT scores, experienced, on average, larger negative effects from increases in class sizes.
El Tantawi, M. M. A., Abdelsalem, M. M., Mourady, A. M., & Elrifae, I. M. B. (2015). e-Assessment in a limited-resources dental school using an open-source learning management system. *Journal of Dental Education, 79*(5).	The aim of this study was to evaluate the use of an e-assessment tool on students that was provided through an open-source learning management system at a limited-resources dental school. Studied students' perceptions of the e-assessment, a single and summative evaluation of learning. Classes large, with 285 students registered in two courses.	Using e-assessments with large numbers of students was efficient for testing students' learning of factual information. Study concluded that e-assessment can be used at minimal cost in schools with limited resources and large class sizes—and with low demands on faculty and teaching staff time. Study supports the use of computer-graded student testing on factual learning; accommodates large numbers of students with limited workload effort by faculty. [Bloom's taxonomy, objectivism–constructivism, CoI]
Freeman, L. A. (2015). Instructor time requirements to develop and teach online courses. *Online Journal of Distance Learning Administration, 18*(1).	Study of time demands for faculty in online vs. face-to-face courses. Indicates content development, pre-semester setup, and instructor–student interaction during courses clearly more time-consuming online. Assessing/grading are also, but less so. Some factors diminish with repeat course teaching. The time demands of online teaching are more associated with pedagogy than with technology.	Due to teaching intensity, study survey found smaller university enrollments in online than traditional courses. Class size tended to be demarcated at around 30 or fewer students for online courses. Of surveyed faculty, 81% indicated it was more time-consuming to develop and teach an online than a face-to-face course. Author calls for research on impact of course enrollments.

Author(s), Date, Title, and Journal	Focus	Recommendations [Related Educational Theory]
Gleason, J. (2012). Using technology-assisted instruction and assessment to reduce the effect of class size on student outcomes in undergraduate mathematics courses. *College Teaching, 60*(3).	Study analyzed student outcomes generated in college algebra and applied calculus courses with class sizes ranging from 37 to 129; courses had common syllabi, homework, quizzes, and tests. Found medium classes (30–55 students) had little to no benefit over large classes (110–130 students) in student learning and achievement, with large classes having small–medium positive-effect sizes over medium classes in the area of student satisfaction.	Class was extensively supplemented with time in a computer and tutoring center staffed with instructors, graduate students, and undergraduate tutors, providing individualized support along with technology-assisted instruction. Students received constant feedback on progress with homework assignments, quizzes, and exams, keeping them on task and engaged. These supplementary methods reduced the effect size of classroom size on student achievement and satisfaction. [CoI]
Goldman, Z. (2012). Online MBA asynchronous discussion workload and value perceptions for instructors and learners: Working toward an integrated educational model for professional adults. *Journal of Online Learning and Teaching, 8*(3)	Study reviews the outcomes of a yearlong survey examining the perceived workload and value of asynchronous discussions by MBA adult learners and instructors. Courses used a discussion guideline.	Instructors' workload hours spent on discussion decreased in smaller classes. Class size was the primary effect for instructor workload. Larger class sizes impose higher time expenditure and load on instructors. Recommends optimal class size as 12 students.
Haynie, D. (2014, September 26). Experts say class size can matter for online students. *U.S. News & World Report, Higher Education*. Not a peer-reviewed source.	The research behind class size in an online environment is inconclusive. For asynchronous classes, where students rely mainly on readings, prerecorded lectures, and discussion boards, experts are divided on whether to pay attention to the number of classmates in a course.	With smaller classes, students feel more engaged with the material and more connected to their professor and fellow students. While students and instructors can interact in a larger class, it's challenging to have substantial interactions. A small class is a necessity in a synchronous environment since more than 15 students are too many faces on the screen. [CoI]
Hewitt, J., & Brett, C. (2007). The relationship between class size and online activity patterns in asynchronous computer conferencing environments. *Computers & Education, 49*(4).	Research question: What is the relationship between class size and student reading and note writing in online courses? Earlier studies on class size concluded that the ideal enrollment appears to be between 8 and 30 students, depending on the type of course. Class size affects social presence, more easily established in small than large classes. Large classes create information overload.	Study discovered that students in large classes read a smaller proportion of peers' notes, and tended to scan them. Larger classes created a higher degree of information overload, encouraging coping strategies, such as scanning and selectivity in note reading. A possible consequence is shallow, superficial peer learning. [Bloom's taxonomy, CoI]
Holzweiss, P. C., Joyner, S. A., Fuller, M. B., Henderson, S., & Young, R. (2014). Online graduate students' perceptions of best learning. *Distance Education, 35*(3).	Studied reports of online master's students regarding their best learning experiences. Differences are inherent between how graduate and undergraduate students learn. Expectations indicate that undergraduates learn foundational content in a general curriculum and within a broad academic field of study, while graduate students are focused on advanced content and skill development for a specific professional field. Graduate-level learning demands an increased level of critical thinking, and understanding and appreciating the flexible nature of knowledge.	Study described developing a community of practice to share and create knowledge. Preferred learning processes involved critical thinking, problem-solving assignments, research, writing, journal reflections, discussion forums, group projects, and videoconferencing. Faculty work was teaching intensive, described as providing feedback, mentoring. Students' deeper learning marked by higher levels on Bloom's taxonomy and a constructivist pedagogy. Implied faculty use of community of inquiry practices. No specific class size recommendations. [Objectivism-constructivism, Bloom's taxonomy, COI]

Author(s), Date, Title, and Journal	Focus	Recommendations [Related Educational Theory]
Horning, A. (2007, Fall/Winter). The definitive article on class size. *WPA, Writing Program Administration.* Councils of Writing Program Administrators. Retrieved from http://wpacouncil.org/archives/31n1-2/31n1-2horning.pdf Not a peer-reviewed source.	Article about college writing courses and class size. Author could not find a comprehensive source providing guidance, so she put together the evidence she found. Students indicated that in writing courses, smaller classes made a difference to them. "Smaller" meant 15 or fewer students. Students viewed prompt feedback, discussing ideas with knowledgeable faculty, and individual research experiences with faculty as especially valuable to their learning, all of which required smaller classes.	Three national umbrella organizations for teachers of English took a position that no more than 20 students should be permitted in any writing class, and ideally, classes should be limited to 15 (smaller for remedial sections). But college administrators largely chose to ignore these recommendations because English classes were revenue generators for schools. Cites study by Arizona State Univ. that lowered its UG English and math class sizes to 19 or fewer. Results showed improvements in students' success with higher pass rates in targeted courses, higher retention, and lower numbers of students who withdrew from or failed courses. [Objectivism–constructivism, CoI]
Jaggars, S. S., & Xu, D. (2016). How do online course design features influence student performance? *Computers & Education, 95*.	Study aimed to establish a clear link between specific online course design features and concrete, student-level course outcomes in a community college context. Examined course organization and presentation, learning objectives and assessments, interpersonal interaction, and use of technology. Participants included 19 faculty who taught 35 course sections and 678 students during spring 2011.	Found that only the quality of interpersonal interaction between students and faculty related positively and significantly to student grades. Positive instructor influences included posting frequency, inviting student questions, responding to student queries quickly, soliciting and incorporating student feedback, and demonstrating a sense of caring. In spite of call for high teacher interaction levels, authors made no specific class size recommendations. [CoI]
Jahang, N., Nielsen, W., & Chan, E. (2010). Collaborative learning in an online course: A comparison of communication patterns in small and whole group activities. *Journal of Distance Education, 24*(2).	Research question: How is student communication behavior in small-group activity different from that in large-group discussions? Study was built on CoI framework.	Students were more uniformly active, cognitively engaged, and equal participants in smaller groups. No specific class size recommendations. [CoI]
Johnson, I. (2010). Class size and student performance at a public research university: A cross-classified model. *Research in Higher Education, 51*(8).	Used data on grade performance from undergraduate class sections across all disciplinary areas at a single institution. Study controlled for student characteristics, class level, and random effects.	Study provided consistent evidence of a negative effect of class size on grade performance, most substantially affecting the achievement of "A" grades. In settings where outstanding student performance is the institutional goal, results suggest that classes should be reduced in size. No specific class size recommendations.
Jones, S. H. (2015). Benefits and challenges of online education for clinical social work: Three examples. *Clinical Social Work Journal, 43*(2).	Three examples of fully online courses offered to clinical social work students by an experienced clinician and online instructor were examined in the context of the benefits and challenges put forth for teaching clinical content and skills online. Saw differences existing in quality and quantity of interaction and skill development. Particular attention paid to effectiveness of learning practice skills solely in this format.	Found that online courses which are strategically and rigorously developed are comparable to face-to-face courses in many ways, including activities, assignments, assessments, outcomes, student quality, and methods of addressing academic dishonesty. Quality required robust interactions. Course prep and delivery involved significantly more time than that for face-to-face courses. Class sizes ranged from 16 to 25. Recommended a class size of 25–35 for online courses and smaller sections for practice skills courses; online advanced clinical skills courses need smaller classes. [Objectivism–constructivism, CoI]

Author(s), Date, Title, and Journal	Focus	Recommendations [Related Educational Theory]
Kim, J. (2013, March). Influence of group size on students' participation in online discussion forums. *Computers & Education, 62*.	Study examined one course and how students participated and interacted in different discussion modules organized with different group sizes. Students expect and were expected to develop cognitive and metacognitive skills and knowledge. If the main purpose for discussion is to have students achieve a higher level of understanding and attitude of inquiry, smaller classes needed. Based on constructivist pedagogy.	Found significant differences between large and small groups in quality of postings (level of understanding, inquiry) and interactivity with peers. Two small-group discussion forums had a higher number (by 21%) of responsive interaction in elaborating and negotiating modes. Large discussion forums had limitations in interactivity and complexity. Larger groups' postings had a greater tendency to be fragmented, not linked to peers' comments. [Objectivism–constructivism, Bloom's taxonomy, CoI]
Kingma, B., & Keefe, S. (2006). An analysis of the virtual classroom: Does size matter? Do residencies make a difference? Should you hire that instructional designer? *Journal of Education for Library and Information Science, 47*(2).	Examined the impact of enrollment, faculty teaching experience, online faculty pedagogical training, and help from an instructional designer on student course evaluations in a master's-level course. Studied traditional classroom-based and online courses.	Mean evaluations were higher for courses with enrollments of 15–25 students than for courses with lower or higher enrollments. Classes larger than 40 resulted in lower student satisfaction with the course, the level of instructor interactivity, instructor evaluations of student progress, and the intellectual content of the course. [Bloom's taxonomy, CoI]
Lai, K. (2015). Knowledge construction in online learning communities: A case study of a doctoral course. *Studies in Higher Education, 40*(4).	Study was undertaken to investigate the extent of knowledge construction in an online EdD program, and how pedagogical practices affected the knowledge construction process. Focused on higher order learning and the social construction of knowledge in online discussions. Analysis, synthesis, and the evaluation levels of Bloom's taxonomy and use of the CoI were central to the conduct of the course.	To build students' knowledge construction, design of the learning tasks drew on faculty teaching presence: creating a learning community, active facilitation and moderation of online discussions, and direct instruction. Class size of 12 students. High online teacher engagement in the course. [Objectivism–constructivism, Bloom's taxonomy, CoI]
Lee, S., Dapremont, J., & Sasser, J. (2011). Nursing students' perception of class size and its impact on test performance: A pilot study. *Journal of Nursing Education, 50*(12).	A combination of increasing student enrollment in BSN nursing programs and the faculty shortage contribute to larger class sizes that may affect both student satisfaction and learning. Purpose of this study was to identify undergraduate nursing students' satisfaction with enrollment and subsequent test scores in small and large medical-surgical nursing courses. Courses were face-to-face with 110 students in the sample. Level of learning in the lower half of Bloom's taxonomy.	Mixed results: indicated that students in the smaller class had significantly higher satisfaction with having adequate time for classroom discussion, a classroom setting providing an environment that allowed for effective socialization with other students and faculty, and that the number of students enrolled in the course positively affected how they learned the material. No significant difference between test scores of students enrolled in the large vs. small classes. Large class was 98, small class 58. [Bloom's taxonomy, CoI]
Liu, O. L. (2012). Student evaluation of instruction: In the new paradigm of distance education. *Research in Higher Education, 53*(4).	Study investigated the factors that impacted student evaluation of instruction in distance education; used a large sample of 11,351 students taught by 1,522 instructors from 29 colleges and universities. Teaching methods not addressed.	Found that class size had no impact on students' evaluation of instruction. Researchers felt that students could actively participate in online discussions if they were willing to, regardless of how many students were taking the class. No specific class sizes identified.
Mandel, P., & Sussmuth, B. (2011). Size matters. The relevance and Hicksian surplus of preferred college class size. *Economics of Education Review, 30*(5).	Examined the impact of class size on student evaluations of 299 instructors' performance using a sample of 1,438 economics classes held at a European university over 10 years. Controlled for course and instructor effects. Class size variation of 1–19, 20–39, 40–59, 60–79, 80–99, 100–149, and 150–200 students.	Found a substantial reduction in mean evaluation scores as class size rose from 1–19 to 20–39 (i.e., a profound threshold effect at a maximum class size of 19). Class sizes > 20 meant an instructor barely knew her students by name, and the course lost its "hands-on" character. Authors noted that it is reasonable to expect a change in pedagogical practices—from more active and engaged to impersonal—at a demarcation point of 19 students. [Objectivism–constructivism, CoI]

Author(s), Date, Title, and Journal	Focus	Recommendations [Related Educational Theory]
Maringe, F. & Sing, N. (2014). Teaching large classes in an increasingly internationalising higher education environment: Pedagogical, quality and equity issues. *Higher Education: The International Journal of Higher Education and Educational Planning, 67*(6).	Diversity in classrooms requires smaller classes to account for differentials in backgrounds, prior knowledge, and language and writing skills. Commonly used to prepare students both conceptually and practically for university learning, large classes (> 100 students) are aimed at providing foundation-level learning (i.e., lecture- and testing-centered pedagogy that emphasizes memory and regurgitation of knowledge), viewed as surface learning. Using Bloom's taxonomy as a framework of analysis, researchers noted that the larger a class is, the greater the chances that students engage at the lower levels of abstraction. Focus is on UG students. Authors state that the case for large classes in higher education is justified primarily on economic grounds.	Provides extensive evidence for small classes with diverse student groups, which yield higher academic achievement, aspirations, and critical thinking. Deep learning only happens in smaller classes; students who learn in small classes consistently outperform those in large classes. Large size limits personalized feedback and reduces both quantity and quality of curriculum coverage and assessment. Students in large classes demonstrate low-level learning: low engagement, question asking and interaction, and critical thinking. Found that in small classes with ≤ 15 students, abstraction was more at the analysis level. In larger classes (16–45), students abstracted at the comprehension level, while those in classes ≥ 46 tended to abstract at the factual recall level. [Objectivism–constructivism, Bloom's taxonomy, CoI]
Mbati, L., & Minnaar, A. (2015). Guidelines towards the facilitation of interactive online learning programmes in higher education. *International Review of Research in Open and Distributed Learning*, *16*(2).	Authors indicated that the use of technologies for teaching and learning requires sound content specialization and understanding of learning theories to guide pedagogy. While gains made by constructivism and observational learning are well documented, research addressing online practices that best encourage constructivist and observational learning in distance contexts is limited.	Researchers identified 4 constructivist criteria: (1) eliciting of prior knowledge; (2) creation of cognitive dissonance, when the student is made aware of the difference between his or her prior and new knowledge; (3) student application of knowledge, with feedback: student interprets and modifies prior knowledge in the context of new knowledge; and (4) student reflects on learning, integrating the new knowledge permanently. Constructivist pedagogy requires small student–facilitator ratios. [Objectivism–constructivism]
Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K., Office of Planning, Evaluation, and Policy Development, Policy and Program Studies Service: US Department of Education. (2010). Evaluation of evidence based practices in online learning: A meta-analysis and review of online learning studies.	Research provided a systematic search of the literature 1996–2008, identifying empirical studies of online learning. Sought to identify studies that contrasted an online to a face-to-face condition and measured student learning outcomes. Described three types of learning experience: • Expository instruction—Digital devices transmit knowledge (information). • Active learning—The learner builds knowledge through inquiry-based manipulation of digital artifacts, such as online drills, simulations, games, or microworlds. • Interactive learning—The learner builds knowledge through inquiry-based collaborative interaction with other learners; teachers become co-learners and act as facilitators.	Largest finding was the equivalency (or better) of learning from online courses vs. face-to-face; blended learning was found to be more effective than both. The practice with the strongest evidence of effectiveness was inclusion of mechanisms to prompt students to reflect on their level of understanding as they are learning online. Relatedly, there was some evidence that online learning environments with the capacity to individualize instruction to a learner's specific needs improved effectiveness. Independent online learning was found less effective. [CoI]

Author(s), Date, Title, and Journal	Focus	Recommendations [Related Educational Theory]
Monks, J., & Schmidt, R. M. (2011). The impact of class size on outcomes in higher education. *The BE Journal of Economic Analysis and Policy, 11*(1).	To estimate the class size direct effects on courses taught over 12 years, this study utilized a natural experiment–a unique policy change about class sizes within a business school—at a single private university; controlled for faculty and course effects. The sample included 48 individual faculty members, 88 separate courses, and 1,928 course sections. Courses with 2–45 students (mean of 23.39) were compared with those holding an average of 13.4 more students.	Found that class size negatively and significantly influenced course outcomes: The larger the section size, the lower the self-reported learning, the instructor rating, and the course rating. Students rated instructors lower in clarity of presentations, effectiveness of teaching methods, daily preparedness, effectiveness in stimulating interest, enthusiasm for teaching the class, and adequacy of graded material relative to course content. Also negative but nonsignificant: critical thinking, availability of the instructor, respect the instructor had for students, and timeliness of feedback. [CoI]
Morse, R., Brooks, E., & Mason, M. (2018). How U.S. News calculated the 2019 best colleges rankings. Retrieved from https://www.usnews.com/education/best-colleges/articles/how-us-news-calculated-the-rankings	*U.S. News and World Report* College Rankings based on up to 16 measures of quality in 6 categories: Outcomes (35%); Faculty Resources (20%); Expert Opinion (20%); Financial Resources (10%); Student Excellence (10%); and Alumni Giving (5%). A measure of class size counts for 50% of Faculty Resources, which itself contributes 20% to the overall ranking.	Class size is the most highly weighted measure of the Faculty Resources category. Class size is scored as the proportion of undergraduate classes with fewer than 20 students (highest level of credit); 20–29 students (second highest level of credit); 30–39 students (medium level of credit); 40–49 students (second lowest level of credit); and 50-plus students (no credit).
Mupinga, D. M., & Maughan, G. R. (2008). Web-based instruction and community college faculty workload. *College Teaching, 56*(1). Not a study; authors sought benchmarking data from like institutions.	The authors examined the workload for faculty teaching online courses in community colleges, specifically, the number of online classes taught per semester, class sizes for online courses, incentives for online instructors, and how the workload for online instructors is calculated. In community colleges, faculty workload commonly refers to the number of hours spent in the classroom each week times the number of students enrolled.	Results from these authors indicated inconsistent practices within and between institutions. For example, the workload for online instructors based on class sizes could be less than, equal to, or more than that of faculty teaching face-to-face courses. Variations in online-class sizes were 20–50, with a mode of 25. Article notes that even the AAUP acknowledges the difficulty of devising a single formula for equitable workloads in higher education.
Palmer, S., & Smith, C. (2013). Updating RIGs: Including the systematic influence of online study on student evaluation of teaching. *Educational Research and Evaluation*, *19*(1).	At a single university, researchers studied the influence of class size, year level, and discipline area on student evaluations of teaching (SET ratings) over a year and across disciplines. Note: Class sizes were < 51, 51–100, and > 100. All of these would be considered "large" by distance learning literature standards.	Found that increasing class sizes yielded significantly lower mean SET ratings. Magnitudes of effect sizes were small but potentially cumulative. Most of the SET items found to be negatively influenced by class size (e.g., helpful feedback, academic challenge) were those relating to student academic engagement with their studies. Findings seemed to indicate that students in online mode notice the absence of personal communication or attention that a teacher can give, the "teacherly" aspects of their studies. [CoI]
Parks-Stamm, E. J., Zafonte, M., & Palenque, S. M. (2016, September). The effects of instructor participation and class size on student participation in an online class discussion forum. *British Journal of Educational Technology.*	Study from a single university in the southwest United States; analyzed the frequency of instructor and student posts in asynchronous discussion forums in online courses to examine factors contributing to student participation. Sampled 500 courses: 250 undergraduate and 250 graduate (189 masters level, 61 doctoral) containing 6,954 students. Authors defined class sizes as small (< 15), medium (15–34), and large (> 34).	Class sizes ranged from 2 to 30 students, with a median of 15 students per class. Study found a significant impact of instructor participation on student participation, which decreased as class size increased. Instructors' participation positively predicted student participation especially in small classes (< 15), i.e., with high-participating faculty, students interacted more. But in medium classes (15–30 students), amount of instructor participation did not predict the number of posts per student. [CoI]

Author(s), Date, Title, and Journal	Focus	Recommendations [Related Educational Theory]
Qiu, M., Hewitt, J., & Brett, C. (2012). Online class size, note reading, note writing and collaborative discourse. *International Journal of Computer-Supported Collaborative Learning, 7*(3).	Study examined relationships among class size, note reading, note writing, and collaborative discourse by analyzing tracking logs from 25 graduate-level online courses (25 instructors and 341 students) and interviews with 10 instructors and 12 graduate students. Class sizes in this study ranged from 6 to 22. Authors indicated that appropriate class sizes should be set in order to ensure for each class a minimum critical mass for participation—without overload—to reach the goals associated with collaborative learning, encourage greater interactivity, and to make it easier to establish social presence.	Findings: Class size was a major factor affecting note reading and writing loads. Class size was found negatively correlated with the percentage of notes students read, their note size, and note grade level score. In larger classes, participants were more likely to experience information overload and therefore were more selective in reading peers' notes. Findings suggested 13–15 as an optimal class size. A graduate-level class of 18 or more would make a single conversation difficult and would become overwhelming and less manageable for both students and instructors. [CoI]
Ravenna, G. (2012). The effects of increased workloads on online instruction. *International Journal of Education*, *4*(4). Article is a report not based on original research.	Paper discussed budget cuts for California State University that created significant workload increases for instructors. Author used the CoI with an emphasis on teaching presence as a framework for report.	As class sizes increase, faculty have more papers to grade; less direct contact with students, and more students engaged in discussions; faculty's ability to individualize instruction decreases. Hence, the quality of education declines with expanding class sizes. Deeper learning requires more student–instructor interaction and smaller class sizes, while classes that require less higher order thinking may suffice with larger numbers. [Objectivism–constructivism, Bloom's taxonomy, CoI]
Roby, T., Ashe, S., Singh, N., & Clark, C. (2013, April). Shaping the online experience: How administrators can influence student and instructor perceptions through policy and practice. *Internet and Higher Education, 17.*	Purpose of the study was to identify factors that would enhance student and instructor experiences in online environments. Surveyed students about their perceptions of the online and blended courses that they participated in, and surveyed instructors about online and blended courses that they taught.	Re: class size: 78% of instructors indicated ideal class sizes as up to 30 students. Students were less impacted by larger classes, with 69% indicating up to 50 students. However, some students were discontented with a lack of instructor availability and slow response times to questions; instructors reported being time challenged by the amount of student monitoring, facilitating, tracking, and grading required with online teaching. [CoI]
Russell, B. H. (2015). The who, what, and how of evaluation within online nursing education: State of the science. *Journal of Nursing Education, 54*(1).	Author examined the state of the science around the current evaluation of educational practices, instructional strategies, and outcomes within the context of online nursing education. Study used 36 articles published between 2008 and 2013 that met the inclusion criteria.	Findings reflected online education evaluation practices that were diffuse and superficial, and served as the basis for recommendations and future research. Among others, article recommends concepts of constructivism, Bloom's taxonomy, and the CoI model. Recommended nursing literature include cross-disciplinary views of best practices in online education. [Objectivism–constructivism, Bloom's taxonomy, CoI]

