Introduction to *Online Learning* Volume 22 Issue 1

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In this issue of *Online Learning*, we present 13 articles researching Massive Open Online Courses (MOOCs), leadership perspectives, student engagement, academic integrity, pedagogy, and support. These papers advance our understanding of online learning with insights from a broad array of national and international investigators using quantitative, qualitative, and mixed methods approaches to inquiry.

The first paper in this issue is "Comparing the Factors That Predict Completion and Grades Among For-Credit and Open/MOOC Students in Online Learning" by Ma. Victoria Almeda of Teachers College, Columbia University; Joshua Zuech, Chris Utz, Greg Higgins, and Rob Reynolds of NextThought; and Ryan Baker of the University of Pennsylvania. In the study the investigators ask whether learners behave the same way in MOOCs and for-credit courses. The answers matter both for research and practical purposes. To answer this question, the authors compare students enrolling in the same online course in for-credit and noncredit modes to develop models based on student interaction and participation that might predict final course grades. The paper examines whether the automated models developed generalize between these populations to understand whether the same patterns of interaction are predictive of student success among both noncredit and for-credit learners. Their findings indicate that the models of interaction and participation predict students' course grades for new students across both populations. They conclude that these models can be used by instructors and course designers to identify both for-credit and noncredit at-risk learners to provide better support.

The next paper in this section is "Customizable Modalities for Individualized Learning: Examining Patterns of Engagement in Dual-Layer MOOCs" by Matt Crosslin and Justin T. Dellinger of University of Texas at Arlington, Srecko Joksimović and Vitomir Kovanović of University of South Australia, and Dragan Gašević of Monash University and The University of Edinburgh. In this study the authors develop different pathways through a MOOC, one that is more learner controlled and one that is more instructor controlled. However, at all times learners retain choice regarding which pathway they take. In this mixed methods study, quantitative data suggested that many learners were interested in trying different pathways to course completion, and qualitative results indicate areas for improvement in dual-layer MOOC design and technology going forward.

The following section begins with "No Significant Differences Unless You Are a Jumper" by Richard Fendler, Craig Ruff, and Milind Shrikhande of Georgia State University. In this paper the authors investigate conditions under which students in online and classroom sections might improve their performance. More specifically, the authors compare the performance of more than 500 undergraduate students enrolled in classroom and online sections of a finance course. Their predictive model identifies students who may have performed up to a full grade better or worse in the opposite modality had they chosen differently. Though there are potential limitations based on

class size and instructor differences, the results provide an interesting foundation for additional research and suggest opportunities for advisors to inform students of risks and opportunities for improved performance either in classrooms or online.

In "Breaking Barriers Through Edmodo: A Qualitative Approach on Perceptions of Malayan University Graduates," Farha Alia Mokhtar of Universiti Utara Malaysia employs a