Author(s), Date, Title, and Journal	Focus	Recommendations [Related Educational Theory]
Russell, V., & Curtis, W. (2013, January). Comparing a large- and small-scale online language course: An examination of teacher and learner perceptions. *Internet and Higher Education, 16*.	Study explored how class size affected the quality of undergraduate online language teaching and learning. Research compared the experiences of instructors and students in 2 online Spanish language courses: 125 students enrolled in the large-scale class and 25 students enrolled in the small-scale class. Each class had one instructor and no teaching assistants. The American Council on the Teaching of Foreign Languages' (ACTFL) 2010 position statement on class size recommended that language courses offered either in a traditional classroom or at a distance should be capped at 15 students, which is in alignment with the National Education Association and the Association of Departments of Foreign Languages (ADFL) 2010 recommendations for maximum class size.	Results indicated that a large class negatively impacted course quality and students' satisfaction with their online language learning experience. In the large-scale course, the quality and quantity of student–student and student–instructor interaction were limited, and since the large size affected the instructor's ability to create an environment conducive to learning, instructor expertise was underutilized. Both faculty and students indicated instructors could not provide sufficient feedback for achieving learning goals. Administrators and departments often make decisions about class size based on fiscal and budgetary constraints rather than on best practices in blended and/or online learning. [Objectivism–constructivism, CoI]
Salley, W., & Shaw, M. (2015). Employment status, teaching load, and student performance in online community college courses. *Online Journal of Distance Learning Administration, 18*(2).	Study was conducted at a community college in the Midwest and addressed 3 issues: (1) overextended online instructors in the local setting with a consequent inability to implement best practices; overextended online instructors may not offer the presence and feedback needed to promote success in online student performance, as measured by final course grades; (2) the institutional system encouraged overload teaching assignments; and (3) increased teaching loads could have negative ramifications for online instructor attentiveness, student performance, and academic rigor.	A negative correlation was discovered between instructor course overload and student success as measured by final course grades and completion rates. Because online teaching presence is a key factor to student success, smaller classes would allow faculty to spend more time with each student. Faculty loads should be carefully monitored to ensure the highest possible rates of student success. [CoI]
Schwartz, M. (2014). KHAN Academy: The illusion of understanding. *Journal of Asynchronous Learning Networks, 17*(4).	Paper examines what learning means from the perspective of the cognitive and learning sciences. Using Khan Academy as an example of limited educational value, author applies learning theory to online environments. Provides a framework for authentic (deep) understanding: Authentic understanding depends on hierarchically organized knowledge, requires formative feedback for student development, and is context sensitive, grounded in direct experience and stabilized by practice at every level within the hierarchy.	Author describes educational systems that are and historically have been mostly didactic, with Khan Academy as a prominent online example. Didactic delivery fails to provide scaffolding experiences, student feedback, and conceptual mastery that allow learners to build deep understandings of complex phenomena. To promote student development and enable the agile transfer of student learning to new contexts, author urges a shift of perspective to focused teaching methods, constructivist pedagogy, and higher order learning. Does not address class size—focus is on pedagogy. [Objectivism–constructivism, Bloom's taxonomy, CoI]
Seaton, J. X., & Schwier, R. (2014). An exploratory case study of online instructors: Factors associated with instructor engagement. *International Journal of E-Learning & Distance Education, 29*(1).	This research was an exploratory case study in which the experiences of 12 online instructors were examined over 1 year. Participant interviews were analyzed for evidence of positive and negative experiences and how frequently each occurred.	Specific barriers to online faculty engagement included an increase in workload, technological issues, and lack of social presence. Instructors hired to teach and conduct research held mixed and often negative feelings about teaching in online environments. Class sizes varied from 15 to > 50. There was a slight difference in faculty engagement between smaller classes and those over 50, but this finding was not significant. [CoI]

Author(s), Date, Title, and Journal	Focus	Recommendations [Related Educational Theory]
Shaw, R-S. (2013). The relationships among group size, participation, and performance of programming language learning supported with online forums. *Computers & Education, 62.*	This study examined the relationships among group size, participation, and learning performance factors of sophomores when learning a programming language in an online collaborative learning (CSCL) context. Capitalizing on the sharing of goals, authority, and responsibility among members and individual differences in abilities, collaborative learning involved intragroup learning via focused group discussions. Study compared learning performance among and between groups; all had the same instructor and educational materials; each group used a forum to discuss 10 programming exercises. There were 120 students in the 2 courses with 2–6 students in 15 small groups and 60 in a large class.	Results showed that (1) the online forum support aided collaborative learning, regardless of group size; (2) group sizes did not significantly influence learning scores directly but significantly influenced participation; small groups had higher participation rates, which positively influenced learning scores; and (3) learning satisfaction using the online forum was higher than the average score. Participation did not significantly influence learning satisfaction, but small groups had higher learning satisfaction rates. Author recommends instructional designs with small groups for learning in online forums. [CoI]
Sorensen, C. (2014, December). Class-rooms without walls: A comparison of instructor performance in online courses differing in class size. *MERLOT Journal of Online Learning and Teaching, 10*(4). and Sorensen, C. (2015). An examination of the relationship between online class size and instructor performance. *Journal of Educators Online, 12*(1).	The purpose of this study was to look at instructors' performance teaching online courses and how class size influenced their performance, measured through peer reviews and scoring of online faculty in 5 areas: fostering critical thinking, providing instructive feedback (CoI teaching presence), maintaining high expectations, establishing relationships (social presence), and exemplifying instructor expertise (CoI teaching presence). Used data collected during a 2013 peer review of 380 part-time online instructors within a college of education at a large for-profit university. The courses were reviewed and scored by full-time faculty and consisted of both undergraduate and graduate courses (217 and 163 respectively).	Author asserted that more time per student is needed to teach online courses. Classes were categorized into three sizes: 1 = classes with 10 students or less (small), 2 = classes with 11–19 students (medium), and 3 = classes with 20–30 students (large). Statistically significant results from this study revealed that larger class sizes potentially had the most negative effect on instructors' ability to use their expertise, establish relationships, and share knowledge of subject matter. Sharing expertise and providing student feedback are key practices to support student learning. Although not statistically significant, negative correlations suggested that as class size increased, instructors' overall teacher performance, a peer review score, decreased. [Objectivism–constructivism, CoI]
Sword, T. S. (2012). The transition to online teaching as experienced by nurse educators. *Nursing Education Perspectives*, *33*(4).	Nurse educator participants were asked to share their lived experiences of the transition from teaching in a classroom setting to online delivery.	The predominant theme, expressed strongly by participants, was the amount of time needed to teach online ("double my time"). Issue links to class size and faculty workload, but these themes were not developed.
Taft, S. H., Perkowski, T., & Martin, L. S. (2011). A framework for evaluating class size in online education. *Quarterly Review of Distance Education, 12*(3).	Study explored the question of optimal online class sizes by reviewing multidisciplinary education research journals to determine what, if any, guidance on class size existed. Research to date offered no consensus regarding appropriate student-to-teacher ratios in online courses. Further research was recommended to assess student learning outcomes across courses of varying size.	Authors proposed the use of three educational frameworks to guide class enrollment decisions while maintaining educational quality: Bloom's taxonomy, objectivist–constructivist teaching strategies, and the CoI model. Proposed setting student numbers for categorizing class size: small: $\leq$ 15 students; medium: 16–30 students; large: $\geq$ 30–no known upper limit of students. [Objectivism–constructivism, Bloom's taxonomy, CoI]

Author(s), Date, Title, and Journal	Focus	Recommendations [Related Educational Theory]
Tynan, B., Ryan, Y., & Lamont-Mills, A. (2015, January). Examining workload models in online and blended teaching. *British Journal of Educational Technology, 46*(1).	Paper reports on a research project in 4 Australian universities, and the perceptions of a representative group of 25 academic staff from each of the universities who perceived that e-teaching had increased their "teaching time" workload. Workload Allocation Models (WAMs) did not take account of contemporary teaching modalities. A search of the international literature indicated there is limited rigorous research that points to the actual effects of online and blended higher education teaching environments on workload. Interactive learning models and constructivist pedagogies should be considered routine.	Australian WAMs do not account for the increased number, complexity, variability, and intensity of teaching/communication tasks associated with online learning. Student numbers per section is often arbitrarily determined by administrators—in Australia, typically 40 per section. Authors urge a rethinking of the models of delivery, pedagogies and activities associated with e-learning, workload implications, and a refocus on desired outcomes rather than input models of "one-size-fits-all." WAMs must be developed that recognize headcount as the determinant of load per class. [Objectivism–constructivism, CoI]
Walls, J. K. (2016). A theoretically grounded framework for integrating the scholarship of teaching and learning. *Journal of the Scholarship of Teaching and Learning, 16*(2).	Article addresses the importance and utility of teaching from a guiding theoretical framework; discusses Bronfenbrenner's bioecological model as an interdisciplinary framework for synthesizing the scholarship of teaching and learning to inform faculty at the college level. Human development, a process that occurs as a joint function of characteristics of the individual and environmental context, has 4 components: process, person, context, and time.	Central to the bioecological model are proximal processes, or the regular interactions that occur between the developing person and his or her environment. Proximal processes are the driving forces behind student development, emphasizing that interactions (e.g., faculty–student, student–student) needed to occur on a regular basis and become increasingly complex over time in order to promote development. As part of context dimension, author sees larger class sizes as linked to poorer student and teacher performance, which suggests that teaching and learning challenges increase in proportion to the number of students in a given class. No specific class size recommendations. [Objectivism–constructivism, CoI]

A 2011 article examining pedagogy provided insight on how online class sizes affect student learning. It reported on a multidisciplinary literature review of relevant research articles from 17 journals published between 2000 and 2009 (Taft et al., 2011). The researchers aimed to distinguish factors found to drive optimal student learning that could serve to guide decisions on appropriate enrollments. Drawing from studies in different settings, the researchers looked for accumulated evidence that identified the impact of various online enrollment numbers on student learning outcomes, faculty workload, and student satisfaction. The article included an unsuccessful search for measurement tools and/or evaluation criteria to assess varying class sizes' influence on student learning. Among the studies identified and reviewed, the then-existing evidence on class size was found to be limited and plagued by conflicting results. Findings reported inconsistent online class size recommendations that ranged from four to several hundred students, results that were insufficient to support enrollment recommendations. However this study's literature review provided the researchers with specific learning theories relevant to student education that they proposed as guidelines for online class size determinations.

The three well-established learning theories in the literature described were repeatedly referenced and linked to class size implications: the objectivist-constructivist continuum, Bloom's taxonomy, and the Community of Inquiry model (Taft et al., 2011). For the current study, we updated the research review to 2017 and greatly expanded the journal search. We explored whether the three learning theories were identifiable in the reviewed literature and found that they were

explicitly or implicitly prominent in most relevant studies. The theories are summarized below and will provide the foundation for categorizing and synthesizing our findings. Expanded theory descriptions and references are profiled in Appendix B.

Three Learning Theories

This section presents the three learning theories connected to student learning and class size effects used in the 2011 study. Appendices A and B provide reference links of these theories to the current literature review.

The objectivist-constructivist continuum. Objectivist-constructivist theory is a well-established construct in pedagogical methods differentiating two ends of a continuum. On the *objectivist* end of the continuum, students are expected to learn relatively passively by receiving and assimilating knowledge communicated to them by a professor. Objectivist pedagogy largely uses teacher-centered one-way communication; students learn individually, independently from one another, and then are tested for evidence of learning. This approach effectively delivers and teaches content of a factual or basic scientific nature.

On the other end of the continuum, the *constructivist* teaching method facilitates learning of a more complex nature via thoughtful interactions among students and faculty and with course content. Constructivist learning environments offer multiple representations of reality by encouraging student reflections on their own and others' understandings, and how they compare or contrast (Arbaugh & Benbunan-Fich, 2006). Constructivism suggests that as students confront new information, they compare it to preexisting "internalized knowledge constructs based on [their] past experiences, and then modify their constructs accordingly … Knowledge has to be discovered, constructed, practiced, and validated by each learner" (Benbunan-Fich et al., 2005, p. 21). Constructivist learning is student centered, requiring that students utilize critical thinking by breaking down, restructuring, and transforming preexisting knowledge to build new conceptions of understanding. Discussion and dialogue are central to promoting critical thinking.

Faculty workload using constructivist teaching methods expands directly in relation to the number of enrolled students—it is *teaching-intensive*. Some researchers argue that as class sizes rise above ~20 students, it is implicitly reasonable for faculty to reduce their workload by changing pedagogical practices, from more active and engaged constructivism to less individualized approaches (Benton & Pallett, 2013; Colwell & Jenks, 2004; Goldman, 2012; Horning, 2007; Mandel & Sussmuth, 2011).

University faculty select teaching approaches that fall somewhere on the continuum between transmitting knowledge to students unidirectionally to engaging them in creating meaningful knowledge development from new information (Taft et al., 2011). In online education, the choice of teaching method along the objectivist-constructivist spectrum has a direct relationship to the number of students enrolled in a course. Further elaboration of this theory, the next two theories, and author sources are presented in Table 2.

Table 2.

Elaborated Description of Three Learning Theories—Objectivism–Constructivism, Bloom's Taxonomy, and the Community of Inquiry—and a Case Example

Theory Description	Sources
Objectivist–constructivist pedagogy is an established construct in education and pedagogy. Objectivist pedagogy is a teacher-centered process used to transmit factual content. It employs test-based or quantifiable assessment methods; assumes that students will generally learn equally well if they are in a class of 5 or 500. While the workload for faculty will expand modestly with rising numbers of students, it does not increase directly with class size. Because research reveals no recognized upper limit to the number of students enrolled per faculty member in objectivist-taught courses, class sizes may be as large as is logistically feasible. Conversely, because it is learner-centered, a constructivist approach requires smaller class sizes. The student work of learning—deconstructing old knowledge and integrating new and more complex information—depends on faculty interaction with individuals and groups of students, regular individual instruction, correction of misconceptions, formative and summative feedback, and assessments to measure learning progress. Constructivist educators approach teaching with the belief that knowledge must be actively reasoned and created by students to effectively integrate knowledge frameworks. Few students are capable of complex learning without focused facilitation from knowledgeable experts.	Arbaugh & Benbunan-Fich, 2005; Bain, 2004; Benbunan-Fich et al., 2005; Benton & Pallett, 2013; Bozkurt et al., 2015; Chu, Zhang, Chen, Chan, Lee, Zou, & Lau, 2017; Curriculum Committee, 2012; El Tantawi, Abdelsalem, Mourady, & Elrifae, 2015; Holtslander, Racine, Furniss, Burles, & Turner, 2012; Holzweiss et al., 2014; Jones, 2015; Kim, 2013; Lai, 2015; Legg, Adelman, & Levitt, 2009; Mandel & Sussmuth, 2011; Maringe & Sing, 2014; Mbati & Minnaar, 2015; Picciano, 2017; Ravenna, 2012; Russell, 2015; Schellens & Valcke, 2006; Schwartz, 2014; Taft et al., 2011; Williams, Jaramillo, & Pesko, 2015
Bloom's taxonomy: A classic in education theory, categories of learning level align in a pyramid, from simple/concrete (lower levels) to complex/abstract (higher levels). Each category contains subcategories. Knowledge at the lower levels is the necessary precondition for higher level understanding and putting skills and abilities into practice. The original taxonomy from 1956 proposed 6 levels: 1. *Knowledge*: the recall of specifics and universals, methods and processes, or patterns, structures, or settings 2. *Comprehension*: an understanding or apprehension such that an individual fathoms what is being communicated and can make use of the ideas without necessarily seeing their fullest implications 3. *Application*: the ability to use and apply abstractions to particular situations 4. *Analysis*: the breakdown of information into its constituent parts such that the relative hierarchy of ideas is clear or the relationships between ideas are explicit 5. *Synthesis*: integrating elements and parts so as to form a whole 6. *Evaluation*: forming judgments about the value of materials and methods for specific purposes The revised taxonomy (2001) added Level 7: 7. Creation: generating, developing, designing, planning, or producing	Armstrong, n.d.; Benton & Pallett, 2013; Bloom et al., 1956; Holzweiss et al., 2014; Lai, 2015; Meyer, 2006; Ravenna, 2012; Russell, 2015; Taft et al., 2011

Theory Description	Sources
Use of the CoI model enhances student learning and satisfaction. Numerous studies have confirmed the value of the CoI. The CoI describes 3 presences: *Teaching/teacher presence:* involves the design, facilitation, and direction of learning to serve students' constructions of meaningful and educationally worthwhile knowledge. Teaching presence is conceptualized as instructional design and organization, facilitating discourse, building understanding, and direct instruction. Extensive activities are associated with a full teaching presence, ranging across developing the course design, syllabus, learning strategies, and activities; engaging in regular authentic interactions with individuals and groups of students; and providing individualized formative and summative feedback. *Cognitive presence* marks the extent to which students demonstrate construction and integration of new meaning through sustained learning activities. When assignments require critical thinking via student explanations or applications, student knowledge construction is visible in the online classroom. In CoI theory, students' cognitive presence is influenced by the faculty's teaching and social presences and by other students' cognitive and social presences. Faculty teaching presence diminishes students' internalized barriers to learning new information while aiding construction of new meanings. *Social presence* is reflected in the ability of faculty and learners to project themselves socially and emotionally into a course, and, in the online environment, create an identity as a "real person." A student's social presence is affected by the faculty's teaching and social presence, and by other students' cognitive and social presence. In CoI theory, *teacher immediacy*, referring to "behaviors that lessen the psychological distance between communicators" (Swan & Shea, 2005, p. 242), is a recognized driver of student learning and satisfaction. It can include a range of faculty social actions such as prompt and focused replies, warmth and friendliness, addressing students individually, use of humor or emotion, self-disclosure, greetings and closures, and connecting language (Lahaie, 2007).	Arbaugh, 2007; Arbaugh, Cleveland-Innes, Diaz, Garrison, Ice, Richardson, et al., 2008; Brook & Oliver, 2003; Chen, deNoyelles, Zydney, & Patton, 2017; Garrison, 2012; Garrison, Anderson, & Archer, 2010; Garrison, 2012; Garrison, Cleveland-Innes, & Fung, 2010; Holzweiss et al., 2014; Jahang, Nielsen, & Chan, 2010; Jaggars & Xu, 2016; Joksimović, Gašević, Kovanović, Riecke, & Hatala, 2015; Kim, 2013; Lai, 2015; Leppa, 2004; Meyer, 2006; Orcutt & Dringus, 2017; Paulus et al., 2010; Picciano, 2017; Ravenna, 2012; Richardson et al., 2015; Russell, 2015; Shea, 2006; Stein, Wanstreet, Slagle, Trinko, & Lutz, 2014; Swan & Ice, 2010; Swan & Shea, 2005; Taft et al., 2011

Case example of a course appropriate for constructivist pedagogy, application level and above on Bloom's taxonomy, and use of the CoI's teaching, cognitive, and social presences:

One of the authors of this article was involved in the teaching of graduate nursing students in an advanced applied clinical pharmacology course. While students entering the course could pass exams testing for knowledge of the physiological action of various classes of drugs, their existing knowledge was insufficient to directly translate that knowledge to caring for real patients (e.g., patients who might be elderly, compromised by a set of chronic diseases, and ingesting prescriptions for 10 or more potentially inter-/counteractive drugs). Faculty needed to draw upon professional and scholarly expertise to lead students through a thinking process of sorting treatment priorities, comparing trade-offs, estimating risks, and factoring in costs while directing care decisions that kept patients' and families' priorities at the forefront–that is, clinical reasoning that served complex patients. Developing higher order thinking was the central learning purpose of the pharmacology course in that students' mastery of a hierarchy of organized knowledge would provide them with a structure for future clinical decision-making.

In teaching-intensive constructivist learning classes, the research indicates that the number of students is a significant driver of increased faculty workload. In courses that use a combination of objectivist and constructivist approaches to teaching—those that fall in the middle of the continuum—consideration of the mix of pedagogies for student learning and the resulting implications for a feasible faculty workload are necessary to determine the "right" number of students. Course enrollment decisions should provide a balance between student learning effectiveness, with faculty serving as pedagogical experts; faculty workload; and university revenue needs, with academic administrators speaking to finances.

In the articles reviewed for this study, researchers commonly used objectivist-constructivist terminology to describe different approaches to teaching and the results in student learning associated with them. Some of the articles used descriptive language consistent with objectivism-constructivism and didn't identify it explicitly, but the researchers were able to infer its meaning from authors' commentary.

Bloom's taxonomy. Bloom's taxonomy is a classification of seven levels of learning moving from lower levels to higher order thinking, respectively: knowledge, comprehension, application, analysis, synthesis, evaluation, and creation (Armstrong, n.d.; Bloom [Ed.], Englehart, Furst, Hill, & Krathwohl, 1956). It is used to structure course learning objectives, activities and assessments, and has become a classic in education theory. Course objectives targeted to various levels of Bloom's taxonomy arrange in a pyramid hierarchy, with more basic knowledge falling low and sophisticated knowledge high on the taxonomy (see Table 2). Student learning is assessed consistent with the learning level. Although there is considerable variability in targeted taxonomic levels in higher education courses, conventionally more basic knowledge and comprehension levels are addressed in lower division college courses, while more complex learning and critical thinking are expected in upper division and graduate courses (Maringe & Sing, 2014); doctoral study disproportionately aims for mastery at the analysis, synthesis, evaluation, and creation levels (Taft et al., 2011).

As noted earlier, by historical practice universities implicitly recognize that extensive faculty–student interaction is necessary for effective learning at the upper levels of Bloom's taxonomy. Higher order thinking requires more advanced student–faculty communication, assignments, assessment methods, feedback, and guidance—and smaller course sizes.

In the studies reviewed for this article, many researchers referred explicitly to Bloom's taxonomy. Some of the articles recommending smaller classes used descriptive language consistent with Bloom but not identified as such. As with objectivism-constructivism, we inferred reference to the taxonomy from the authors' descriptions (summarized in Table 1).

The Community of Inquiry. The Community of Inquiry (CoI) is the third educational theory relevant to online class size. The CoI and constructivist pedagogy are listed, respectively, as first- and third-most-cited concepts from seven peer-reviewed distance education journals dated 2009–2013 (all seven were included in this article's journal reviews; Bozkurt et al., 2015). First developed in 2000 by Garrison et al., and later supported by the results of numerous studies, the CoI model in online education posits that the instructor's role is critical to enabling student learning. The model advances three kinds of presence—*teaching/teacher, cognitive*, and *social*—as meaningful contributors to learning effectiveness within online environments (see Table 2). They are applicable to all levels of university curricula.

Comprehensive use of the CoI model has been consistently found to enhance student learning and satisfaction. It is relevant to class size determinations because full implementation of teaching, cognitive, and social presence behaviors involves student interaction, more frequent faculty interventions, and individualized student learning feedback and development. CoI-designed courses are *time-intensive to teach*. Partial implementation of the CoI is less teaching intensive, as in courses where faculty forego elements of knowledge-building interactions, developing social presence, providing individualized instruction, or facilitating discourse. For such courses, faculty tend to use testing for student assessments and more objectivist and standardized teaching methods. As with objectivist-constructivist pedagogy and Bloom's taxonomy, some research articles reviewed for this study referred explicitly to the CoI model while others used descriptive language consistent with it.

Of the 58 selected articles reviewed for the current study, 40 implicitly or explicitly identified one or more of the three learning theories discussed above. These theories are noted for each reference [in brackets] in the third column of Table 1, under Recommendations & Related Educational Theory. Those that did evidence use of the learning theories focused on pedagogy; educational depth, level, and quality; faculty presence; and effectiveness of student learning. Those that did not show connections with one or more of the three theories lacked study variables relevant to student learning; instead, they focused on class size associations with faculty workload, student evaluation of instruction, or used settings with preexisting small classes.

Three research questions guided the literature review for this study:

- When are small classes needed?
- When are large classes appropriate?
- What number of students constitutes a small, medium, or large class?

Based on the three learning theories reviewed above and following the next two sections on Methods and Findings, we will propose pedagogically driven class sizes and guidelines for making evidence-based enrollment decisions.

Methods

Research on online education is a multidisciplinary endeavor (Russell, 2015; Taft et al., 2011). It is based on the concepts and theories derived from the field of education, but teaching practices use concepts, principles, models, and theories from many other fields (e.g., engineering, management, sociology, psychology, economics, journalism, etc.; Bozkurt et al., 2015). Therefore, for a literature search on online class sizes, we selected higher education research journals from a variety of disciplines.

This study was designed as a more extensive literature review on class size than was reported in a 2011 review, which had included 17 education journals and 20 selected articles (Taft et al., 2011). The current systematic review comprised 43 cross-disciplinary education journals published, with a few exceptions, over a roughly five-year time frame of ~2012 to 2017; earlier articles that were frequently cited were included. Journals were chosen based on their known history of publishing articles relevant to this study's purpose (see journal list in Table 3). The authors also conducted electronic keyword searches on "class size in online education" for articles listed through Education Source, Scopus, ProQuest, PsychINF, ERIC, Academic Search Complete, CINAHL, and PubMed, but these resulted in few additional sources.

Table 3

Cross-Disciplinary Education Journals and Years Selected for Literature Review (n = 43)

Academy of Management Learning and Education, 2012–2017 (Issue 1)	*Journal of Distance Education*, 2010, 2015–2016
American Journal of Distance Education, 2012–2017 (Issue 1)	*Journal of Higher Education,* 2012–2016
British Journal of Educational Technology, 2012–2017 (January)	*Journal of Information Systems Education*, 2012–2016
Computers and Education, 2012–2017 (Vol. 109)	*Journal of Interactive Online Learning*, 2012–2016
Computers & Education: Distance Education, 2014–2016	*Journal of Management Education*, 2012–2017 (issue 2)
Distance Education, 2012–2016	*Journal of Nursing Education,* 2012–2017
Distance Learning, 2012–2016	*Journal of Professional Nursing*, 2012–2017 (Issue 1)
Educational Technology Research and Development, 2012–2017	*Journal of Scholarship of Teaching and Learning*, 2012–2016
Educause Review, 2012–2017 (Issue 1)	*Management Learning*, 2012–2017 (Issue 1)
European Journal of Open Distance and e-Learning (EURODL), 2012–2016	*Management Teaching Review*, 2016 (year of inception)
Higher Education: The International Journal of Higher Education and Educational Planning, 2014–2017 (Issue 1)	*(Merlot) Journal of Online Teaching and Learning (JOLT)*, 2012–2015
Higher Education Research and Development, 2012–2017	*Nursing Education Perspectives*, 2012–2016
Instructional Science, 2012–2016	*Online Journal of Distance Learning Administration*, 2012–2016
International Journal of E-Learning and Distance Education (previously the *Journal of Distance Education)*, 2012–2016	*Online Journal of Nursing Informatics*, 2012–2016
International Journal on E-Learning, 2013–2016	*Open Learning: The Journal of Open, Distance and e-Learning* (*OL*), 2012–2017 (Issue 1)
International Journal of Nursing Education Scholarship, 2012–2016	*Online Learning: The Official Journal of the Online Learning Consortium* (previously *The Journal of Asynchronous Learning Networks*), 2007–2017 (Issue 1)
International Journal of Teaching and Learning in Higher Education, 2013–2016	*Quality Assurance in Education*, 2012–2017 (Issue 2)
International Review of Research in Open and Distributed Learning, 2012–2016	*Quarterly Review of Distance Education*, 2012–2016 (Issue 3)
Internet and Higher Education, Sept. 2011–2017 (Issue 1)	*Review of Educational Research,* 2012–2016
Journal of Computer Assisted Learning, 2012–2017 (Issue 1)	*Research in Higher Education*, 2012–2017 (Issue 2)
Journal of Computer and Education Research, 2013–2017	*Studies in Higher Education*, 2012–2017 (Issue 4)
	Teaching in Higher Education, 2013–2017 (Issue 2)

With a focus on online class size, the authors systematically examined the table of contents for each issue of 43 journals over the five-year period, reviewing titles and abstracts, and identifying studies about class size associated with the factors of student learning processes/learning outcomes and various pedagogical approaches (e.g., learning communities, Bloom's taxonomy, deep learning, collaborative learning, MOOCs, objectivism-constructivism, the CoI model). They also reviewed articles on faculty workload as they pertained to class size and pedagogical intent. In addition to articles published from 2012–2017, the authors reviewed and included single articles of varying dates that had been prominent in selected articles' reference lists, had serendipitously come to their attention, or were located through keyword searches (a limited number). Most, but not all, were peer-reviewed; those not peer-reviewed contained content from well-recognized institutional sources (e.g., Morse, Brooks, & Mason, 2018, *U.S. News and World Report* College Rankings).

The vast majority of articles used in this review addressed online courses, but eight were included that contained relevant findings for hybrid and face-to-face courses. The studies crossed disciplines and undergraduate, graduate, and doctoral program education levels.

For the 58 studies identified as relevant for inclusion, we retrieved full texts of the pertinent articles, qualitatively annotated each, and subsequently used inductive reasoning methods to thematically analyze the content (see study summaries presented in Table 1).

Results

A summary of the compiled evidence—our thematic findings from the 58 articles connecting online class size to learning goals and pedagogical practices, student learning outcomes, and faculty workload—is displayed in Table 4. The more than six-year review period revealed a maturation in the body of knowledge regarding learning factors associated with differing class sizes. But, as the researchers found in the 2011 work, no consistent cross-study guidelines have appeared in the research literature, now extending up through 2017, to guide university class size decisions aligned with pedagogy.

Our synthesis of research on specific student numbers recommended for online courses follows. When sizes were discussed, most of the reviewed articles identified classes of "small," "medium," or "large" without specifying what numbers were associated with each term (Chen et al., 2017). We discuss why guidelines are needed to align enrollment with pedagogy and propose a framework to guide decisions on class sizes with a breakdown of recommended enrollment numbers, in the Discussion.

When Are Small Classes Needed?

We found extensive evidence supporting the use of smaller online classes for learning subject to the following four types of educational intent (see Table 4):

a. nuanced learning dependent on substantive online interaction (30 articles),
b. student development (22 articles),
c. mastery of complex phenomena (16 articles), and
d. development of higher order thinking (14 articles).

With less robust research support than for the four preceding purposes, the literature identified three additional conditions that call for smaller classes:

e. inspiring and challenging students (six articles),
f. meeting learning needs under conditions of high student diversity (five articles), and
g. specialization learning—for example, developing skills in writing, language, and clinical competencies (three articles).

While a preponderance of evidence justifying small classes characterizes the first four educational purposes (a–d), all seven (a–g) reflect credible and consonant reasoning. In the following paragraphs, we provide descriptions of the studies' thematic content; Table 4 complements this section by providing elaboration, examples, and author citations.

Table 4

Research Evidence of Learning Goals and Pedagogical Strategies Requiring Smaller Classes

Descriptions of Learning Goals and Pedagogies Requiring Smaller Classes	**Authors**	**# Refs.**
(a) Creating a learning community through substantive interaction: meaningful and nuanced learning dependent on collaborative relationships and interaction; includes diverse perspectives for the social construction of reality; interaction about course material and course-related ideas; enables social presence; student engagement; positive student attitudes about the discipline; faculty input on future career direction. Occurs between faculty and students and among students.	Batts, 2008; Beattie & Thiele, 2016; Benton & Pallett, 2013; Colwell & Jenks, 2004; Goldman, 2012; Haynie, 2014; Hewitt & Brett, 2007; Holzweiss et al., 2014; Horning, 2007; Jaggars & Xu, 2016; Jahang et al., 2010; Jones, 2015; Kim, 2013; Kingma & Keefe, 2006; Lai, 2015; Lee et al., 2011; Maringe & Sing, 2014; Palmer & Smith, 2013; Parks-Stamm et al., 2016; Qiu et al., 2012; Ravenna, 2012; Russell, 2015; Russell & Curtis, 2013; Shaw, 2013; Sorensen, 2014, 2015; Taft et al., 2011; Tynan et al., 2015; Udermann, 2015; Walls, 2016	30
Example of interactive pedagogy: Student learning about how to do research is heavily dependent on interaction. Students arrive at the challenge of conducting research by first acquiring foundational knowledge about types of research, research methods, data collection, statistical and qualitative data analysis, and drawing inferences from results. Once students master knowledge of fundamental areas of the research process, they are ready to apply it by considering the various ways to study the phenomena of interest. Through online intragroup interactions, students may generate research questions or hypotheses and set about the task of debating different research approaches, examining the pros and cons of each option. Faculty direction to students would flow from immersion in the students' discussion, an understanding of key choice points in research design and their benefits and limitations (i.e., investments of time and costs and considerations of differing perspectives of external stakeholders), and the feasibility of potential approaches. Interactive pedagogy drawing on faculty expertise assumes constructivist and developmentally oriented characteristics.		
(b) Developing students: faculty providing incremental student feedback, mentoring; may involve creativity, problem-solving, research, writing, communication, and other skills; students access faculty expertise; faculty use the CoI practice of teaching presence	Artemiou et al., 2013; Benton & Pallett, 2013; Curriculum Committee, 2012; Holzweiss et al., 2014; Horning, 2007; Jahang et al., 2010; Jaggars & Xu, 2016; Jones, 2015; Lai, 2015; Maringe & Sing, 2014; Mbati & Minnaar, 2015; Monks & Schmidt, 2011; Palmer & Smith, 2013; Ravenna, 2012; Russell, 2015; Russell & Curtis, 2013; Salley & Shaw, 2015; Schwartz, 2014; Sorensen, 2014, 2015; Taft et al., 2011; Walls, 2016	22

Descriptions of Learning Goals and Pedagogies Requiring Smaller Classes	Authors	# Refs.
(c) Mastering complex phenomena: critical thinking; deep learning with constructivist pedagogy	Bristol & Kyarsgaard, 2012; Colwell & Jenks, 2004; Curriculum Committee, 2012; Holzweiss et al., 2014; Kim, 2013; Lai, 2015; Maringe & Sing, 2014; Mbati & Minnaar, 2015; Monks & Schmidt, 2011; Ravenna, 2012; Russell, 2015; Schwartz, 2014; Sorensen, 2014, 2015; Taft et al., 2011; Tynan et al., 2015; Walls, 2016	17
(d) Attaining higher order learning: advanced content at the application level or above on Bloom's taxonomy	Benton & Pallett, 2013; Colwell & Jenks, 2004; Curriculum Committee, 2012; Holzweiss et al., 2014; Kim, 2013; Kingma & Keefe, 2006; Lai, 2015; Maringe & Sing, 2014; Palmer & Smith, 2013; Ravenna, 2012; Russell, 2015; Stein, Wanstreet, Slagle, Trinko, & Lutz, 2014; Schwartz, 2014; Taft et al., 2011	13
(e) Effects of instructor inspiration: more challenge for and effort by students; greater motivation and enthusiasm; better study/work habits; greater student average progress on course objectives	Benton & Pallett, 2013; Haynie, 2014; Monks & Schmidt, 2011; Palmer & Smith, 2013; Sorensen, 2014, 2015	6

Re: instructor inspiration: Sorensen (2014, 2015) reported that faculty with smaller enrollments created stronger intracourse relationships and more fully shared their knowledge and expertise about the subject matter, thereby enabling the expression of teacher and student social presences and engagement, than did faculty in larger classes. Meaningful relationships generate emotions that facilitate learning (Berg & Seeber, 2016). In Monks and Schmidt's (2011) natural experiment of 1,928 course sections, smaller classes were found to correlate with greater faculty enthusiasm for teaching the class, effectiveness of teaching methods, clarity of presentations, stimulation of interest, daily preparedness, and adequacy of graded material relative to course content. Not significant but trending in the same positive direction were increased critical thinking, availability of the instructor, perceived respect the instructor had for students, and timeliness of feedback. Complementing these findings, Holzweiss et al. (2014) found that when students did not believe the faculty were fully engaged in a course, their perception of academic quality diminished. Palmer & Smith (2013) noted that the personal attention and feedback that a teacher can give in smaller classes, which they identified as the "teacherly" aspects of learning, are inspirational.

(f) High student diversity: lower income, first-generation in college, low SAT scoring or grades, Black or Latino, or international students	Beattie & Thiele, 2016; Bettinger & Loeb, 2017; De Giorgi et al., 2012; Diette & Raghav, 2015; Maringe & Sing, 2014	5
(g) Specialization courses; writing-intensive basic English, language learning, and clinical skills courses	Betts, 2008; Jones, 2015; Russell & Curtis, 2013	3

Studies supporting small classes for learning dependent on substantive interaction (a) emphasized that the multiple perspectives of student peers and the expert knowledge of faculty, accessed through interaction, enriches online learning. While factual information provides the underlying structure for any knowledge, at advanced levels of learning additional demands arise: reasoning through multivariate or ill-structured problems, considering different perspectives of a problem (Hew & Cheung, 2011), or selecting approaches attuned to contextual factors and political influences. Factors such as these must be identified, weighed, and negotiated to identify a preferred action or set of actions. And once an action is chosen, learners confront the need to adjust approaches as new understandings emerge.

Social presence of faculty and students, as defined in the CoI model and identified as requiring small classes, is richly developed in high-quality interactive learning courses, as are teaching and cognitive presences. In any course, faculty develop the content, structure, and evaluation components for learning, set expectations and goals, and design learning activities. In interactive learning, instructors add actions such as facilitating focused and substantive discourse, correcting students' misconceptions, identifying areas of consensus and disagreement, providing developmental feedback, and building knowledge understanding among student participants. In CoI interactions, course relationships are multidimensional and, ideally, both faculty and students tend to demonstrate authenticity and engagement (Orcutt & Dringus, 2017).

A learning pedagogy high in interaction is responsive to both individual and group learning and is teaching intensive. The faculty workload associated with frequent knowledge-building interactions, regular interventions, and student assessments is impractical in large classes.

Research on developing students (b) called for equally time-intensive teaching strategies. College courses on language learning, public speaking, English writing, clinical skills, or specialization (g) are examples appropriate for developmental learning strategies. Given the variation in knowledge and skill levels among students, faculty performance feedback is provided to students through time-intensive assessments of individual assignments, demonstrations, or videos of clinical skills practice. Developmental pedagogies commonly employ research and writing, problem-solving, creative activities, practice, role-playing, and projects through which students demonstrate, incrementally, their learning accomplishments. While the grades attached to an assignment are often a primary motivator for student achievement, in courses that are oriented to student development, faculty routinely engage in informal coaching. Coaching enables faculty expertise to be shared in a variety of "soft" ways that don't carry the force of a grade designation. It elicits an emotional connection between faculty and student that feels more collegial than does the "judgment" impact of a grade. Students understand intuitively the difference between "being graded" and "being coached," the latter being a more emotionally fulfilling and motivating experience.

Courses with a core purpose of student development depend heavily on the teaching, cognitive, and social presence practices of the CoI model. Faculty work is close-up and individually focused; students are assessed for their cognitive presence or skill growth within the learning environment. In developmentally focused courses with a sense of community, students often share an awareness of their peers' developmental strengths and weaknesses. Faculty work of assessing and coaching students while creating a safe and supportive learning environment is dependent on smaller and more intimate courses, which tend to engender trust.

Studies recommending small classes for learning about complex phenomena (c) and at higher levels of Bloom's taxonomy (d) identified faculty's expert leadership of interactive discussions, provision of individual and group feedback, and coaching for critical thinking. Garrison (2012) and Kasi and Yorks (2016) concluded that research on critical thinking and deep understanding indicates that this level of learning is hard to achieve without discourse. In most subject areas, it is difficult to imagine how students could advance higher order or complex thinking without faculty use of constructivist pedagogy, which takes contexts into consideration and moves students beyond orderly factual information into conceptions of multifactorial or ambiguous areas.

Developing complex and higher order thinking in students (c) requires faculty to design and facilitate applied learning activities while monitoring individual knowledge gains in analysis, synthesis, evaluation, and/or creation. Providing developmental formative and summative feedback to students is teaching intensive; therefore, educational efficacy is dependent on manageably small courses.

Studies identifying small classes as consistent with inspiring and challenging students (e) indicate such courses create the right conditions for greater student connection to the professor, thereby heightening student engagement with the teacher and the course material. Assignments in inspiring milieux tend to offer more academic challenge to students while also being more time-consuming for faculty to grade.

Studies recommending small classes for learning under conditions of high student diversity (f) offered relatively self-explanatory rationales: Because of differentials in backgrounds, prior knowledge, interpersonal, and language and writing skills, students from diverse, underserved, and/or minority backgrounds need more individualized faculty attention to succeed (Walls, 2016).

Additional benefits associated with smaller classes, such as the following, appeared in a lesser number of reviewed studies (see Table 5, a supplement to Table 4, for references on the additional benefits):

- positive student evaluations of instructors and satisfaction with courses;
- higher perceived student learning and better student learning performance;
- sense of group cohesion and connectedness;
- faculty involvement that encourages student participation; and
- positive effects associated with faculty workload (e.g., time spent interacting, providing feedback, assessing/evaluating student work), accessibility and responsiveness to students, and student evaluations of instructors.

In large classes, negative but nonsignificant relationships were found for critical thinking, availability of the instructor, perceived respect the instructor had for students, and provision of feedback (Ravenna, 2012; Russell & Curtis, 2013; Sorensen 2014, 2015).

Table 5

Supplement to Table 4: Research Sources Indicating Additional but Research-Limited Benefits Associated With Smaller Classes

Additional Benefits Associated With Smaller Classes	Sources	# Refs.
Student positive evaluations of instructors and satisfaction with courses	Bedard & Kuhn, 2008; Benton & Pallett, 2013; Chapman & Ludlow, 2010; Cheng, 2011; Kingma & Keefe, 2006; Lee et al., 2011; Mandel & Sussmuth, 2011; Monks & Schmidt, 2011; Palmer & Smith, 2013; Russell & Curtis, 2013; Sapelli & Illanes, 2016; Shaw, 2013; Udermann, 2015; Walls, 2016	14
Better student learning and performance	De Giorgi et al., 2012; Diette & Raghav, 2015; Horning, 2007; Johnson, 2010; Maringe & Sing, 2014; Monks & Schmidt, 2011; Salley & Shaw, 2015; Shaw, 2013; Walls, 2016	9
Higher perceived student learning	Chapman & Ludlow, 2010	1
Positive effects on faculty associated with workload (e.g., sufficient time to interact, provide feedback, assess/ evaluate student work); responsiveness to students; and higher student evaluations of instructors	Chapman & Ludlow, 2010; Curriculum Committee, 2012; Freeman, 2015; Goldman, 2012; Tynan et al., 2015	5
Sense of group cohesion and connectedness, and faculty participation that encouraged student participation	Colwell & Jenks, 2004; Haynie, 2014; Monks & Schmidt, 2011	3

In summary, the research reviewed for this study consistently linked smaller online classes to student development; student engagement with challenging material; higher order thinking; deeper levels of personal interactions, participation levels, and connectedness; socially constructed understandings; individualized faculty feedback; writing and creative assignments; full access to faculty expertise; and positive student reviews of faculty. Small courses enable teaching methods that differ markedly from those feasible with large enrollments. Large classes inherently drive pedagogy away from the above practices toward strategies that effectively disseminate factual information and require less individualized faculty–student interaction (Chapman & Ludlow, 2010; Mandel & Sussmuth, 2011).

When Are Large Classes Appropriate?

The case for large classes in higher education is reasonable and legitimate, justified primarily on economic grounds (Maringe & Sing, 2014). Since universities must generate budget-enhancing revenues to survive, and salaries are the single largest operational expense, small classes cannot realistically prevail uniformly across college courses. Larger classes produce financial surpluses via scale while smaller classes for advanced learning consume more resources. An

intentional mix of large and small classes can balance revenues and expenses by using the large courses to cross-subsidize those requiring smaller enrollments.

Evidence from our research review justifying large enrollments in online courses aligned with pedagogies for foundational and factual learning—that is, those requiring relatively low levels of critical thinking; limited personalized interaction with faculty, little individualized instruction, formative feedback, sense of community, or shared knowledge creation; and less higher order thinking, intellectual challenge, skill development, problem-solving, research and writing, journal reflection, or faculty-moderated discussions (El Tantawi et al., 2015; Haynie, 2014; Holzweiss et al., 2014; Mandel & Sussmuth, 2011; Maringe & Sing, 2014; Ravenna, 2012; Rees, 2017; Taft et al., 2011). Foundation-level learning can rely on lecture- and testing-centered pedagogies that emphasize content recall and demonstration of knowledge at the lower levels of Bloom's taxonomy (Pelech et al., 2013). Many college courses involve basic levels of learning that can be managed in large classes.

Schwartz (2014) examined what learning means in online environments from the perspective of the cognitive and learning sciences. Using Khan Academy (KA), a purveyor of online content, as an example of what he called "the illusion of understanding," Schwartz identified didactic education with testing, as practiced by KA, as inadequate to the task of building *complex understandings* in students. Among other characteristics, complex understanding is described as learning dependent upon experiences that provide formative feedback, sensitize students to context, require experimentation and practice, and lead to building models of hierarchically organized knowledge (i.e., conditions identified for small classes). MOOCs, self-study, and independent learning courses share pedagogical characteristics with those of KA. However, other researchers note that basic levels of factual knowledge acquired under conditions of didactic education—in large classes—can succeed in providing the foundation for subsequent development of more complex understandings (Fischer, 2014; Picciano, 2017; Rees, 2017).

Some studies described the differences between undergraduate and graduate courses and how pedagogies need to differ based on student learning level. Holzweiss et al. (2014) identified constructivist teaching methods and CoI practices as most suitable for graduate students learning at middle to upper levels of Bloom's taxonomy. Graduate students are focused on advanced content and skill development for specific professional fields. Their education requires an understanding of and appreciation for the flexible and growing nature of knowledge, taught by expert faculty who support and encourage them as novice members of the academic disciplinary community. In contrast, undergraduate students in lower division and some upper division courses, and graduate students in factual information courses, learn foundational knowledge efficiently and effectively in classes with large enrollments.

With advances in computer technology, some subject areas can accommodate large classes by supporting substantial individualized student learning outside of formal classes. Math and information sciences courses that supplement class time with labs and computerized tutorials incur costs in initial setup and design but save personnel costs significantly over time (Gleason, 2012). Advances in computerized practice and tutorial labs extend to the sciences. Graduate students and tutors can staff labs and coach students in an informal lab setting via hands-on learning while enabling very large courses for faculty lectures. Such settings that individualize instruction to a learner's specific needs have proven effective, whereas nonindividualized or independent online learning generally have not (Means et al., 2010).

What Number of Students Constitutes a Small, Medium, or Large Class?

We found an abundance of articles about online pedagogies. As detailed in Table 1, those selected for this analysis addressed the class-size implications associated with educational intent and pedagogical strategy. Only 18 of the 58 selected articles went beyond basic *small/medium/large* language to specify numbers of students for each size category. Those research recommendations are displayed in Table 6, Recommendations Specifying Enrollment Numbers in Smaller, Medium, or Larger Classes.

Table 6

Research Recommendations Specifying Enrollment Numbers in Smaller, Medium, or Larger Classes (n = 18)

Authors and Dates	Recommendations
The Academic Senate for California Community Colleges, Curriculum Committee, 2012	College English classes: 20 students; 15 students for basic skills courses. In mathematics courses, a ratio of 30 students for one teacher. Delineates pedagogies requiring teaching intensity.
Benton & Pallett, 2013	Small: 10–14; medium: 15–34; large: 35–49; and very large: 50+.
Betts, 2008	No more than 20–25 students in online graduate courses; less than 20 students in specialization courses.
Colwell & Jenks, 2004	Maximum undergraduate course size: 20 students; 8–15 students for graduate courses.
Goldman, 2012	Optimal online MBA class size (with discussion): 12 students.
Haynie, 2014	Online synchronous courses of no more than 15 students.
Hewitt & Brett, 2007	Ideal enrollment of 8–30 students, depending on the type of course.
Horning, 2007	No more than 20 students in any English writing class; ideally, should be limited to 15 (smaller for remedial sections).
Jones, 2015	Online master's courses of 25–35 students. Smaller classes for practice skills courses and advanced clinical skills courses.
Kingma & Keefe, 2006	Courses of 15–25 students.
Lai, 2015	Online doctoral course: 12 students.
Mandel & Sussmuth, 2011	Maximum size of 19 students.
Morse, Brooks, & Mason (2018), *U.S. News and World Report* College Rankings, 2019	Awards full points for undergraduate classes with ≤ 20 students.
Parks-Stamm, Zafonte, & Palenque, 2016	Small classes less than 15 students; medium classes 15–30 students.
Qiu, Hewitt, & Brett, 2012	Optimal class size 13–15 students.
Sorensen, 2014, 2015	Small: classes with 10 students or less; medium: classes with 11–19 students; large: classes with 20–30 students.
Taft et al., 2011	Small: ≤ 15 students Medium: 16–30 students Large: ≥ 30–no known upper limit of students

Of the 18 articles, just four proposed actual student numbers associated with a small, medium, or large category. There was virtually no agreement on what constituted large classes; proposed numbers ranged from 20 students to "no known upper limit" (three articles). For medium sizes, four articles recommended 11–30 students. There was convergence among four articles that small classes should hold ≤ 15 students.

Regarding differences between undergraduate and graduate courses, the recommended range for undergraduate courses was 15–30 students, with more refined specifications for basic skills (≤ 15) and mathematics courses (30). Size recommendations for masters/graduate courses ranged from eight to 35, a large spread; one author called for < 20 for specialization courses. Doctoral courses were mentioned in just one study, with a recommendation of eight students. The remaining sources did not differentiate class sizes between undergraduate and graduate courses, recommending eight to 50 or more online students, with lower and upper limits varying widely among the studies.

In conclusion, this literature review identified substantial research attention linking pedagogical practices to online course sizes, but it offered ambiguous guidance on specific student enrollment numbers associated with student learning and faculty pedagogies. Below, we discuss and present our conclusions from the findings, our recommendations for course sizes, and a framework for class enrollment decisions.

Discussion and Conclusions

Class enrollment numbers in higher education settings are influential factors impacting online student learning, faculty pedagogy, school finances, and faculty workload, yet they have been addressed without sufficient specificity or consensus using learning theory to provide policy guidance. This research was intended to advance the knowledge and practice of evidence-based class size determinations in higher education, a factor repeatedly linked to student learning in online courses. The authors presented evidence from a comprehensive literature review of 43 cross-disciplinary education journals on student learning and the implications of various pedagogical practices for class sizes. Fifty-eight selected articles were inductively analyzed and informed the findings for the study.

Our findings demonstrate clear and continuing academic interest in online course sizes as they align—or fail to align–with research about student learning. We found substantial research support for structuring course enrollments consistent with educational goals and pedagogical strategies known to address student learning needs effectively. The reality that student learning needs and pedagogical practices vary meaningfully—by student educational level, demographics, complexity of subject matter, faculty teaching methods, and university policies—has historically confounded the identification of "the right number" for course enrollments. Student competencies, learning expectations, and pedagogical variations bring complexity to calculations of class sizes and faculty workloads. Wide and random size discrepancies are reported across studies, universities, between departments within a single setting, and between face-to-face and online courses (Mupinga & Maughan, 2008). Research clearly indicates that in the world of online education, *no one size fits all courses*. In spite of a continuing interest in online class sizes, there is a striking absence of coherent guidelines on student enrollments.

University policies on class sizes and academic staff workload are frequently guided more by historical precedents, "what other colleges do," or by untested assumptions about reducing costs or scaling up revenues than by research-based measures of learning and staffing effectiveness. Often, courses have student numbers arbitrarily assigned based on their placement within a curriculum. Additionally, online courses are generally acknowledged to be more teaching intensive than are face-to-face courses due to extra tasks associated with them, increased faculty preparation and interaction time, technical complexity, contextual variability, and student supports needed. The multiplicity of relevant factors has muddied the development of guidelines for online course sizes and faculty workload expectations (Tynan et al., 2015).

Most university workload assignment practices fail to take into consideration the educational intent and pedagogical strategies faculty apply in their courses, how variable or appropriate they are, or how effectively they educate students in the near and long-terms. Colleges tend to apply standard formulae: for example, tenured professor X is given a semester workload of three 3-credit-hour graduate courses with a course cap of 25, while part-time faculty member Y has a workload of five 3-credit-hour undergraduate courses with a course cap of 40 students. Standardized workload assignments are efficient to implement and, because they are commonly used, may on the surface appear to be reasonable assignments. However, other than differentiating undergraduate from graduate students and tenure track from non-tenure-track faculty, these workload examples take no account of expected student learning goals or faculty pedagogical methods appropriate to a course. While student enrollment numbers intentionally matched to course-appropriate pedagogy should be at the center of workload calculations, instead routine application of pre-established enrollments leaves the door open for disparities in the quality of student learning and inequities across faculty workloads. The authors found no evidence, explicit or implicit, of university online workload assignments that considered how student learning needs were aligned with pedagogical methods and course enrollment sizes (Fischer, 2014; Pelech et al., 2013).

Online course sizes should advance student education without compromising institutional fiscal stability. It is fair to conclude that universities need an evidence-based analytical framework for assisting faculty and administrators to make differentiated enrollment size decisions that take into account student learning goals, pedagogical methods, university financial needs, and faculty workload. Our results suggest three conclusions of interest bearing on enrollment decisions in online courses.

Established Educational Theories Offer Guidance for Online Class Size Decisions

To structure our findings regarding how well different class sizes function in the distance-learning world, we followed earlier class size researchers (Taft et al., 2011) in applying three recognized educational theories: objectivist–constructivist pedagogies, Bloom's taxonomy, and the CoI model. Each theory invokes a continuum for a range of teaching practices that address, for example, the level of learning, complexity of subject matter, and degree of faculty engagement required for effective student learning. When the three theories are used to examine the implications for online class sizes, they show considerable pedagogical overlap, yet each theory adds a singular perspective for categorizing courses as high, medium, or low in pedagogical demand.

Given the reality that college courses require no automatic pedagogical approach—neither constructivism nor objectivism is mandated for any given course, Bloom's taxonomy allows for

variation across targeted learning levels, and choices must be made for degree of implementation of the CoI model—only a course-specific analysis should guide enrollment sizes.

Use of an Analytical Framework for Online Course Enrollment Numbers Is Timely and Necessary

We identified a clear need for ways to structure university decisions on class sizes in online courses. This final section addresses the need explicitly. We propose a stabilization of class size terminology, followed by a framework that employs the stabilized terminology and incorporates pedagogical factors in enrollment decisions.

To support university financial stability, our framework advances the use of larger classes for courses primarily focused on foundational and/or factual knowledge acquisition. Research reviewed for this study provided no evidence that student learning was disadvantaged when the pedagogical characteristics for large classes described in the Findings section were applied. Universities are fiscally responsible in assigning large enrollment sizes to courses fitting these criteria: large classes satisfy foundational learning needs while generating budgetary surpluses, some of which can be used to cross-subsidize courses requiring smaller student-to-faculty ratios. Concurrently, existing research promotes smaller class sizes under conditions specified earlier: learning associated with higher order and critical thinking, reasoning through complexity, incorporation of context and a diversity of perspectives, creative problem-solving, and developing individual students in research, writing, and disciplinary expertise.

Pedagogical requisites for learning should drive the choice of online class sizes. Given the connection of learning goals and pedagogical strategy to class size, and the limited evidence of specific online student enrollment numbers, researchers need to build a consensus on the number of students associated with each class size. Researchers have prescribed different class sizes generally characterized as *small*, *medium*, or *large*. This terminology is a good starting point, but we determined that adding specific numbers and intermediate terms to cover the ground between small and medium and between medium and large provides a more refined and actionable five-category spread. Our findings synthesized data from the research reviews to create five categories with specific student numbers. Below, we propose online course sizes compatible with both financial considerations and the educational theories applied in this study.

The evidence compiled on student enrollment numbers, displayed in Table 6, and the identified pedagogical characteristics associated with small, medium, and large classes, enabled us to propose specific student enrollment numbers for online college class sizes. We recommend that the following terminology be adopted:

Online Class Size	Number of Students
Small:	≤ 15
Small–medium:	16–23
Medium:	24–30
Medium–large:	31–39
Large:	40–no upper limit

We apply this terminology in an enrollment size framework structured according to pedagogical strategies in Table 7. *The goal for class size decisions should be to balance learning goals and university revenue needs by applying a model that respects both*.

Table 7

Recommended Student Enrollment Sizes by Learning Needs and Pedagogical Strategies, With Course Examples

Class Size	Learning Needs and Pedagogical Strategies	Course Examples
Small: ≤ 15 students	• Faculty instruction, extensive class discussion; individual projects and papers, one major; in-depth research on course topics of interest • Constructivist methods • Application level and above of Bloom's taxonomy • CoI: o teaching presence includes course design and organization, facilitating discourse, and direct instruction; individualized feedback o extensive student cognitive presence o well-developed faculty and student social presence	Undergraduate level: information technology research; interventions for children with moderate to severe disabilities; writing for publication Graduate level: research design and methodology; advanced interventions in psychology practice
Small–medium: 16–23 students	• Faculty instruction, class discussion; student debates; student public-speaking practice; writing and/or math assignments; written application/analysis assignments; group project work; written term paper • Mix of objectivist and constructivist methods • Application and analysis levels of Bloom's taxonomy • CoI: o teaching presence includes course design and organization, facilitating discourse, and direct instruction; individualized feedback o student cognitive presence in class and on performance assignments o faculty and student social presence exhibited	Undergraduate level: ESL writing; creative writing; anthropology of gender and sexuality; debate; public speaking; composition; public relations; mathematical modelling; advanced comparative religions; online journalism Graduate: case studies in language translation; research statistics
Medium: 24–30 students	• Mix of faculty lecture, class discussion, small-group project work; quizzes and/or tests, short essays • Predominantly objectivist method, some constructivism • Knowledge, comprehension, and application levels of Bloom's taxonomy • CoI: o teaching presence includes course design and organization, facilitating discourse, direct instruction; feedback to student group as a whole, some individualized feedback o moderate level of student cognitive presence o moderate level of faculty and student social presence	Undergraduate level: ethics; quantitative data analysis; race and ethnicity; cultural evolution Graduate: public finance; communication disorders of the aged; computer applications in business; infectious diseases in the developing world

Class Size	Learning Needs and Pedagogical Strategies	Course Examples
Medium–large: 31–39 students	• Predominantly faculty lecture with selected periods of class discussion; students assessed by testing, quizzes, short-answer questions, automated activities • Mainly objectivist method • Knowledge and comprehension levels of Bloom's taxonomy • CoI: o teaching presence includes course design and organization, facilitating discourse; feedback to student group as a whole o cognitive presence limited to test or quiz performance and brief interactions o faculty and student social presence limited to episodic discussions	Undergraduate: principles of economics; introduction to sociology; history of science; health disparities in the U.S.; computer science with individualized lab tutoring Graduate: pharmacology; sports governance
Large: 40–no known upper limit of students	• Predominantly faculty lecture; students assessed by standardized testing of knowledge • Objectivist method • Knowledge and comprehension levels of Bloom's taxonomy • CoI: o teaching presence limited to course design and organization, evaluation o cognitive presence limited to test performance o minimal faculty and student social presence	Undergraduate level: world history; introduction to biology; global archeology; world religions; history of mathematics Graduate: neuroanatomy; adult pathophysiology

Table 7 details recommended student enrollment sizes (column 1) for specified learning needs and pedagogical strategies (column 2), and provides illustrative course examples for each category (column 3). We selected course examples from our own universities whose learning strategies we deduced to correlate with student learning level, complexity of subject matter, interaction requirements, and student diversity. These attributes may or may not align with how courses are taught in other university settings and are not intended to be prescriptive. Instead, we propose that our recommendations lead to local academic discussions about structuring class sizes to integrate pedagogical factors into decision-making.

Our proposed framework rests on the best evidence compiled from articles found in recent higher education journals reported by researchers from a variety of disciplines. We do not view the question, *What is the right number of students to enroll in online college courses?* as definitively answered by our work, but we do believe that we have put forward a model with high generalizability worthy of testing across university settings. We encourage future research examining the educational and financial issues addressed by this review as well as studies reporting on decision-making processes and results from implementing similar proposed frameworks.

Our guidelines for class sizes in online courses are recommended for trial and evaluation at varying levels and across different disciplines in universities. We urge universities to draw on the combined expertise of both administrative leaders and experienced faculty who, together, deliberate to determine course enrollments. The process and methods for such decision-making need further development. We have begun trialing one rubric, displayed in Table 8 (Implementation Rubric for Experimentation With Class Size Decisions), with some success among university faculty; it may be a useful beginning model for experimenting with application/implementation methods for our class size recommendations.

Table 8
Implementation Rubric for Experimentation With Class Size Decisions

Name of online course: _____
Level of course: ____UG lower division ___UG upper division _____Master's _____PhD _____Other:

How you would rate this course on each of the pedagogical theories? Circle the column cell most closely describing each of the 3 teaching methods; if the course falls between two rows, circle both.

Pedagogical Level & Theory: Point Allocation	Bloom's Taxonomy (Column A)	Objectivist-Constructivist (Column B)	Community of Inquiry (Column C)
1 pt.	Knowledge and comprehension levels of taxonomy	Predominantly faculty lecture; students assessed by standardized testing of knowledge.	Teaching presence limited to course design and organization, delivery, student evaluations. Cognitive presence limited to test performance. Minimal faculty and student social presences.
2 pts.	Knowledge and comprehension levels of taxonomy	Predominantly faculty lecture with selected periods of class discussion; students assessed by testing, quizzes, short answer questions, automated activities.	Teaching presence includes course design and organization, delivery, some discourse facilitation. Feedback largely to student group as a whole. Cognitive presence limited to students' test or quiz performance and brief interactions. Faculty and student social presences limited to episodic interactions.
3 pts.	Knowledge, comprehension, and some application levels of taxonomy	Mix of faculty lecture, class discussion, small group project work; quizzes and/or tests, short papers/essays.	Teaching presence includes course design and organization, delivery, facilitating discourse, direct instruction. Feedback to student group as a whole, some individual feedback. Moderate level of student cognitive presence. Moderate level of faculty and student social presences.
4 pts.	Application and analysis levels of taxonomy. Requires critical thinking, ability to think holistically, use different perspectives.	Faculty instruction, class discussion; student debates; student public speaking practice; writing and/or math assignments; written application/analysis assignments; group project work; individual written term paper.	Teaching presence includes course design and organization, delivery, facilitating discourse, and direct instruction; individualized feedback. Student cognitive presence in class and on performance assignments. Faculty and student social presences exhibited.
5 pts.	Application level and above of taxonomy. Extensive critical thinking requires reasoning through complexities and ambiguities.	Faculty instruction, extensive substantive class discussion; individual projects and papers, one major; in-depth research on course topic of interest.	Teaching presence includes course design and organization, delivery, facilitating discourse, and direct instruction; individualized student feedback. Extensive student cognitive presence. Well-developed faculty and student social presences.

1. Indicate score for each column: Column A____ Column B____ Column C____
   Note: when scores fall *between* 2 rows, circle both and assign a point score between the two rows.
2. Sum the scores from the 3 columns: Column A + Column B + Column C = Total course score of: ____. (Score range = 3–15).
3. Total score will identify the numerical parameters of class size. In the range of course sums below, circle the appropriate size for the course.

Total course score (Sum):
3 = Large-sized course, 40 students > no known upper limit
4
5
6 = Medium/large-sized course, 31-39 students
7
8
9 = Medium-sized course, 24-30
10
11
12 = Small/medium-sized course, 16-23 students
13
14
15 = Small course, ≤ 15 students

Evidence-based Class Size Guidelines:

Online Class Size	Number of Students
Small courses:	≤ 15
Small/medium courses:	16-23
Medium courses:	24-30
Medium/large courses:	31-39
Large courses:	40-no known upper limit

This framework is an explicitly synthetic effort to present our understanding of the recent research literature, but it also aligns comfortably with our personal experiences as online educators. It is meant to be considered, discussed, challenged, and customized to particular settings. We offer it to introduce a process of inquiry and experimentation into decision-making about online class sizes that is worthy of the high educational stakes.

Limitations

This research was rooted in a systematic review of recent research articles published by education scholars from more than 43 cross-disciplinary education journals. Undoubtedly, there are relevant studies from outside of our search parameters residing in other publications or within educational settings. We welcome additional research insights to add to the compilation of evidence.

As learning technologies continue to advance, the potential exists for emerging discoveries to alter our understanding of learning processes, change pedagogical methods, and expand options for effective individualized online student learning. Over time these influences may transform the structure of learning systems and impact the factor of class size.

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Examining the Role of Motivation and Learning Strategies in Student Success in Online Versus Face-to-Face Courses

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Abstract
The goal of this paper is to compare the motivations and learning strategies of online and face-to-face students, utilizing the Motivated Strategies for Learning Questionnaire (Pintrich et al., 1993). Prior research (Crede & Phillips, 2011) suggests that motivation variables play a larger role in predicting student success in online courses compared to the specific learning strategies that are used, but little research has directly compared online students to face-to-face students. Results of this study found that while online students reported lower levels of motivation compared to face-to-face students, motivation variables were more strongly correlated with course performance than learning strategies, particularly for online courses. The results are discussed with implications for how to build student motivation to succeed, particularly in an online format, as well as different considerations for lower level or upper level students.

Keywords: online learning, learning strategies, motivation

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Examining the Role of Motivation and Learning Strategies in Student Success in Online Versus Face-to-Face Courses

As online education continues to grow at a rapid pace (Seaman, Allen, & Seaman, 2018), a growing number of studies have examined the characteristics of online learners. Much of this work has focused on both personal characteristics of these students (such as motivation, self-discipline, or self-efficacy) and their level of computer experience or access to technology, and has found that students' motivation and self-discipline predict success in online courses (Waschull 2005; Schrum & Hong, 2002; Stark, Lassiter, & Kuemper, 2013). However, it is unclear whether these predictors also equally apply to success in face-to-face courses or what aspects of motivation or particular study habits are facilitating student success. The goal of the current study is to examine whether taking a course online or face-to-face influences student motivation to succeed in that course, as well as to identify the strategies they employ to learn in that particular course, and how student motivations and learning strategies relate to course performance.

Review of Literature

Many students seek out online education because it offers them greater flexibility than face-to-face courses. In many online courses, students can choose to access learning materials and complete assignments on a schedule that is convenient for them, rather than attending class in a particular location or at a specific time. Although this flexibility can lead to increased rates of course withdrawal or failure for students who realize too late that they cannot manage their time effectively (Parker, 1999), other research has shown high rates of success in terms of course performance for students in online courses (del Valle & Duffy, 2009), suggesting that most students are able to successfully adapt to an online environment.

The greater flexibility offered by online education has led researchers to focus primarily on characteristics related to self-discipline and motivation to understand how aspects of the learners influence their success in an online setting. For example, Cho and Shen (2013) found that intrinsic motivation and students' self-efficacy beliefs positively influenced both students' persistence and success in an online course. Specifically, students who reported stronger intrinsic motivation (as measured by learning itself being the primary goal, rather than only earning high grades) were more likely to use complex learning strategies, such as quizzing themselves after reading to test what they had learned, which then led to improved course performance. Similarly, Kerr, Rynearson, and Kerr (2006) found that motivation to learn, and ability to work independently through setting goals, being self-disciplined, and managing time, best predicted course success for online students, and Artino and Stephens (2009) found that higher levels of self-efficacy and belief that the course had value positively related to performance in online courses.

Other characteristics of students, such as their overall experience with college-level courses, may also influence their approach to online courses. Stark et al. (2013) found that motivation to study and self-discipline predicted higher course grades for upper level college students in an online course; for lower level college students, access to technology was the most significant predictor of online course success. It could be that students who have already developed successful study habits through experience with college courses can better apply them to an online course if they are motivated, whereas success for newer students is more dependent on basic access to technology.

It may also be the case that student characteristics influence their decisions to complete online courses in the first place. Roblyer (1999) found that students who chose online courses placed a higher value on controlling the timing and pace of their learning, compared to those who chose face-to-face courses. Jenkins and Downs (2003) found no differences in age or gender when comparing online to face-to-face students; however, the online students were more likely to work full-time and live further from campus. These studies suggest that students chose online learning primarily for convenience and support the focus on examining student motivation as a predictor of success for online students.

The Motivated Strategies for Learning Questionnaire (MSLQ) was developed by Pintrich, Smith, Garcia, and McKeachie (1993) to assess types of academic motivation as well as strategies employed to assist in the learning of the material in a specific college course. This instrument is based on a social–cognitive view of the student, such that the specific context in which a student is learning will influence the particular motivations that arise in the student as well as the particular study approaches or learning strategies that the student employs (see Garcia & McKeachie, 2005, for an overview of the MSLQ and review of research incorporating this tool). A student may be highly motivated to learn in a class for their major and willing to use time-intensive and complex study methods but less motivated to work as hard in a course that they see as less relevant to their future career goals.

The motivation scales for the MSLQ focus on three components (Pintrich et al., 1993): student beliefs that they can effectively complete tasks (self-efficacy), the reasons students engage with a course (including internal motivators, such as finding content interesting, or external motivators, such as striving to achieve high grades), and student anxiety over taking exams in a course. The learning strategies scales explore a range of approaches that students can use to manage their learning, ranging from simple and basic techniques, such as memorizing information, to more complex metacognitive approaches, such as reflecting on their own understanding or connecting material to other courses. Overall, this tool provides a range of potential motivation and learning variables that could both be influenced by the particular context of the course the student is taking and relevant to student performance in that course.

The focus of the MSLQ on student motivations and behaviors in a specific course (rather than in general) makes it a useful tool to examine how course modality, such as online versus face-to-face courses, influences student motivations to learn and the strategies they use to achieve learning, especially given that motivational variables have been shown in prior research to be particularly relevant to student success online. A growing number of studies have used the MSLQ to examine student performance specifically in online courses. For example, Castillo-Merino and Serradell-Lopez (2014) and Cho and Heron (2015) found that aspects of motivation played a stronger role in predicting student achievement compared to use of particular learning strategies; in these studies, motivational variables predicted course performance, but student effort or use of particular learning strategies did not relate to course grades nor, in Cho and Heron (2014), satisfaction with the course.

Cho and Heron (2014) suggest that the lack of relationship between course success and use of particular learning strategies was due to studying performance in a remedial mathematics course. For students in this study, being presented with mathematic problems and clear instructions to solve them, via the online system, perhaps did not leave them many options for using various types of learning strategies, making this aspect less relevant to their success in the course. Or, if students were mainly focused on passing the course and less concerned with earning high grades,

they may have been less likely to put time into using more involved learning strategies in this particular course, doing only what was needed to pass. This suggests that the nature of specific courses can influence student motivations to succeed (i.e., being focused on passing the course rather than achieving high grades), which can then influence the specific techniques students use to learn course material.

Crede and Phillips (2011) conducted a meta-analysis of research utilizing the MSLQ, and found that the motivation constructs of self-efficacy and intrinsic motivation, as well as the overall strategies of spending more time studying and choosing appropriate study environments consistently predicted course grades. Intriguingly, the measures of complex learning strategies, such as using elaborative memory techniques versus rehearsing information, using critical thinking, or organizing material to be learned, did not regularly predict academic performance, even though these represent deeper and presumably more effective ways to learn material. Crede and Phillips (2011) encourage future researchers to more closely examine how course characteristics, such as the extent to which a course relies on multiple-choice exams, or the extent to which course content is complex and theoretical, may moderate students' use of learning strategies and their performance in the class.

Finally, Wang, Shannon, and Ross (2013) also used the MSLQ to examine students enrolled in online courses, and found that those who had taken online courses before reported using more learning strategies compared to those students new to online learning. Also, the use of more learning strategies led to increased motivation to learn, which then related to improved performance in online courses. The authors suggest that prior experience with online courses allows students to determine what strategies are most effective in that context, and that this experience increases students' technology self-efficacy and belief in their own abilities, leading to course success.

The goal of the current study is to extend this prior work by directly comparing the motivations and learning strategies of students in both online and face-to-face courses. Previous research has examined how these strategies and motivational variables relate to performance, but has not examined whether students enrolled in online classes report different motivations or approaches to learning the material compared to students enrolled in face-to-face classes. The population of students sampled for this current study attend a university with both online and face-to-face options for most courses, so students had the choice of format for their classes. This made for an ideal opportunity to study how the course context of being enrolled in online or face-to-face courses influenced both student motivations to learn and the strategies that they employed in that particular course. Thus, the following was my first research question:

- Research Question 1: Do students enrolled in an online course report different motivations or learning strategies for that course, compared to students enrolled in a face-to-face course?

This study also extends work examining the predictors of performance in online and face-to-face classes. Specifically, this study examined whether, as suggested by prior research (i.e., Cho & Heron, 2015), motivational variables are more related to course performance for online compared to face-to-face courses. In addition, this study examined potential connections between particular motivations for success and the use of specific learning strategies. As such, my second and third research questions were the following:

- Research Question 2: How do motivational and learning strategy variables predict performance in online compared to face-to-face courses?
- Research Question 3: Do specific motivational variables relate to use of particular learning strategies?

Finally, this study examined whether the strategies and motivations that best predict performance differ based on whether the students were lower level (i.e., self-reported as first years or sophomores) or upper level (reported themselves as juniors or seniors). Therefore, my final research question was the following:

- Research Question 4: Do motivational and learning strategy variables predict performance in online and face-to-face courses differently for lower level compared to upper level students?

There has been limited work addressing this question, so this will serve as an exploratory opportunity to begin to build an evidence base showing the impact of level of schooling on the connection between the MSLQ variables and course performance. Overall, this current study adds to an understanding of the learning strategies and motivations of college students in both face-to-face and online courses, and how these relate to course performance.

Methods

Setting

This study was completed at the institution of the author, a midsize midwestern university in the United States, with a convenience sample of participants who were enrolled in psychology courses. Some participants were taking psychology courses as majors or minors in the department, whereas others were completing general education courses, such that a range of student majors and programs are represented in this sample. The research procedure and survey questions were approved by the university's Institutional Review Board before beginning data collection. All participants viewed consent information before beginning the survey, and all were given the opportunity to skip questions or quit the study at any time.

Participants

A total of 778 participants completed the survey (77% female; 82% Caucasian/White). The average age of participants was 20.73 (range 18–53, *SD* = 3.28). Participants also indicated their year in college, with 31% indicating they were first-year students, 17% sophomores, 19% juniors, and 25% seniors, and 9% noting "other," which could include non-degree-seeking students. Students' GPAs ranged from 1.15 to 4.00, with an average of 3.29 (*SD* = 0.47), indicating fairly high achievement in courses among the participants. Students were asked to choose a particular class in which they were currently enrolled to consider as they completed the MSLQ, and then they noted whether that particular course was online or face-to-face. Responses were split fairly evenly, as 47% of participants responded thinking of an online course, and 53% responded thinking of a face-to-face course. Students were also asked to list the specific course that they referenced when responding to the MSLQ questions, and reported a wide range of courses across a number of majors and colleges at this university. Due to this range, specific details on the particular requirements or aspects of the online and face-to-face courses are not considered in this report.

Measures and Procedure

The survey was disseminated using Qualtrics, an online survey tool. Participants first read consent information and then continued to the survey questions. The questions began with demographic information, including gender, age, year in school, race/ethnicity, and current GPA. Next, students were asked to indicate whether they were currently enrolled in a fully online course. They were told that for the remainder of the survey, they would need to answer the questions with a specific course in mind, and that if they were taking an online course, they should think of that course. If they were not currently enrolled in an online course, then they were told that they should pick one of their other current courses to think about as they responded to the survey questions.

The next portion of the survey included the 81 questions of the MSLQ (Pintrich et al., 1991). All 81 items were scored on a 7-point Likert scale, ranging from 1 (*not at all true of me*) to 7 (*very true of me*). Participants were instructed to think of the specific course they had noted previously, indicating how much they think each statement is true of them. See Appendix A for a list of all the items and specific scoring information.

The motivation scales include 31 total items, creating five overall measures of intrinsic motivation (focus on learning and curiosity about the subject matter: four items, $\alpha = .73$), extrinsic motivation (focus on earning high grades and approval from friends or family: four items, $\alpha = .64$), self-efficacy (a belief that they are able to learn the concepts taught in the class: eight items, $\alpha = .93$), task value (how interesting, useful, or important the course content is perceived to be: six items, $\alpha = .92$), and test anxiety (worry about course exams: five items, $\alpha = .81$).

The learning strategy scales include 50 items, resulting in nine overall measures of various learning strategies. These include the simplest learning strategy of rehearsal of information (repeating items over and over to encourage memorization of concepts: four items, $\alpha = .73$), as well as more complex strategies of elaboration (summarizing information and connecting to other courses: six items, $\alpha = .80$), organization strategies (such as creating outlines or charts of course concepts: four items, $\alpha = .69$), critical thinking (evaluating evidence for theories or ideas presented in the course: five items, $\alpha = .77$), and metacognition (staying focused on learning and studying in a way to fit that particular course: 12 items, $\alpha = .78$). In addition, four scales measure strategies related to student resource management, including managing time and study environment (keeping up with assignments and studying regularly: eight items, $\alpha = .74$), regulating effort (working hard even if material is difficult or dull: four items, $\alpha = .66$), peer learning (studying with a friend: three items, $\alpha = .75$), and help seeking (asking for help if concepts are confusing: four items, $\alpha = .65$).

After responding to the MSLQ items, participants were asked to indicate their current grade in the course, with options of below 60%, 60–70%, 70–80%, 80–90%, and above 90%. Finally, participants were asked whether they were able to easily access the Internet for their studies. This was measured on a 5-point Likert scale, with endpoints of 1 (*strongly disagree*) and 5 (*strongly agree*). After completing this measure, participants were told they had completed the survey and were thanked for their participation.

Responses to all items were averaged to result in measures for the motivation and learning strategy scales, as described above. Independent samples *t*-tests were used to compare differences between students who responded to the scales thinking of a specific online course to those students who responded thinking of a face-to-face course. Regression analyses were used to examine how the motivation and learning strategy scales predicted self-reported course performance. These regressions were initially performed separately for participants from online and face-to-face

courses, and then further separated to compare patterns of prediction for participants who reported being first years or sophomores and those who reported being juniors and seniors, in online or face-to-face courses.

Results

When comparing the motivations and specific learning strategies of students in online courses to those in face-to-face classes, independent samples *t*-tests showed significant differences for many of the measures. Due to the number of analyses, descriptive and inferential statistics comparing online to face-to-face students are presented in Table 1.

Specifically, students in online classes reported significantly lower levels of both intrinsic motivation and extrinsic motivation compared to students in face-to-face courses. The MSLQ conceptualizes intrinsic motivation as a focus on learning and mastery of the content, whereas extrinsic motivation refers to a goal of earning high grades or approval from others, so this finding suggests that students in the online courses were less motivated by both the content of the material itself and the potential to earn higher grades compared to those in face-to-face classes. Students also gave greater task-value ratings to face-to-face courses compared to online courses, showing that they viewed face-to-face courses as more interesting and useful. However, students had greater self-efficacy ratings for online courses compared to face-to-face courses, indicating that they felt more capable of success in online courses. There were no differences in reported test anxiety or their beliefs about the extent to which they could control their own learning between the two types of courses in this sample.

When comparing student learning strategies between online and face-to-face courses, several differences emerged. Students in face-to-face courses were more likely to report using the basic strategy of rehearsing information compared to those in online courses. Students in face-to-face courses were also more likely to use the more complex strategy of organizing information while studying compared to those in online courses. Students in face-to-face classes also reported using more metacognitive strategies when studying compared to those in online courses. Finally, students in face-to-face courses reported greater usage of seeking peer support when learning and seeking help from the instructor compared to those in online courses.

Table 1
Differences in Reported Motivations and Learning Strategies Between Online and Face-to-Face Students

		Online courses		**Face-to-face courses**		**Inferential statistics**	
Variables		***M***	***SD***	***M***	***SD***	***t*(*df*)**	***p***
Motivation variables	Intrinsic motivation	4.61	1.19	4.89	1.08	-3.33 (747)	.001*
	Extrinsic motivation	5.50	1.06	5.67	0.98	-2.39 (748)	.017*
	Task value	4.88	1.49	5.39	1.26	-5.01 (732)	.0001*
	Control of learning	5.39	1.06	5.35	1.08	0.47 (743)	.64
	Self-efficacy	5.48	1.13	5.20	1.18	3.38 (737)	.001*
	Test anxiety	4.14	1.43	4.25	1.41	-1.12 (739)	.262
	Rehearsal	4.45	1.37	4.82	1.19	-3.95 (745)	.0001*
	Elaboration	4.67	1.21	4.79	1.09	-1.45 (739)	.148

Learning strategy variables	Organization	4.31	1.35	4.56	1.19	-2.64 (744)	.009*
	Critical thinking	4.00	1.24	4.12	1.16	-1.28 (745)	.201
	Metacognition	4.34	0.92	4.48	0.84	-2.19 (734)	.029*
	Regulating time/study environment	4.85	0.99	4.96	0.97	-1.51 (733)	.132
	Regulating effort	5.13	1.13	5.15	1.07	-0.24 (745)	.809
	Peer support	2.95	1.53	3.52	1.49	-5.16 (749)	.0001*
	Seeking help	3.33	1.36	3.86	1.24	-5.60 (751)	.0001*

* significant difference ($p < .05$) between online and face-to-face courses

Predicting Course Performance

Students reported their current course grade based on their overall percentage grade. Only 1% of students reported course grades lower than 60%, and many participants (44%) reported course grades above 90%. There was also a significant difference in reported grades based on the course modality; students reported higher grades in online courses ($M = 4.34$, $SD = .90$, equivalent to 80–90% average) compared to face-to-face courses ($M = 4.02$, $SD = .91$, equivalent to 70–80% average, $t\ (753) = 4.96$, $p < .0001$).

To predict course performance, regression analyses were performed separately for face-to-face and online courses, including the motivation and learning strategy subscales as predictors. Only subscales that emerged as significant predictors of current course grades are reported in the text. See Table 2 for regression information for all variables.

Table 2
Predicting Course Performance in Online- and Face-to-Face Courses

		Online courses		**Face-to-face courses**	
Variables		***b***	***p***	***b***	***p***
Motivation variables	Intrinsic motivation	-.119	.025*	-.150	.015*
	Extrinsic motivation	.049	.283	-.016	.749
	Task value	.009	.816	-.016	.743
	Control of learning	.048	.324	.003	.958
	Self-efficacy	.408	.0001*	.513	.0001*
	Test anxiety	-.069	.041*	-.021	.561
Learning strategy variables	Rehearsal	.017	.696	-.055	.271
	Elaboration	-.052	.352	.110	.090
	Organization	-.061	.205	.065	.219
	Critical thinking	.005	.921	.097	.057
	Metacognition	-.041	.605	-.215	.017*
	Regulating time/study Environment	.146	.017*	.163	.012*
	Regulating effort	.008	.882	.012	.847
	Peer support	.008	.842	.046	.237
	Seeking help	.049	.230	-.014	.737

* $p < .05$

For online courses, variables relating to motivation emerged as stronger predictors than variables relating to learning strategies. Specifically, students with lower intrinsic motivation (b = -.119, $p < .025$), lower test anxiety (b = -.069, $p < .041$), and greater self-efficacy (b = .408, $p < .0001$) reported higher current course grades in their online course. Only the learning strategy variable of managing their time and study environment predicted current course grades for students in online courses (b = .146, $p < .017$).

For face-to-face courses, variables relating to learning strategies played a slightly stronger role in predicting current course performance compared to the results for online courses. As with online courses, students with less intrinsic motivation (b = -.15, $p < .015$) and greater self-efficacy (b = .513, $p < .0001$) performed better in their face-to-face course. For learning strategy variables, students who reported *less* use of metacognitive strategies had higher grades (b = -.215, $p < .017$), and students who reported more management of their time and study environment had higher grades (b = .163, $p < .012$). Both critical thinking (b = .097, $p < .057$) and elaboration (b = .110, $p < .09$) emerged as marginal predictors, such that students reporting greater use of these strategies had slightly better grades in their face-to-face class.

It was also predicted that students with greater motivation to succeed in their courses would use more complex learning strategies compared to students with lower levels of motivation. Results showed that both intrinsic and extrinsic motivation related positively and significantly to use of all the different learning strategies. Table 3 shows the correlation values for each.

Table 3
Correlations Between Intrinsic and Extrinsic Motivation Variables and Reported Use of Learning Strategies

	Motivation variables	
Learning strategy	**Intrinsic motivation Pearson correlation (*r*)**	**Extrinsic motivation Pearson correlation (*r*)**
Rehearsal	.395**	.367**
Elaboration	.546**	.287**
Organization	.412**	.333**
Critical thinking	.490**	.240**
Metacognition	.530**	.336**
Regulating time/study environment	.283**	.298**
Regulating effort	.315**	.221**
Peer support	.265**	.113**
Seeking help	.173**	.122**

** p-values < .01

To determine whether grade level (defined as lower level, meaning first or second year, or upper level, meaning third year or above) influenced the primary predictors of course performance, the prior regression analyses were performed again, now separately for lower level and upper level students.

For lower level students, the only significant predictor of success in an online course was extrinsic motivation (b = .322, $p < .013$). None of the other motivation or learning strategy

variables emerged as significant predictors. For lower level students in a face-to-face course, now only self-efficacy emerged as significant predictor of course success (b = .543, p < .001).

The pattern of prediction was slightly different for upper level students. For upper level students taking an online course, intrinsic motivation (b = -.228, p < .04), self-efficacy (b = .567, p < .001), and organization (b = -.234, p < .05) predicted success. It is important to note that both intrinsic motivation and organization *negatively* related to course grades, such that lower levels of intrinsic motivation and less reported use of organization predicted higher course grades for upper level students taking an online course.

For upper level students taking a face-to-face course, both intrinsic motivation (b = -.428, p < .005) and self-efficacy (b = .706, p < .001) were significant predictors of current course grades. Again, intrinsic motivation was a negative predictor, such that lower levels of intrinsic motivation related to higher course grades. See Table 4 for regression information for all variables.

Table 4
Predicting Course Performance for Lower Level and Upper Level Students

		Lower level students				**Upper level students**			
		Online courses		**Face-to-face courses**		**Online courses**		**Face-to-face courses**	
Variables		***b***	***p***	***b***	***p***	***b***	***p***	***b***	***p***
Motivation variables	Intrinsic Motivation	.013	.927	-.194	.084	-.161	.040*	-.414	.005*
	Extrinsic motivation	.253	.013*	-.123	.151	.009	.888	.114	.249
	Task value	-.151	.084	-.054	.566	.053	.353	.181	.095
	Control of learning	.114	.297	.059	.514	.054	.468	-.159	.176
	Self-efficacy	.290	.086	.421	.001*	.430	.001*	.645	.001*
	Test anxiety	.080	.449	.002	.975	-.029	.549	.027	.741
Learning strategy variables	Rehearsal	.083	.318	.052	.611	.051	.452	-.197	.117
	Elaboration	.094	.592	.113	.340	-.053	.489	.167	.274
	Organization	-.147	.178	.080	.400	-.140	.048*	.060	.626
	Critical thinking	-.087	.370	.119	.205	.044	.530	.151	.195
	Metacognition	-.112	.492	-.248	.148	-.064	.604	-.282	.171
	Regulating time/ study environment	.228	.131	.073	.527	.069	.466	.242	.078
	Regulating effort	.085	.594	.141	.183	.065	.407	.025	.864
	Peer support	-.102	.250	.056	.431	.051	.379	.091	.353
	Seeking help	.090	.347	-.084	.327	.034	.558	-.049	.614

* p < .05

Discussion

First, this study examined differences between student learning strategies and motivations in online and face-to-face courses. Results showed that students in online courses had lower levels of both intrinsic and extrinsic motivation to succeed in that class and viewed their online course as less interesting and useful, compared to students in face-to-face courses. If students viewed their online courses as easier than their face-to-face ones, they could have needed less motivation or time to still do well in their courses. This interpretation is supported by the finding that students in online courses reported greater self-efficacy compared to those in face-to-face courses, such that

they felt more able to successfully complete the work for those courses. Or, students in online courses could have felt more disconnected from the professor or other students due to the online format, and that could have reduced their motivation to engage in the course. It is important to note that students in online courses did report earning higher grades compared to those in face-to-face courses, so their success could be contributing to their perception of their courses as less difficult and therefore a lower motivation to succeed. However, this study did not measure students' perception of their courses, so it is difficult to understand why course format (online or face-to-face) influenced their motivation.

Also, students in online courses reported less use of a number of learning strategies, including rehearsal, organization of information, metacognition, and seeking help from peers and the instructor, compared to those enrolled in face-to-face courses. Again, if students in online courses perceive or experience them as easier, they may be less likely to see the need to use specific learning strategies to enhance their performance. Of course, this study only asked students to reflect on one particular course, rather than comparing students who choose all online courses versus taking all face-to-face courses. Students who prefer to learn online could differ in meaningful ways from students who prefer to learn face-to-face, and future researchers should continue to examine the qualities of students who seek out this form of learning.

There were slight differences in the predictors of course grades when comparing online to face-to-face courses. The motivation variables did play a greater role in predicting success for online courses, whereas use of learning strategies related more strongly to performance for face-to-face classes. This is consistent with the reported low usage of learning strategies in general for online courses, such that these strategies do not seem relevant for success in the online environment, at least not for the students who participated in this study. Interestingly, students with *less* intrinsic motivation reported better grades for both online and face-to-face courses. It could be that being too focused on internal motivators may at times get in the way of studying information, and that students who are overly focused on mastering their understanding of the material (which is the primary way intrinsic motivation is conceptualized by the MSLQ) may run out of time to study the entirety of the material and miss components relevant to success on exams or papers. Or, if students are too focused on the external motivators for a class (i.e., grades), this could reduce their intrinsic motivation while still leading to a strong course performance (consistent with the undermining effect; see Eisenberger, Pierce, & Cameron, 1999, for a discussion of the influence of incentives on intrinsic motivation). Basila (2014) also found that motivation negatively predicted success in an online course and noted that this could be due to the overall high grades that students earned in the online course, limiting the range of performance and hindering the study's ability to get an overall picture of the influence of motivation on course performance. Basila's (2014) study also utilized the MSLQ but analyzed all the motivation scales together, without identifying individual effects of intrinsic versus extrinsic motivation. Future researchers should spend more time examining the separate and combined effects of extrinsic and intrinsic motivations on student performance in a classroom, utilizing a broad sample with a full range of course performance scores.

As predicted, there was some relation overall between student motivation and the learning strategies used, such that students with greater intrinsic and extrinsic motivation were more likely to report using all of the learning strategies. This is consistent with the findings of Wang, Shannon, and Ross (2013), who also found positive correlations between motivations to learn and the use of learning strategies, as well as Kruger-Ross and Waters (2013), who found that students who

perceived more value in the online course they were taking were more active at seeking out course information. Intrinsic motivation in particular related more strongly to use of the more complex learning strategies of elaboration, organization, critical thinking, and metacognition, compared to external motivation. Students who are driven to thoroughly master concepts (as internal motivation is defined by the MSLQ) seem to be more likely to put in the time to deeply think about the material, using the more complex learning strategies to learn and study. However, it is important to note that use of these more complex learning strategies did not necessarily lead to better course grades and that only the learning strategies of metacognition and regulating time related to earning a higher grade in the course. The use of more complex learning strategies by intrinsically motivated students could reflect them deepening their understanding of some of the course concepts rather than specifically pursuing better course grades overall.

Also, del Valle and Duffy (2009) examined different patterns of learning strategies used by students in an online course and found that while some students were more minimalist in their approach (spending less time) and others used more complex and time-intensive strategies, all students were successful in completing the course. Factors such as their past experience with both the subject matter and online learning in general influenced the approach that students took, and students were able to calibrate their effort and learning approaches to meet their specific course goals. The current study examines a wide range of course types as well as students with varying levels of online experience, familiarity with and interest in the subject matter, and other characteristics that all could be influencing their approach to learning in an online environment, which could lead to the lack of strong connections between specific learning strategies and course performance.

There were few differences in the patterns of prediction when comparing lower level students to upper level students. For lower level students, only extrinsic motivation predicted success in an online course, and only self-efficacy predicted success in face-to-face courses, and none of the learning strategy variables related to course success for either type of course. For upper level students, now intrinsic motivation negatively related to course success in both online and face-to-face courses, and self-efficacy positively related to success in both types of courses. For both lower and upper level students, the motivation variables were more relevant to course success than the learning strategy variables. Researchers should partner with course instructors to more deeply examine the class components that influence student motivations and the learning strategies students use and how these aspects influence student success in a course. For example, Chang et al. (2014) found that students with greater levels of Internet self-efficacy, or a belief that they could effectively learn in an online environment, showed stronger motivation to learn, which thereby improved their course performance. Both student experiences and aspects of the course itself could influence their motivation in an online setting, and these determinants should be explored in future research.

Limitations

In this study, students self-reported their current course grade, which could have led to errors or distortions. This study utilized a convenience sample as well, which limits the ability to generalize responses to students at other types of institutions, and could also have resulted in only certain types of students volunteering to complete the study. Specifically, self-reported grades were generally quite high among participants, as over half of participants reported course grades of 90% and above. This could be due either to students overstating their performance or to higher performing students being more likely to choose to participate in the study, and this limited

variance in performance hinders an examination of how either their motivations or use of particular strategies affected their course grades.

Also, this research did not examine whether students had specifically chosen to take a course online or whether this was the only course option available to them. Both Mattes, Nanney, and Coussons-Read (2003) and Reisetter, Lapointe, and Korcuska (2007) found differences in the personality traits, past computer experience, and learning skills in students who chose an online course rather than a face-to-face course, and so student differences in preferred course modality could also be contributing both to their motivations to learn and their performance in a course. As students gain more options for online learning, future research should more closely examine distinctions between students who choose to learn online and those who do not have a choice in course format, to examine how student individual differences may be driving their learning strategies and motivations.

Conclusion

Overall, this study showed differences in the reported motivations and use of learning strategies between students in face-to-face and online courses, and it revealed some connections between different types of motivation and learning strategies and student performance in a course. Consistent with prior work (Crede & Phillips, 2011; Cho & Heron, 2015), the use of specific learning strategies did not strongly relate to student performance in their course. As the popularity of online courses and programs continues to rise, more attention should be paid to both the ways in which students approach and experience these courses and how student characteristics (such as motivation of different types) and activities (how they study and approach the material) relate to their success.

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Appendix: Motivated Strategies for Learning Questionnaire

Below are the individual items for the MSLQ. Please reference Pintrich, Smith, Garcie, and McKeachie (1991) for full details about subscales and scoring of this questionnaire.

Section 1: Motivation

1. In a class like this, I prefer new course material that really challenges me so I can learn new things.
2. If I study in appropriate ways, then I will be able to learn the material in this course.
3. When I take a test I think about how poorly I am doing compared with other students.
4. I think I will be able to use what I learn in this course in other courses.
5. I believe I will receive an excellent grade in this class.
6. I'm certain I can understand the most difficult material presented in the readings for this course.
7. Getting a good grade in this class is the most satisfying thing for me right now.
8. When I take a test I think about items on other parts of the test I can't answer.
9. It is my own fault if I don't learn the material in this course.
10. It is important for me to learn the course material in this class.
11. The most important thing for me right now is improving my overall grade point average, so my main concern in this class is getting a good grade.
12. I'm confident I can learn the basic concepts taught in this course.
13. If I can, I want to get better grades in this class than most of the other students.
14. When I take tests I think of the consequences of failing.
15. I'm confident I can understand the most complex material presented by the instructor in this course.
16. In a class like this, I prefer course material that arouses my curiosity, even if it is difficult to learn.
17. I am very interested in the content area of this course.
18. If I try hard enough, then I will understand the course material.
19. I have an uneasy, upset feeling when I take an exam.
20. I'm confident I can do an excellent job on the assignments and tests in this course.
21. I expect to do well in this class.
22. The most satisfying thing for me in this course is trying to understand the content as thoroughly as possible.
23. I think the course material in this class is useful for me to learn.
24. When I have the opportunity in this class, I choose course assignments that I can learn from even if they don't guarantee a good grade.
25. If I don't understand the course material, it is because I didn't try hard enough.
26. I like the subject matter of this course.
27. Understanding the subject matter of this course is very important to me.
28. I feel my heart beating fast when I take an exam.
29. I'm certain I can master the skills being taught in this class.
30. I want to do well in this class because it is important to show my ability to my family, friends, employer, or others.
31. Considering the difficulty of this course, the teacher, and my skills, I think I'll do well in this class.

Section 2: Learning Strategies

32. When I study the readings for this course, I outline the material to help me organize my thoughts.
33. During class time, I often miss important points because I'm thinking of other things. [reverse-coded]
34. When studying for this course, I often try to explain the material to a classmate or friend.
35. I usually study in a place where I can concentrate on my course work.
36. When reading for this course, I make up questions to help focus my reading.
37. I often feel so lazy or bored when I study for this class that I quit before I finish what I planned to do. [reverse-coded]
38. I often find myself questioning things I hear or read in this course to decide if I find them convincing.
39. When I study for this class, I practice saying the material to myself over and over.
40. Even if I have trouble learning the material in this class, I try to do the work on my own, without help from anyone. [reverse-coded]
41. When I become confused about something I'm reading for this class, I go back and try to figure it out.
42. When I study for this course, I go through the readings and my class notes and try to find the most important ideas.
43. I make good use of my study time for this course.
44. If course readings are difficult to understand, I change the way I read the material.
45. I try to work with other students from this class to complete the course assignments.
46. When studying for this course, I read my class notes and the course readings over and over again.
47. When a theory, interpretation, or conclusion is presented in class or in the readings, I try to decide if there is good supporting evidence.
48. I work hard to do well in this class even if I don't like what we are doing.
49. I make simple charts, diagrams, or tables to help me organize course material.
50. When studying for this course, I often set aside time to discuss course material with a group of students from the class.
51. I treat the course material as a starting point and try to develop my own ideas about it.
52. I find it hard to stick to a study schedule. [reverse-coded]
53. When I study for this class, I pull together information from different sources, such as lectures, readings, and discussions.
54. Before I study new course material thoroughly, I often skim it to see how it is organized.
55. I ask myself questions to make sure I understand the material I have been studying in this class.
56. I try to change the way I study in order to fit the course requirements and the instructor's teaching style.
57. I often find that I have been reading for this class but don't know what it was all about. [reverse-coded]
58. I ask the instructor to clarify concepts I don't understand well.
59. I memorize key words to remind me of important concepts in this class.
60. When course work is difficult, I either give up or only study the easy parts. [reverse-coded]

61. I try to think through a topic and decide what I am supposed to learn from it rather than just reading it over when studying for this course.
62. I try to relate ideas in this subject to those in other courses whenever possible.
63. When I study for this course, I go over my class notes and make an outline of important concepts.
64. When reading for this class, I try to relate the material to what I already know
65. I have a regular place set aside for studying.
66. I try to play around with ideas of my own related to what I am learning in this course.
67. When I study for this course, I write brief summaries of the main ideas from the readings and my class notes.
68. When I can't understand the material in this course, I ask another student in this class for help.
69. I try to understand the material in this class by making connections between the readings and the concepts from the lectures.
70. I make sure that I keep up with the weekly readings and assignments for this course.
71. Whenever I read or hear an assertion or conclusion in this class, I think about possible alternatives.
72. I make lists of important items for this course and memorize the lists.
73. I attend this class regularly.
74. Even when course materials are dull and uninteresting, I manage to keep working until I finish.
75. I try to identify students in this class whom I can ask for help if necessary.
76. When studying for this course I try to determine which concepts I don't understand well.
77. I often find that I don't spend very much time on this course because of other activities. [reverse-coded]
78. When I study for this class, I set goals for myself in order to direct my activities in each study period.
79. If I get confused taking notes in class, I make sure I sort it out afterwards.
80. I rarely find time to review my notes or readings before an exam. [reverse-coded]
81. I try to apply ideas from course readings in other class activities such as lecture and discussion.

Research Ethics of Twitter for MOOCs

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Abstract
This study examined the ethical considerations researchers have made when investigating MOOC learners' and teachers' Twitter activity. In so doing, it sought to addresses the lack of an evidence-based understanding of the ethical implications of research into Twitter as a site of teaching and learning. Through an analysis of 31 studies, we present a mapping of the ethical practices of researchers in this area. We identified potential ethical issues and concerns that have arisen. Our main contribution is to seek to challenge researchers to engage critically with ethical issues and, hence, develop their own understanding of ethically appropriate approaches. To this end, we also reflected and reported on our own evolving practice.

Keywords: social media, privacy, research ethics, MOOCs, Twitter

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Research Ethics of Twitter for MOOCs

There is a significant body of research literature related to the implications and applications of Twitter for teaching, learning, and scholarly activity (Gao, Luo, & Zhang, 2012; Williams, Terras, & Warwick, 2013; Dunlap & Lowenthal, 2009; Veletsianos, 2012). The open, online nature of Twitter meant that it was quickly adopted and co-opted by MOOC designers and teachers but also informally by MOOC learners. MOOC teachers have used it as a secondary learning space (Salmon et al., 2015) or as part of the fabric of MOOC itself (Bozkurt et al., 2016). Research has been conducted using Twitter on a wide diversity of topics, such as MOOC learner experience (Kop, 2011), the acquisition of social capital (Joksimović, Dowell, et al., 2015) and comparisons between what happens within a MOOC and what learners say on social media (Joksimović, Zouaq, et al., 2015). Researchers have analyzed hashtag aggregations, creating large Twitter data sets made of many MOOC teachers and learners across multiple courses. Research has been undertaken of learners according to user sentiment (Shen & Kuo, 2015), temporality of learning (Zhang et al., 2015), level and types of learner discussion (Veletsianos, 2017), and the influence of various actors in discussions about MOOCs (Costello et al., 2017).

Twitter opens possibilities for researchers who are not MOOC providers (i.e., not directly involved in the provision of the MOOC itself). MOOC providers have access to discussion forum postings, assessment work, and activity logs. This information, for many reasons that include

strong ethical ones, may be tightly controlled by these stakeholders. In contrast, the tweets that emanate beyond the MOOC walls into Twitter are there for any researcher to potentially gather and analyze.

This treasure trove of data is alluring. It is accessible and free to harvest—a digital data feast that has been described in terms of its latent value as akin to gold or oil (Hirsch, 2013). To pursue the analogy, however, we know that the extraction and exploitation of oil has many downsides. There may be a great many insights we could unlock from mining digital data, but there are equally consequences that this activity could have that may be unforeseen, unintended, or at worst wilfully ignored. This became apparent to members of our research team during a research study of the hashtag #MOOC on Twitter (Costello et al., 2016; Costello et al., 2017). In our study we sought to analyze the discourse of MOOCs on Twitter by conceptualized Twitter users as actors in a form of networked public.

In conducting a literature review of research for a study of Twitter and MOOCs, (Costello et al., 2018), we noted that researchers had varying practices with regard to ethics. This was in truth not an initial major concern of our literature review, and it was only during the project as we began asking questions about how we should best report data and results that we found ourselves contemplating this question. Our initial belief was that Twitter data was in the public domain and did not pose many complications for use in low-risk research. However, practices of some scholars in this area (Veletsianos, 2017; Koutropoulos et al., 2014), and cautions from other research traditions, such as medical health research (Conway, 2014), gave us pause. This, combined with the ethical context of the new European Union General Data Protection Regulation (GDPR), which has increased the legal obligation to protect citizens' data rights, spurred us to conduct a systematic analysis of ethical practices and concerns of the relevant research literature. The overarching aim of the research presented here was to interrogate the underlying ethical assumptions that had informed our initial research design. We aimed to do this by asking what ethical considerations other researchers have made when investigating MOOC learners' and teachers' Twitter activity.

Ethics and Big Data

Ethical consideration can be seen as a cornerstone of any research endeavor. Indeed, it can be argued that ethics are integral to professional academic practice (Bruhn et al., 2002). The need for increased ethical awareness has been highlighted for research into teaching and learning at scale (Slade & Prinsloo, 2013; Ferguson & Buckingham Shum, 2012). This clarion call has been made in an era where the phenomenon of big data has been posited as an interplay of "technology, analysis, and mythology that provokes extensive utopian and dystopian rhetoric" (boyd & Crawford, 2010). Selwyn (2012) cites social media as one example of technology that is socially disruptive and that poses deep "ideological (rather than purely technical) questions" of institutional education. This is in part because big data may be oversimplified as an "educational fix" (Enyon, 2013). In other words, the issues of big data are neither neutral, nor straightforward.

If we follow such warnings of deep sociotechnological entanglement, ethics becomes an imperative cornerstone of research design. It is therefore surprising that there is such a dearth of relevant literature on the ethical considerations of research on MOOCs (the few articles on the subject include Esposito, 2012; Rolfe, 2015; Marshall, 2016). Learning analytics research often deals with MOOCs, and there are some ethical methods and practices discussed in the literature here (Slade & Prinsloo, 2013, 2014; Ferguson & Buckingham Shum, 2012; Siemens, 2013; Manca, Caviglione, & Raffaghelli, 2016). Moreover, in social media research there is well-developed

research literature concerned with the analysis and discussion of ethical research (Taylor & Pagliari, 2018; Conway, 2014). This is particularly notable in medical health research, where researchers may be working in areas with obvious privacy implications, such as illness, addiction and so on (Conway, 2014). We will now expand on some key themes of this literature.

Privacy and Informed Consent

There are a few key issues that such literature reveals that are relevant for our purposes here—namely, the right to privacy, the complexity of preserving this right, informed consent, and researcher biases. First is the issue of the right to privacy. This can be seen as closely linked to informed consent, when a research participant willingly cedes some privacy through disclosure of information to a research team. The participant is making an informed decision to share their data with the researchers with full knowledge of any potential risks and of the privacy implications. Many ethical review boards or committees see information that is publicly available as essentially unproblematic and not requiring user consent. It has been argued, however, that this conception may be overly simple in complicated modern digital networked environments where what is public and what is private is not always easy for people to discern. It is easy to overshare, to not realize the privacy settings of systems such as Facebook or Twitter:

> Given a general lack of deep understanding by most researchers and research subjects of the technical operation of the Internet, private and public spaces on the Internet can really only be understood in term of metaphors. (Anderson & Kanuka, 2009, p. 119)

Best practice from medical social media research holds that data should not be reproduced without being anonymized and de-identified even if it is in the public domain (Conway, 2014).

Privacy options of technology may be complicated, confusing, or hidden. Equally, technology can be overly simple and seductive, designed to reel us in, make us feel safe, and hence while away some time in its embrace. It may cause users to overshare. One question that consequently arises is whether it is ethically appropriate not just to collect data without user consent from public spheres but also to reproduce that data. Such reproduction may fail the test of whether such user-generated data is being used in a context intended by its creator.

Preserving Privacy When Publishing Research

Can researchers forgo informed consent if they simply anonymize and de-identify the data? Zheleva and Getoor (2009) showed that making a profile private on a social network may be insufficient to ensure privacy and that metadata, such as group membership, can "leak" information in unforeseen ways. Similarly, data sets that have been "anonymized" in good faith by researchers, such as by the removal of personal identifiers (e.g., names of students), can be reverse engineered to uncover the original identities. This was well recounted by Zimmer (2010) in his analysis of the case of a data set publicly released by researchers of the anonymized Facebook activity of students in an unnamed northwestern university in the United States. Clues quickly led commentators to conclude that the university in question was Harvard, and it soon became apparent that the identity of students could easily be pieced together and either determined or inferred from metadata, including a codebook that described the data set. What this incident revealed was that the sociologists, by their own admission, were not computer or information scientists (Zimmer, 2010). Moreover, it illustrates how linked data can change the nature of information because, once it was known that the university was Harvard, other information, such

as particular class offerings, dorm sizes, and so on, could be used (i.e., linked) to the original data set, which further revealed personal identity likelihoods of individuals.

A number of open data sets, such as those of MOOC learners, have anonymized and de-identified participant data (Manca, Caviglione, & Raffaghelli, 2016) and been published to enable their study by a wide research community. In many ways, Twitter may look like a large open data set and the fact that it is in the public domain may lead us to assume that it does not need to be anonymized or de-identified during research. The development of anonymized and de-identified data is not without particular problems. Firstly, critical meaning may be leached from the data during the process. Daries et al. (2014) showed, using an empirical example, how efforts to obscure the identities of learners in an edX MOOC data set lead to perturbations in the data. They showed how they got different results from an equivalent analysis of raw data set and of a de-identified data set. What this highlights is that ethical designs can have methodological implications or rather that the two are not so easily separable as one might assume.

Twitter is a classic example of data that, because of its open nature, is often assumed to be straightforward to compile. However, in reality the compilation of Twitter data sets requires much expertise, technical computing resources, and access to high-quality data sources, such as a Twitter streaming or firehose API, which can be expensive (Driscoll & Walker, 2014; Morstatter et al., 2013). Moreover, even the very best Twitter data sources cannot yield 100% complete data; hence, researchers are always operating on some sample of the data. The language of streams and fire hoses is apt when considering catching such torrents of digital data, as even the best bucket will incur some spillage. Big data needs to be handled with care. Without proper infrastructure and expertise, there are potentials for data leaks and breaches.

Role of the Researcher

With Twitter and through tweets, accounts of learning can extend beyond the MOOC itself. This has implications for the type of research that is carried out. Researchers who lack access to what is happening within the walled garden of the MOOC may claim to have fewer potential conflicts of interest. Given that they are not teachers, who have particular ethical responsibilities, their role may be one concerned only with research and a fidelity to its process. Much research highlights the pitfall of bias towards positive findings in educational research. One recent study ascribed this bias to factors including the "fuzzy boundaries between learning and teaching research, scholarship and teaching; [and] the positive agendas of 'learning and teaching' funding bodies" (Dawson & Dawson, 2016). In other words, the overlapping roles of teacher and researcher can lead to potential conflict. Tensions may arise as to whether ultimate loyalty should lie with the research process, the teaching, the students, or the institution (Dale, 1996; Burman & Kleinsasser, 2004). That is not to say, of course, that teachers cannot be researchers. Positionality is well established in educational research (Merriam et al., 2001). One of its essential aspects is precisely an explicit articulation or conceptualization of the researcher's role (Denzin, 1989). Indeed, it may do this not to acknowledge that researcher biases *may* exist so much as to assert that they cannot *but* exist (Merriam et al., 2001).

Research Question

Ethics cannot be something bolted onto a research process, some necessary compliance evil. If we consider research as a complicated human activity, and in this case a sociotechnical one, we will see that there are decision points at many stages that have ethical dimensions. Ethical decisions may preserve or betray rights of participants. In the case of the former, do they then

weaken the potential strength of the research? If researchers anonymize, de-identify, and aggregate everything, will the results be less meaningful? Or if they tie themselves up in knots with ethical concerns, will they get anything done?

In an attempt to untangle these questions and provide some handrails, we sought to critically appraise the relevant literature through an analysis of the existing ethical practices of researchers on MOOCs and Twitter as recounted in the literature. The overarching question that guided our research was, hence, formulated as follows: What ethical considerations have researchers reported to have made when investigating MOOC learners' and teachers' Twitter activity in the published literature?

From this, and following from the literature outlined above, we derived the following guiding subquestions:

- Have researchers reported that they sought ethical approval? Have they believed ethical approval to be necessary or exempt by deeming Twitter data to be in the public domain?
- How did the studies report on the collection, processing, and storage of tweets? Did any of the studies make reference to use of linked data?
- How have studies reported conflicts of interest and the role of the researcher or a stance adopted on this role?
- In studies that reproduced tweets, how did they deal with the ethical implications of this, such as by anonymizing and obfuscating the tweets or by seeking the Twitter users' permission to reproduce such tweets?

Methods

The data set for this study was generated by using a systematic literature review approach (Petticrew & Roberts, 2009; Okoli, 2015; Kitchenham, 2004). Our inclusion rules specified that studies must meet five criteria: (1) be concerned with using Twitter (or Sina Weibo, the Chinese version of Twitter) for research into MOOCs, (2) be written in English, (3) be empirical, (4) be published in peer-reviewed conference proceedings or journals, and (5) be published (or available in preprint) during the period between January 2011 and July 2017. We took *empirical* to mean studies that gathered primary data in some form (i.e., not theoretical, conceptual, or opinion pieces). The data could be from Twitter in the form of tweets, or it could comprise tweet and Twitter-user metadata, such as social network structures of Twitter users.

We followed the approaches of existing systematic literature reviews of both MOOC and Twitter research literature (Liyanagunawardena, Adams, & Williams, 2013; Veletsianos & Shepherdson, 2016; Gao, Luo, & Zhang, 2012; Williams, Terras, & Warwick, 2013) and derived search terms for MOOCs, Twitter, and their known academic synonyms. This gave us the terms *micro-blogging*, *micro-blog*, *microblogging*, *Microblog*, *Twitter*, and *tweet*, along with *Massive Open Online Course*, *Massively Open Online Course,* and MOOC.

Using queries constructed from these terms, we conducted database/indices searches of EBSCO, Web of Knowledge, Google Scholar, IEEE Explore, and Scopus. Google Scholar is permissive in its indexation and is known to include grey literature and non-peer-reviewed work (Haddaway et al., 2015). Hence, we followed Gao et al. (2012) in conducting a full-text search of

Google Scholar articles, sorting them by relevance. After analysing the first 200 results, we determined a lack of further relevant papers.

Results

Overview of the Results

Following the search strategy and application of the inclusion and exclusion criteria described above, we determined that 31 articles could be included in our final corpus. Of these, 20 (65%) were from peer-reviewed journals, and 11 (35%) were from peer-reviewed conference proceedings. The articles described an assortment of methods employed in their studies, which we classified as belong to one of six categories: interviews, surveys/questionnaires, researcher manual qualitative coding of social media content, machine learning analysis of social media content, social network analysis, or other metadata analysis. Figure 1 below shows a high-level mapping of these approaches.

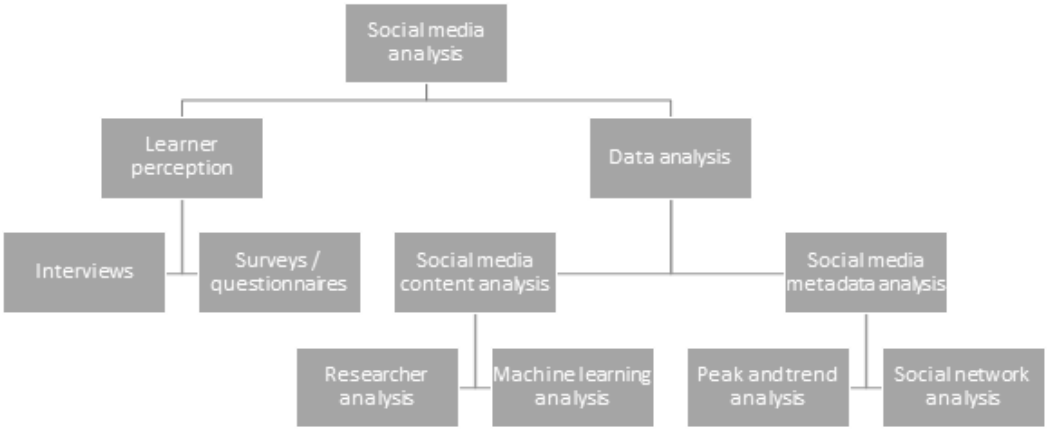

Figure 1. Mapping of the MOOC Twitter literature by research method.

A full detailing of the classes of research method employed by each article is given in Table 1 below. Twenty-one of the studies examined (68%) used more than one research method, while 10 (32%) used only one method. The most common techniques were machine analysis of social media content (employed by 19 studies, or 61%) and metadata analysis (19 studies, or 61%). Other methods were social network analysis (a specialised form of metadata analysis), researcher analysis of social media content, and assessment of learner perceptions via surveys/questionnaires and interviews.

Table 1

Research Methods Employed

	Interviews	Surveys/questionnaires	Researcher analysis of social media content	Machine analysis of social media content	Social network analysis	Other metadata analysis
Abeywardena (2014)				x		
Alario-Hoyos et al. (2014)						x
Alario-Hoyos et al. (2013)		x				x
Bell et al. (2016)		x			x	x
Bozkurt et al. (2016)				x	x	
Chen et al. (2016)						x
Costello et al. (2017)					x	
Costello et al. (2016)				x		
Cruz-Benito et al. (2015)		x	x	x		x
Cruz-Benito et al. (2017)		x	x	x		x
de Keijser and van der Vlist (2014)					x	x
de Waard et al. (2011)		x				
Enriquez-Gibson (2014a)				x		
Enriquez-Gibson (2014b)				x		x
Fournier et al. (2014)	x	x	x	x	x	x
García-Peñalvo et al. (2015)				x		x
Jiang and Kotzias (2016)					x	
Joksimović, Dowell, et al. (2015)				x	x	
Joksimović, Zouaq, et al. (2015)			x	x		x
Knox (2014)		x	x	x		x
Kop (2011)		x	x	x		x
Koutropoulos et al. (2014)				x		
Kravvaris et al. (2016)				x		x
Liu et al. (2016)		x	x			x
Saadatmand and Kumpulainen (2014)	x	x				x
Salmon et al. (2015)	x	x		x		
Shen and Kuo (2015)				x	x	x
Skrypnyk et al. (2015)					x	
Spilker et al. (2015)		x		x		x
Tu (2014)			x	x	x	
Van Treeck & Ebner (2013)				x		x
Veletsianos (2017)			x	x		x
Yeager et al. (2013)			x		x	x
Zhang et al. (2015)						x
Totals	**3**	**14**	**11**	**22**	**12**	**22**

Ethical Approval

Twenty-three (74%) of the articles analyzed did not make any mention of ethics or ethical approval. Only one article (Salmon et al., 2015) reported to have gained approval from an Ethics Review Committee or Institutional Review Board for the research carried out. Six studies (18%) referred to data being in the "public domain" (Chen et al., 2016; Cruz-Benito et al., 2015, 2017; Koutropoulos et al., 2014; Skrypnyk et al., 2015; Bozkurt et al., 2016). Two studies (6%) explicitly stated that due to the public domain nature of the data that their research was exempt from any requirement for institutional approval (Skrypnyk et al., 2015; Bozkurt et al., 2016). Further, Borzut et al. (2015, p. 21) stated that the researchers informed participants that their data would be reproduced in a published study "as a matter of courtesy." Two studies stated that they were participants of the MOOC they studied (Rhizo14) and that "ethical protocol for use of data was developed in consultation with Rhizo14 participants" (Bell et al., 2016; Bozkurt et al., 2016). Despite not mentioning ethical approval requirements or lack thereof, some studies nonetheless did have some treatment of ethical issues in general (Fournier et al., 2014; Kop, 2011; Bell et al., 2016; de Keijser & van der Vlist, 2014; Skrypnyk et al., 2015). One study stated that that data was collected specifically for the purpose of the study (Skrypnyk et al., 2015). Another study reported a converse situation whereby the researchers "didn't originally plan to collect Twitter data for this purpose, but since we had this public data we wanted to analyze it" (Koutropoulos et al., 2014, p. 9).

Collection, Processing, and Storage of Tweets

Only 22 articles (71%) discussed how tweets were collected, and of those, not all were explicit with regard to the technique used. Where methods were stated, approaches included Crowdmap (Koutropoulos et al., 2014), Digital Methods Initiative Twitter Capture and Analysis Toolset (de Keijser & van der Vlist, 2014), GNIP API (Costello et al., 2016), gRSShopper (Fournier et al., 2014; Joksimović, Dowell, et al., 2015; Joksimović, Zouaq, et al., 2015; Skrypnyk et al., 2015), NodeXL (Bozkurt et al., 2016; Tu, 2014), TAGsExplorer (Bell et al., 2016), Twitonomy (Enriquez-Gibson, 2014a, 2014b), Twitter API (Cruz-Benito et al., 2015, 2017; Shen & Kuo, 2015) and web crawlers (Chen et al., 2016; García-Peñalvo et al., 2015; Zhang et al., 2015).

Twenty-one studies (68%) outlined their methods for processing Twitter data with various techniques mentioned, including CohMetrix computational linguistic facility (Joksimović, Dowell, et al., 2015), Dedoose (Salmon et al., 2015), Gephi (Costello et al., 2017; de Keijser & van der Vlist, 2014; Tu, 2014; Yeager et al., 2013), Netlytic (Bell et al., 2016), NVivo (Bozkurt et al., 2016; Fournier et al., 2014; Liu et al., 2016), OpinionFinder (Shen & Kuo, 2015), PHP/MySQL scripts (Veletsianos, 2017), R Big Query (Costello et al., 2016, and 2017; Joksimović, Dowell, et al., 2015), Semantria3 (Abeywardena, 2014), spreadsheets (Cruz-Benito et al., 2015, 2017), TagMe (Joksimović, Zouaq, et al., 2015), Twitonomy and Wordle (Enriquez-Gibson, 2014a, 2014b), and WEKA, SimpleKMeans and Weka ClassifierSubsetEval (Kravvaris et al., 2016).

Eleven (35%) studies discussed the extent to which they had obtained full or representative data sets, making mention of the completeness, or otherwise, of their sampling. Of these, some made claims for a complete or at least largely complete data set (e.g., Bozkurt et al., 2016; Kravvaris et al., 2016; Veletsianos, 2017); others acknowledged that they had deliberately obtained only a "snapshot" of the data (e.g., Abeywardena, 2014; Enriquez-Gibson, 2014b), while others lamented the inadequacy of collection tools at their disposal and the extent to which this

compromised the ability of their data to be truly representative (e.g., Fournier et al., 2014; Joksimović, Dowell, et al., 2015; Joksimović, Zouaq, et al., 2015; Koutropoulos et al., 2014).

Seven studies (23%) made mention of how tweets and tweet metadata were stored. Various storage methods included cloud computing (Costello et al., 2016; Costello et al., 2017), Excel spreadsheets (Abeywardena, 2014), raw data being stored in an HTML file (Liu et al., 2016), and JSON format (Joksimović, Zouaq, et al., 2015; Skrypnyk et al., 2015). Of these, only one study (Skrypnyk et al., 2015, p. 212) discussed how security of and access to data were managed: "All analysed data sets are stored in a secure password-protected personal repository."

It was not fully clear in all studies whether data was linked between Twitter and other sources, and this was typically not prominently discussed. However, two studies made obvious use of linked data that was critical to their research question. One study by Joksimovic, Zouaq, et al. (2015) used data from inside the MOOC (course discussion topics) and data from Twitter to see whether the conversations were being mirrored in both spaces. Another study, of 16 million MOOC learners, linked data from MOOC user profiles with other data generated by the same people from the social networks LinkedIn, Gravatar, GitHub, and StackExchange (Chen et al., 2016).

Role of the Researcher

Of the 31 articles reviewed, 24 (77%) did not disclose whether or not there were any conflicts of interest in their study or give a stated position or conceptualization of the role of the researcher, such as whether they were a teacher of the MOOC. Two articles stated that there were no conflicts of interest. One of these was via a standard unelaborated statement of "no conflict of interest" (Skrypnyk et al., 2015), while the second was more explicit in stating that teachers or those involved in the deployment of the MOOC had been precluded from involvement in the research team (Salmon et al., 2015). Five studies disclosed that at least one of the authors of the research had also played a role in the teaching or facilitation of the MOOC (Knox, 2014; Koutropoulos et al., 2014; Yeager et al., 2013; Saadatmand & Kumpulainen, 2014; Bell et al., 2016). Two of these elaborated on this to articulate a position on the role of the researcher. Saadatmand and Kumpulainen (2014, p. 21) cite "the researcher's crucial role in ethnography (Creswell, 1998)." Bell et al. (2016) gave more space to this aspect, declaring that the authors were participants in the MOOC that was the subject of their research, seeing themselves "as both insiders and outsiders (Dwyer & Buckle, 2009)" to the research process. Bell et al. (2016) also identified "the dangers of projecting our experiences onto those of others. We did not want to speak 'for' others but rather to engage with what was said." Accordingly, the authors purported to counter this risk by "participant observation and the retrospective study of course archives" (Bell et al., 2016).

Reproduction of Tweets

Six studies (18%) reproduced tweets. Four studies reproduced tweets in their original, unmodified form, and two studies anonymized the tweets in some way. This is shown in Table 2 below, along with the number of tweets. In Veletsianos (2017) tweets were anonymized and de-identified. This was confirmed by searching via Google for the text of the tweets, as shown in the study, which returned no results.

Table 2
Tweets Reproduced

	Tweets reproduced	Anonymised & de-identified
Salmon et al. (2015)	1	No
Liu et al. (2016)	3	No
Bozkurt et al. (2016)	6	No
Costello et al. (2016)	17	No
Veletsianos (2017)	20	Yes
Koutropoulos et al. (2014)	60	Yes

Discussion

Almost three quarters of the studies 261ehaviou did not contain any mention of ethics. It may be that ethical considerations were taken by the authors but not mentioned in their studies. In such possible cases we can only say that ethics are considered not important enough to deserve a specific mention. A hint as to this rationale may lie in the six studies that mentioned "public domain data," considering it essentially unproblematic and to obviate the need for any informed consent. One study, the exception that proved the rule, reported having Ethics Committee/Institutional Review Board approval. Researchers seem to not believe that Twitter could be anything other than a public sphere and not potentially a private space. Moreover, their reasoning can be seen to flow from a harm-based conception of privacy (Bloustein, 1964). However, privacy can also be dignity based:

> Such a stance recognizes that one does not need to be a victim of hacking, or have a tangible harm take place, in order for there to be concerns over the privacy of one's personal information. Rather, merely having one's personal information stripped from the intended sphere of the social networking profile, and amassed into a database for external review becomes an affront to the subjects' human dignity and their ability to control the flow of their personal information. (Zimmer, 2010, p. 321)

We found that there was underreporting of data collection techniques and tools. This raises issues around properly interpreting results and the replicability of studies. However, it also has ethical implications, as collecting data from official APIs will not return tweets that users have chosen to delete. For example, the accounts of deceased people can be deleted by Twitter and will not appear via official Twitter API searches but may appear in screen-scraping techniques (Driscoll & Walker, 2014). Official APIs will also be less likely to return tweets which have been removed under European Union laws around the Right to Be Forgotten (European Parliament and Council, 2016).

We found little evidence of protocols around data storage, deletion, or data access. Again, researchers may believe that as the data is in the public domain, then they are simply parsing something that is already freely available. However, analysis itself, specifically using machine learning techniques, generates new data. This is particularly stark in the case of linked data where data from one source is combined with data from one or more other sources. As we found, one

study combined data about users from several social networks. This study by Chen et al. (2016), which conducted a very large-scale analysis of MOOC learners on Twitter (and other social media platforms), is also worth noting for other aspects of its approach. It reported that words in tweets indicating maleness (or by their absence femaleness) were "boxers, shaved, haircut, shave, girlfriend." Words used in tweets reported to be indicative of younger users were "parents, exams, pregnant, youth, mommy." If nothing else, these examples serve to illustrate that social media is far from a formal sphere. Rather, it may be one of chat and intimate expression. Certainly, researchers would do well to guard against an overly reductive focus in such contexts (Baruh & Popescu, 2017; Selwyn, Henderson, & Chao, 2018).

The issue arises as to whether use of this data for research into MOOCs constitutes use in a context beyond that intended by the original creator and publisher of that data. In the interest of a research 262ehaviour, a research team may believe they have good reasons to collect personal data; however, linking this data with other data in sophisticated ways raises many issues. Research teams could require ethical practices in the handling and access of such data. More critically perhaps, they would need expertise in protection of that data from hacking, theft, or leaks. Even the most sophisticated and well-resourced of organizations have learned that they cannot control or protect data once in digital form. The studies we 262ehaviou were all conducted before the European Union's GDPR had come into effect (European Parliament and Council, 2016). There are many aspects of these studies, at least in the reporting of their results, that indicate that they could be in breach of these regulations were they conducted today. It would therefore be interesting to revisit this issue in the future to see whether the GDPR has had any effect on researchers' practice.

The vast majority of studies that replicated tweets and tweet metadata (such as usernames) in their publication made no attempt to obfuscate this data. Indeed, the two studies that did so stood out in this context (Veletsianos, 2017; Koutropoulos et al., 2014). Though we might consider this best practice for social media research (Conway, 2014), one commentator on a blog post purported to be frustrated that the data was anonymized in one of these studies. He suggested that this made the results less meaningful and lessened the possibility of analysis by other researchers (Downes, 2017). This may illustrate the design decisions that researchers must take and defend in their community and certainly confirms that "ethical issues of digital and open data sets are puzzling and demand careful attention" (Manca, Caviglione, & Raffaghelli, 2016). Given this situation, it is also interesting to note here that so few researchers disclosed their own role in the research process or addressed the issue of researcher positionality.

To fully disclose our own part in this research, we have included our own publications and subjected them to the same levels of analysis as all others, even those that showed what could be argued to be higher levels of ethical best practices. Indeed, this was one of the motivations of the present study—to reflect critically and honestly on our own practice by comparing it with others in the field. For instance, we have republished tweets in full and also tweet metadata in some of our papers. At the time that research was undertaken and published, we believed (as a majority of the studies we 262ehaviou here) that this information was in the public domain and that, as we carefully reviewed the tweets to ensure that they did not contain any sensitive information, this was sufficient. With the benefit of the hindsight afforded by this study, would we have done the same today? Perhaps not, and in later published research (Costello et al., 2018), we modified our practice to anonymize and de-identify republished tweets. However, the issue is not as straightforward as deciding whether to publish information. It may involve weighing a balance of

commitments, priorities, and fidelities to different, potentially conflicting, codes or principles. Our intention has been to critically examine and explore ethical issues with regard to specific research. Hence, we used the research into the effects and implications of the phenomenon of MOOCs as reflected in Twitter as an example. However, this limited the scope of our study. Although ethical issues in Twitter research have been studied (Taylor & Pagliari, 2018; Conway, 2014), much less attention has been paid to the ethical practices of MOOC researchers. This topic requires future study.

A limitation of this study is that absence of evidence is not evidence of absence. Lack of mention of ethical concerns does not mean they have not been considered. Hence, we make a key recommendation that editors and publishers require authors to make explicit details of the following: ethical approvals they have been granted or waived, ethical considerations they have made to protect participant privacy, and information on how data is handled, processed and stored. Moreover, such considerations should be included in the published article or its metadata for readers (Committee on Publication Ethics, 2018).

A key aim of this paper's contribution is to highlight how, when studies are carried out beyond a certain scale, or when data are linked with other data or processed in sophisticated ways, new possibilities but also new responsibilities arise. If big data can be said to have a "social life" (Perrotta & Williamson, 2016), then we argue that researchers would do well to engage as a community in an ongoing response by reflecting critically on our own practice towards its improvement.

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Artificial Intelligence and the Academy's Loss of Purpose

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Abstract
This article speculates on the future of higher education as online technology, specifically adaptive learning and analytics as infused by artificial intelligence software, develops and matures. Online and adaptive learning have already advanced within the academy, but the most significant changes are yet to come. These evolving technologies have the potential to change the traditional roles in our colleges and universities to the point that many educators will reconsider their purposes as teachers, researchers, and administrators.

Keywords: artificial intelligence, online education, adaptive learning, analytics, online learning, blended learning, higher education, the future

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Artificial Intelligence and the Academy's Loss of Purpose

In February 2019, an article in the *New York Times* described a global competition that hundreds of scientists enter every two years called the Critical Assessment of Structure Prediction (Metz, 2019). Referred to as the "World Cup" of biochemical research, teams of scientists tackle a biological puzzle called "the protein folding problem." Essentially, they try to predict the three-dimensional shape of proteins in the human body, a problem that no one has ever been able to solve. Past winners have chipped away at it, but a solution still eludes the scientific community. In 2018, the contest was not won by academics. It was won by a team at DeepMind, the artificial intelligence (AI) lab owned by Google's parent company, Alphabet, Incorporated. In describing DeepMind's accomplishment, Mohammed AlQuraishi, a biologist at the Harvard Medical School, who has dedicated his career to protein research, commented that he felt "a melancholy" after losing to DeepMind. "I was surprised and deflated. They were way out in front of everyone else." He criticized big pharmaceutical companies like Merck and Novartis, as well as his academic community, for not keeping pace. "The smartest and most ambitious researchers wanting to work on protein structure will look to DeepMind for opportunities" (AlQuraishi, 2018). He urged the life-sciences community to shift their attention toward the kind of AI work practiced by DeepMind.

DeepMind's victory predicted the future of biochemical research, increasingly driven by machines and the people who oversee them. Another researcher, Derek Lowe, said "It is not that machines are going to replace chemists. It's that the chemists who use machines will replace those that don't" (Metz, 2019).

AI development of this magnitude requires enormous amounts of data. DeepMind can lean on the massive computer data centers that underpin Google as well as many of the world's top AI researchers, who know how to get the most out of these facilities. "It allows us to be much more creative, to try many more ideas, often in parallel," said Demis Hassabis, the chief executive and a cofounder of DeepMind (Metz, 2019). Universities and big pharmaceutical companies are unlikely to match these resources.

Kai-Fu Lee, a former senior executive at Google and Microsoft, stated that humanity is moving towards the establishment of a "new world order" dominated by AI, cloud computing, and robotics that will have significant ramifications for many aspects of human endeavors (Lee, 2018). How will our species respond? Lee believes that many workers will experience a "psychological loss of purpose" as AI changes the nature of their occupations (Lee, 2018, p. 21). A more pessimistic prediction comes from Yuval Noah Harari, bestselling author of *Sapiens*, who commented that AI has the potential to create a "useless class of superfluous people" (Harari, 2017, p. 322). The term "useless class of superfluous people" surely attracts attention, but it may be a bit extreme. In a later book, Harari takes a more moderate stand and discusses at length the merging of workers with large-scale integrated digital networks (Harari, 2018, p. 22). There are no firm estimates of the number of jobs in this country that will be displaced by AI and other forms of automation. While one estimate suggests 47% (Frey & Osborne, 2013), another poses 38% (Berriman & Hawksworth, 2017), and yet another puts it as low as 9% (Artnz, Gregory & Zierahn, 2016). The fact is that no one really knows. One aspect of this displacement is certain: Many of these displaced jobs will be in white collar and professional areas, such as teaching, law, and medicine as well as the corporate sector.

It is not the purpose of this article to review this issue as it relates to the entire human race but to speculate specifically on the future of higher education as online technology, such as AI-infused adaptive software and analytics, changes the traditional role of educators in our colleges and universities. Online and adaptive learning have already advanced within the academy, but the most significant changes are yet to come.

Online Education Has Already Made Significant Progress in Higher Education

Overall enrollments at colleges and universities have seen a small decrease in recent years, leveling off at about 20 million students. As of fall 2016, there were 6,359,121 students taking at least one fully online course, comprising 31.6% of all higher education enrollments. Furthermore, the percentage of higher education students taking these courses keeps increasing every year. It stood at 25.9% in 2012, at 27.1% in 2013, 28.3% in 2014, and 29.7% in 2015 (Seaman, Allan, & Seaman, 2018). For the purpose of their study, Seaman, Allan, and Seaman defined a fully online course as one where 80% or more of the seat time was replaced by online activity. The word *blended* was used to designate courses where some percentage of seat time (less than 80%) was conducted online. Web-enhanced courses were defined as courses that have substantial Internet-based activity but do not necessarily replace seat time with time online. Although there is no exact count, it is estimated that there are millions of students taking these blended and Web-enhanced courses. Almost every college and university has acquired or contracted for a course or learning

management system or platform. Soon most courses will have some Internet components, ranging from being fully online to being blended to having Web-enhancements. In a mere 25 years, online education has become integral to the delivery of instruction and no longer a novelty. As Larry Ellison, the founder and CEO of Oracle Corp., has often been quoted as saying "The Internet changes everything, I really mean everything" (as quoted by Schlender, 1999).

The pedagogical models being used in online education today range widely. Highly interactive models (teacher–student, student–student, student–course material) are very popular. Asynchronous (blogs, discussion boards, wikis) as well as synchronous communications (video and voice conferencing) are common. Furthermore, faculty and instructional designers integrate and blend these models to provide a variety of course activities. These models remain highly dependent upon teachers to guide, direct, and facilitate instruction. They generally are not more cost-efficient than traditional face-to-face instruction unless full-time faculty are replaced by contingent faculty. Recently, adaptive or personalized learning, which combines programmed instruction and learning analytics, is expanding and receiving a good deal of attention. Adaptive learning takes advantage of learning analytics and rudimentary AI software to monitor student progress and performance very closely and is consequently able to provide timely adjustments to the presentation of instructional material. Adaptive learning systems are customized to the personal needs of each student, which is why they are frequently referred to as *personalized learning systems*. As described by the EDUCAUSE Learning Initiative,

> Adaptive learning is one technique for providing personalized learning, which aims to provide efficient, effective, and customized learning paths to engage each student. Adaptive learning systems use a data-driven—and, in some cases, nonlinear—approach to instruction and remediation. They dynamically adjust to student interactions and performance levels, delivering the types of content in an appropriate sequence that individual learners need at specific points in time to make progress. These systems employ algorithms, assessments, student feedback, instructor adjustments/interventions, and various media to deliver new learning material to students who have achieved mastery and remediation to those who have not. (Moskal, Carter, & Johnson, 2017)

It should also be mentioned that adaptive learning is not new but can be traced back to the computer-assisted instruction (CAI) work of B. F. Skinner and Patrick Suppes in the 1950s and 1960s. However, the technology back then was very rudimentary compared to what exists today with high-speed Internet communications and advanced multimedia that can be delivered to homes, businesses, and mobile devices.

Depending upon the course design, adaptive learning can minimize the amount of interaction between the teacher and student and instead allow the software to deliver and monitor much of the course content. Learning analytics software monitors student progress and controls the pace of content delivery accordingly. Increasingly adaptive technology minimizes the faculty role in teaching and instead expands their role as tutor. The "faculty as tutor" model has been evolving as online learning has become more prevalent. Colleges with extensive experience in fully online academic programs, such as Athabasca University, the University of Phoenix, and Western Governors University, have promoted a model in which a master teacher administers a fixed curriculum with contingent faculty serving as guides and tutors for students. Contingent faculty have little discretion to modify or customize the curriculum or syllabus and follow a carefully developed script. In an adaptive course, all content, assignments, and assessments are delivered by the software. The adaptive model will become more prevalent in the future and may

even come to dominate much of higher education because of its cost-effectiveness rather than its pedagogical value. Early research does suggest, however, that student learning outcomes are comparable to other formats (Dziuban, Moskal, Parker, Campbell, Colm, & Johnson, 2018; Dziuban, Moskal, & Hartman, 2016).

Of all the online learning models, the adaptive learning model has become the focus of a good deal of investment by corporate America and venture capital. Educational software companies that develop adaptive learning, such as Knewton, are raising tens of millions of investment dollars to develop new products (Wan, 2018). This type of investment is not common in the other types of teaching and learning models. To the contrary, the development of other models relies heavily on college-based faculty and instructional designers, many of whom have modest resources at their disposal. Eventually, the well-financed adaptive course development will likely win out. While adaptive learning integrated with learning analytics is in its early stages, it will continue over the next decade to change the way most teaching and learning is conducted in higher education.

Two Futures—One Evolutionary and the Other Profound!

Any attempt at predicting the future is based on calculated speculation. *What* will happen is difficult enough, but *when* it will happen is even more difficult. Niels Bohr, the Danish physicist, was said to have been fond of saying that "prediction is very difficult, especially if it's about the future." While he did not originate this quote, he fervently believed it. This article speculates about the future of American higher education in two periods: one over the next decade or so and the other in the 2030s and beyond. The latter will see major new technological developments bringing profound changes to our colleges and universities and presenting dilemmas for educators regarding their purpose and their role in the academy.

Over the next decade, digital technologies will advance in the development of man–machine interfacing or the ability of digital technology to interact with and assist in human activities. Figure 1 provides an overview of the major technologies presently in various stages of development and evolution. Nanotechnology and quantum computing form the base for the development of man–machine interfaces, such as AI, biosensing devices, robotics, and supercloud computing. In the 2020s these technologies will be more visible, but in the 2030s and beyond they will begin to mature, integrate, and have their greatest impact. Robotics will play a major role in reshaping commercial, industrial, and manufacturing processes, while biosensing will do the same for medical and health services. For the purposes of adaptive learning, the supercloud and AI are most important and will be the focus of the remainder of this article.

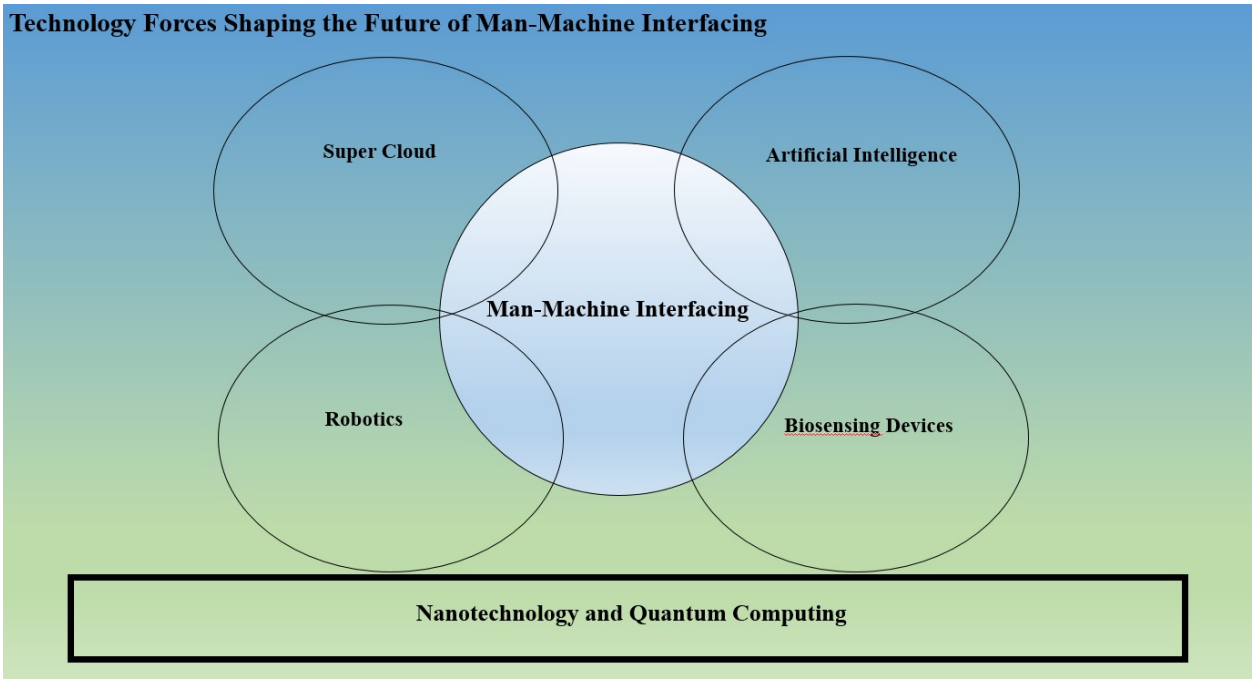

Figure 1. Technology Forces Shaping the Future of Man-Machine Interfacing.

Nanotechnology and quantum computing. *Nano* refers to a billionth of a meter, or the width of five carbon atoms. The simplest definition of nanotechnology is technology that functions at very close to the atomic level, and governments around the world have been investing billions of dollars to develop applications using it. These applications, for the most part, have focused on areas such as medicine, energy, materials fabrication, and consumer products. However, companies such as Intel and IBM have been developing nanochip technology, which has the potential to change the scope of all computing and communications equipment. IBM, for instance, announced in July 2015, a prototype chip with transistors that are just 7 nanometers wide, or about 1/10,000th the width of a human hair (Neuman, 2015). Nanochip technology is here now and is developing into commercial production and application. By the 2020s, it will become a mature technology.

By the 2030s, the whole concept of a digital computer may give way to a quantum computer that operates entirely on a scale the size of atoms and smaller. Another decade or so of research and development on quantum computers may find their speed thousands of times faster than the speed of today's supercomputers. The storage capacity of such equipment will replace the gigabyte (10^9) and terabyte (10^{12}) world of today with zettabyte (10^{21}) and yottabyte (10^{24}) devices. Large-scale digitization of all the world's data will occur with access available on mobile devices. And all this technology and computing power will eventually be less expensive than it is now. Nanotechnology and quantum computing will provide the underlying base for the development of a host of new applications using AI and supercloud computing. The first generation of quantum computers will likely be available via the supercloud and geared to specific applications related to large-scale, complex research in areas such as neuroscience, NASA projects, DNA, climate simulations, and machine learning.

Supercloud computing and education resources. In 1994, I described a place called Futuretown, where in the year 2025 people would be served by an all-inclusive Communications and Computer Services Utility (Picciano, 1994). This digital utility would provide all services related to computer, television, communications, and transaction processing, and it would be a one-stop facility for all information and entertainment services. Government, corporate America, hospitals, schools, and colleges would all use this utility for their operations. We have not quite developed this utility, but we are moving in that direction. Services provided by companies such as Optimum and Verizon already integrate data, voice, and video entertainment but are not there yet regarding transaction processing. When this prediction was made in 1994, the Internet and World Wide Web were in their nascent stages of development. There were few applications available other than file transfer (ftp), email, and electronic messaging. Home access was nonexistent in most parts of the country, and where it was available, users relied on low-speed dial-up modems. While there were some limited facilities for uploading and downloading images, video was impossible due to these low-speed connections. This began to change as higher speed connectivity became available via cable modems, fiber optics, and digital subscriber lines (DSL) in the early 2000s. With the improvement in the speed and quality of connectivity, cloud computing (or simply "the cloud") evolved, wherein users relied less on their personal computers for storing files and running programs. Cloud computing services became available through major companies, such as Google, Amazon, and Microsoft. Best-selling author Nicholas Carr described cloud providers as having turned data processing into utility operations that "allow vast amounts of information to be collected and processed at centralized plants" and fed into applications running on smartphones and tablets (Carr, 2014, p. 194). Essentially, cloud services can take responsibility for all file handling and storage as well as applications such as email, text messaging, and social networking. It is likely that a cloud-based database establishing a national registry of all citizens in the United States will be created similar to ones in Sweden and several other European countries. All of a Swedish citizen's medical and education information, for instance, is maintained on the national registry database. All Swedish citizens also are assigned a personal identification number (PIN), which is keyed to the national registry database. The PIN is then used for a host of services in medicine, banking, purchasing, and education. With advances in nano- and quantum-computing technology, cloud computing will expand significantly to the supercloud and provide the database, communications, and computing capacity needed to perform most daily functions.

On the education front, cloud computing is just beginning to make inroads. While there has been movement to low-cloud applications, such as personal email, and middle-cloud applications, such as course and learning management systems, mission-critical applications, such as student or financial database systems, are still mostly maintained locally by colleges (Green, 2015). By the end of the 2020s, it is likely that the supercloud will have evolved to provide most digital services to all of education. By then, there will be little need for colleges to maintain their own administrative databases or course/learning management systems, and the implications of cloud computing will be significant, especially for instructional course development.

First, students and faculty will be able to access large numbers of courses and course materials developed by other faculty or commercial developers. We are seeing this now in the open educational resources (OER) movement, but an efficient and all-inclusive file-sharing system does not presently exist. While some websites and services assist with this, most course materials still reside on school- or campus-based computer systems with restricted access. Furthermore, since many faculty customize their materials to their own courses, they are not thinking about the convenience that sharing with others would provide.

Second, the MOOC movement allowed for high investment in course development. A single course might cost $1 million or more to develop and make available to a customer base. At most colleges this type of funding and investment in course development is a rarity, but it is beginning to catch on, usually in partnership with private enterprise. Some of the materials, especially media files, are very well done and are attracting faculty who use them for their own non-MOOC courses. The MOOC courses also integrate state-of-the-art features, such as adaptive/personalized learning, learning analytics, and micro assessments.

Third, MOOC-type materials are setting a standard for high-quality course content development that may in fact be leading to course standardization. This is especially true for introductory and gateway required courses that make up large portions of the curriculum. If all this course development is moved away from private developers and onto computer facilities in the supercloud, the ease with which faculty and students can access course material will increase tremendously. It is not unfathomable to think that there will be great pressure both inside and outside education to make use of these course materials. Policy makers who seek standards and promote common assessments will material available readily accessible to them in the supercloud. Perhaps most importantly, students also will have access to these courses and materials and will be able to develop their own programs of study with or without the guidance of faculty mentors and advisers. The ready availability of these courses will also raise important questions as to the credentialing of students, specifically as to whether only a traditionally accredited college or university can award a degree or certificate of completion.

Artificial intelligence and adaptive learning. Learning analytics software is still in its developmental stages but is gaining traction as an important facility for teaching and learning. This software increasingly depends upon AI techniques that use algorithms to understand instructional processes. The software also relies on large amounts of "big" data to build a series of decision processes. Significant increases in the speed and storage capabilities of computing devices that will be possible through nano and quantum technology will also increase the capabilities and accuracy of AI-driven learning analytics software. What is presently known as big data will be small in comparison to the "superbig" data that will be available with quantum computer systems.

AI allows learning analytics to expand in real time to support adaptive and personalized learning applications. For these applications to be successful, data must be collected for each instructional transaction that occurs in an online learning environment. Every question asked, every student response, every answer to every question on a test or other assessment is recorded and analyzed and stored for future reference. Software to grade essays and unstructured written assignments has also been evolving for several years (Markoff, 2013). While this approach is controversial, several states, such as Ohio and Utah, as well major companies, such as Education Testing Service and EdX, are moving to "robo-grading" and "e-rating" of essays (Smith, 2018; Ford, 2015, p. 130–131). As a result, complete evaluations of individual students as well as entire classes are becoming more common. Alerts and recommendations can be made as the instruction proceeds within a lesson, from lesson to lesson, and throughout a course. Students can receive prompts to assist in their learning, and faculty can receive prompts to assist in their teaching. By significantly increasing the speed and amount of data to be analyzed through nano- or quantum technology, the accuracy and speed of adaptive or personalized programs will be improved. Faculty will make inquiries about individual students to understand strengths and needs. They will be able to use an "electronic teaching assistant" to determine how instruction is proceeding for individual students and the class as a whole. They will be able to receive suggestions about

improving instructional activities. Most AI applications in use today, and for the near future are narrow in their application and focus on a specific activity. In the years to come, broader purpose AI will evolve that will be applied to a variety of activities.

Lee (2018) classifies AI into five technologically sophisticated stages as follows:

1. Internet AI – makes recommendations based on Internet activity (i.e., Amazon);
2. Business AI – uses data that companies and other organizations routinely capture for commercial and procedural activities to make predictions (i.e., bank loan approval, insurance fraud, medical prognosis);
3. Perception AI – uses data from the physical world to make predictions using sensors and smart devices (i.e., weather, traffic flow, facial recognition)
4. Autonomous AI – uses all the capabilities of the previous stages plus directs and shapes the world around it (i.e., self-driving cars, assembly line production control)
5. Artificial General Intelligence - AI functions similar to the human brain and can perform any intellectual task.

The first two forms of AI are in evidence today and are utilized in adaptive learning software. The next two are still in their early development stages. The fifth, which is the most sophisticated form of AI, is in discussion stages, with some predicting it will be available as early as 2030 and others indicating it will not be perfected until later in the 2040s and beyond. The fact is that there are "no known algorithms for artificial general intelligence or a clear route to get there" (Lee, 2018, p. 142). However, recent advances being made with AI should not be underestimated, especially regarding algorithms that take on characteristics of machine or deep learning. Unlike many earlier forms of AI that depended upon hundreds of thousands of lines of code to predict something, new advances enable AI algorithms to learn from within themselves. Lee (2018) also cautions not to think of the development of AI as simply computer coding but rather as a new form of intellectual "electricity" that will support all forms of personal and commercial endeavors.

Steven Strogatz, professor of mathematics at Cornell University, has raised the possibility that AI has evolved to the point where it has the beginnings of insight. He described AlphaZero, a generic algorithm that mastered chess and Go with absolutely no knowledge of the games beyond their basic rules, and within a matter of hours of playing against itself had become the best player, human or otherwise, we have ever seen. Here is an excerpt from Strogatz's essay:

> Computer chess has come a long way over the past twenty years. In 1997, I.B.M.'s chess-playing program, Deep Blue, managed to beat the reigning human world champion, Garry Kasparov, in a six-game match. In retrospect, there was little mystery in this achievement. Deep Blue could evaluate 200 million positions per second. It never got tired, never blundered in a calculation and never forgot what it had been thinking a moment earlier. For better and worse, it played like a machine, brutally and materialistically. It could out-compute Mr. Kasparov, but it couldn't outthink him. …
>
> These principles, which have been refined over decades of human grandmaster experience, are programmed into the engines as complex evaluation functions that indicate what to seek in a position and what to avoid: how much to value king safety, piece activity, pawn structure, control of the center, and more, and how to balance the trade-offs among them. Today's chess engines, innately oblivious to these principles, come across as brutes: tremendously fast and strong, but utterly lacking insight.

> All of that has changed with the rise of machine learning. By playing against itself and updating its neural network as it learned from experience, AlphaZero discovered the principles of chess on its own and quickly became the best player ever. Not only could it have easily defeated all the strongest human masters—it didn't even bother to try—it crushed Stockfish, the reigning computer world champion of chess. In a hundred-game match against a truly formidable engine, AlphaZero scored twenty-eight wins and seventy-two draws. It didn't lose a single game.
>
> Most unnerving was that AlphaZero seemed to express insight. It played like no computer ever has, intuitively and beautifully, with a romantic, attacking style. It played gambits and took risks. …
>
> AlphaZero won by thinking smarter, not faster; it examined only 60 thousand positions a second, compared to 60 million for Stockfish. It was wiser, knowing what to think about and what to ignore. By discovering the principles of chess on its own, AlphaZero developed a style of play that "reflects the truth" about the game rather than "the priorities and prejudices of programmers." (Strogatz, 2018)

Adaptive learning and analytics are already being significantly integrated with Internet and business AI. The integration of learning analytics is greatly enhanced based on student responses to prompts, questions, quizzes, and increasingly on less structured assessments, such as essay writing. Combining these with the ongoing collections of student demographic, academic performance, and other information provides an extensive learning analytics database upon which students and faculty can depend for recommendations as they proceed through a course of study. Over the next decade or so, the software supporting these types of applications will grow in sophistication, especially when integrated with supercloud data depositories that will extend academic programs, curriculum, and coursework beyond individual colleges and institutions. In the 2030s and beyond, AI-based adaptive learning will come to dominate much of the instruction in higher education.

What Is the Academy to Do?

Joseph E. Aoun is the president of Northeastern University and author of *Robot Proof, Higher Education in the Age of Artificial Intelligence*. In looking at the future of higher education and the changes that will occur as a result of digital technology and especially AI, Aoun acknowledged American colleges and universities as among the fullest expressions of human culture ever evolved and perhaps the most effective institutions for intellectual advancement ever developed. However, he went on to caution that if they fail to respond creatively and deliberately to the technological challenges that they face, "they will wither into irrelevance" (Aoun, 2017, p. 12). In considering a future dominated by advanced technologies, educators should seek to integrate technology into a comprehensive plan that addresses other major issues that they will be facing in the not too distant future.

Clayton Christensen, Harvard Business School Professor and author of *The Innovator's Dilemma*, during a speech at a Higher Education Summit in 2017, spoke at length about disruption theory and discussed its application to colleges and universities. Higher education, he explained, was among the industries that "for several centuries was not disrupted," but "online learning has put a kink in that." He predicted that half of American universities would close or go bankrupt within 10 to 15 years. He went on to say that "technology itself is never the disruptor, a new business model is. But it is technology that enables the new business model to coalesce, and that's what is happening in higher education now " (Hess, 2018).

Drew Faust, the former president of Harvard University, in a message to the World Economic Forum in 2015, described three major forces that will shape the future of higher education:

1. the influence of technology
2. the changing shape of knowledge
3. the attempt to define the value of education.

She went on to extol the facilities that digital technology and communications will provide for teaching, learning, and research. She foresees great benefits in technology's ability to reach masses of students around the globe and to easily quantify large databases for scaling up and assessment purposes. On the other hand, she made it clear that "residential education cannot be replicated online" and stressed the importance of physical interaction and shared experiences.

On the nature of knowledge, she stated that the common organization of universities by academic departments may disappear because "the most significant and consequential challenges humanity faces" require investigations and solutions that are flexible and not necessarily discipline specific. Doctors, chemists, social scientists, and engineers will work together to solve humankind's problems.

On defining value, she accepts that quantitative metrics are now evolving that can assess the importance of meaningful employment. She also believes that higher education provides something very valuable: It gives people "a perspective on the meaning and purpose of their lives." Furthermore, it is not possible to quantify this type of student outcome. She concluded that

> so much of what humanity has achieved has been sparked and sustained by the research and teaching that take place every day at colleges and universities, sites of curiosity and creativity that nurture some of the finest aspirations of individuals and, in turn, improve their lives—and their livelihoods. As the landscape continues to change, we must be careful to protect the ideals at the heart of higher education, ideals that serve us all well as we work together to improve the world. (Faust, 2015)

While Faust presented three key elements in higher education's future, it is the interplay of these elements that will become most crucial in predicting its future. Will technology drive the shape of knowledge and the definition of value, or will it be the other way around? Techno-centrists see technology as the driver while others who look at higher education holistically see technology as a tool serving the needs of the other elements.

Aoun, Christensen, and Faust are all respected and accomplished individuals in American higher education. Common to their predictions of the future is the role technology will play. Aoun and Christensen have concerns about whether and if higher education can adjust and adapt to a new world order dominated by technology. Faust holds out hope that colleges will adjust and continue to function and "protect the ideals that have served us well." Most of those in higher education, and especially the faculty, like to think that Faust has it right. There will be adjustment and accommodation to technology and the academy will go on. However, there are dark clouds on the horizon driven especially by financial realities as well as technological and economic competition. In addition, the academy is squarely in the crosshairs of political factions in this country and is seen as a bastion of liberal philosophy that needs to be reined in. While there is support from progressive-minded government policy makers, there is also opposition from the other side of the political spectrum, where calls for funding contraction are already in evidence.

In the United States during the past 20 years, there has been a loud, sustained call for more accountability and assessment as policy makers and the public question whether colleges and universities are as effective as they should be. The nonprofit public higher education sector where the majority of American college students are enrolled has seen a signifcant shift in funding away from government subsidy to student tuition. Contingent faculty, especially lower paid adjuncts, now teach the majority of all postsecondary courses. It is not by accident that public higher education systems have emerged (along with for-profit institutions) as among the most prolific in developing online education programs. They were moved to do so in order to meet student demand and also because of increasing competition from the other sectors, especially the for-profit institutions. Increasing enrollments and stagnant state-government subsidies also moved many public systems to adopt online instructional technology in hopes of stabilizing costs, especially for capital and campus-building projects. As we approach the 2020s, practically all segments of higher education (nonprofit, private, public, and for-profit) have embraced online technology as critical for their academic programs. However, what has been accomplished to date may not be enough to sustain what is coming in the years ahead. We are already seeing closures, mergers, and consolidations like never before.

The United States Education Department's National Center for Education Statistics shows that the number of colleges and universities eligible to award federal financial aid reached their peak in 2012 with 7,416 institutions. Due to closures, mergers, and consolidations, the number had declined to 6,760, or 9%, by 2016. The vast majority of colleges that closed were in the for-profit private sector (Lederman, 2017). However during the past two years, the nonprofit private sector and the public sector have also seen a significant number of closures. Since 2016, 170 colleges have announced closures, mergers, or consolidations. Of these, 71 were private, for-profit; 63 were private, nonprofit; and 36 were public colleges (Education Dive Staff, 2019). Most of the private, nonprofits were small liberal arts colleges and were tuition driven with modest endowments. The publics were mostly in the states of Georgia, Wisconsin, and Connecticut, where major restructuring of public higher education has been underway. In Wisconsin, for instance, all 13 community colleges were restructured as extension centers under the auspices of the Wisconsin system's senior colleges. In Connecticut, all 12 community colleges are in the process of being consolidated into one institution. These changes were made strictly because of existing financial exigencies. The future does not look brighter, and more governing boards in all higher education sectors will be facing serious finanical pressures. Closures will be more common, and those colleges and universities that continue will have to find more cost-efficient ways of offering an education. Policy makers will look to technology to effect savings in all aspects of the higher education enterprise, including instruction, advising, counseling, administrative services, and research. It is also likely that some colleges and universities, especially those publicly funded, will grow significantly in terms of enrollments. An institution such as the University of Southern New Hampshire, which grew from 8,000 students in 2008 to over 122,000 by 2018 by adopting a new online education technology model, is being closely watched by educational policy makers in other states (Blumenstyk, 2018).

The critical questions to be answered by the academy are how to adapt to and address the new technologies. Full-time faculty will likely see their ranks reduced. Those that primarily teach in colleges and universities may have to adjust to a tutor role rather than develop and teach their own content via their own pedagogical practices. Students may increasingly select off-the-shelf courses, perhaps developed at another college, university, or by a private supplier. Faculty researchers may be engaged in very large-scale projects that involve multiple partners in the academy and in private industry. It is also possible that the lead researchers may be algorithms in

an AI laboratory. The comments of Mohammed AlQuraishi, the biologist who at the beginning of this article had a feeling of melancholy when he saw an AI application sweep away the competition in the Critical Assessment of Structure Prediction Competition, may portend the feelings of many teaching and research faculty. Other aspects of the academy likewise will be affected by AI. Library holdings will be moved to all-electronic access, with AI speeding searches for materials and delivering the same within minutes on mobile devices. Academic advisers and counselors will see their roles reduced to offering assistance only in deeply personal situations where the human side of their work is most important. All academic advisement regarding course requirements, majors, and careers will be done via AI applications. Administrative functions will be consolidated and centralized with supercloud services for admissions, registration, financial aid, bursaring, and purchasing. Large public university systems will see many of these services centralized, and the need for presidential, vice presidential, and other administrative operations at the local campus level will be significantly reduced. The question is whether higher education will adjust to and accommodate the new world order where technology will provide foundational services. Many educators will feel a loss of purpose in light of the fact that their expertise will be overshadowed by AI software. Younger and newer educators will take their places, accept the new order, and work within it to make it successful; but the period of transition will be tense, if not painful. Educators will have to come to see technology as primary partners in the higher education enterprise, as have counterparts in private industry (McAfee & Brynjolfsson, 2017, p. 15). As Auon, Christensen, and Faust alluded to earlier, the issue is not just that the technology changes but how people change in response to the technology. This will be higher education's challenge over the next two decades and beyond.

It would be easy to dismiss negative speculation as just crying wolf and assume that our colleges and universites will weather any possible storm well. I hope this is the case, but it is not likely. Much of higher education, with the exception of the heavily endowed colleges, are in difficult financial times; closures, mergers, and consolidations are already happening. It is difficult to see how we will move gracefully beyond the financial exigencies already in evidence. The federal government is the one institution that might be able to ease this situation, but its debt has grown considerably in the past five years, and there does not appear to be the political wherewithal to address it. It is unlikely that the federal government will come to the rescue of higher education, especially since there will be pressures from other government services, such as health and social welfare. Unemployment will permeate many endeavors. In addition, in the AI arena, there will be severe competition between the United States and the People's Republic of China for dominance. Right now seven companies are making the greatest investments in AI development (Lee, 2018, p. 91). Four (Google, Amazon, Microsoft, and Facebook) are based in this country, and three (Baidu, Alibaba, and Tencent) are based in China. The Chinese government is pouring huge amounts of capital into developing its AI capabilites and will very possibly take the lead in this area in the not too distant future. Higher education will be directed if not forced to respond to this AI challenge. It might be beneficial for administrators, faculty, and researchers to consider how they might partner with centers of AI and adaptive learning that exist in the corporate sector (Dziuban, Colm, Johnson, & Moskal, 2017). Technology companies are proliferating and generally welcome collaborators for their products and services. This was the conclusion that the biologist and chemist reached in the DeepMind vignette that opened this article.

A few years ago, a young associate professor approached me after I had given a talk about online education. Our discussion centered on the future of higher education, and she asked if I thought that in 10 years she would be out of a job. My answer to her was that she would not be

displaced anytime soon but that the way she teaches would change. I stand by that comment. Educators must be alert to new technologies and adjust, change, and adapt those that may benefit their students. These changes are best implemented through carefully planned and developed projects, programs, and initiatives rather than by disruptive sudden upheavals. It is critical that colleges and universities be open to changing and adapting. Higher education must use technologies that are beneficial, question those that are not, but most importantly not ignore them. In addition, it would be wise for the academy to partner with those private companies that can bring financial resources and expertise to the issues that AI will usher in. The challenges are formidable. Joseph Aoun, referenced earlier, commented as follows: "If technology can replace human beings on the job, it will. Preventing business owners from adopting a labor-saving technology would require modifying the basic incentives built into the market economy" (Aoun, 2017, p. 46).

The Future of Life Institute (2015) initiated an open letter entitled *Research Priorities for Robust and Beneficial Artificial Intelligence* expressing the same concerns about AI development as described above by Aoun and others. The open letter was signed by Stephen Hawking, Elon Musk (founder of SpaceX and Tesla Motors), Steve Wozniak, (cofounder of Apple), and many of the world's top computer scientists. It also was a call for more dialogue among all parties involved with AI development. Their concerns reflect the concerns of humanity over our ability to control the advancements of AI.

In *A Christmas Carol*, by Charles Dickens*,* the miserly Ebenezer Scrooge is visited on Christmas Eve sometime in the 1840s by the ghost of his former business partner Jacob Marley as well as the Ghosts of Christmases Past, Present, and Future. The Ghosts take a reluctant Scrooge on a time-travel voyage to see the people, places, and things that have mattered and will matter to him. The past reflects memories of childhood, love, and career. The present has some joys but also illuminates the stark realities of London's poor, its orphans, its prisons, and its workhouses. The future is dark and haunting. Scrooge sees the empty chair where Bob Cratchit's lame son, Tiny Tim, would normally sit. The visit to the future ends as Scrooge faces his own mortality in the form of a tombstone inscribed with his name. He asks the Ghost,

> "Before I draw nearer to that stone to which you point, answer me one question. Are these the shadows of the things that Will be, or are they shadows of things that May be..?"

The Ghost continued to point downward to the grave by which it stood.

> "Men's courses will foreshadow certain ends, to which, if persevered in, they must lead," said Scrooge. "But if the courses be departed from, the ends will change. Say it is thus with what you show me!" (Dickens, 1843)

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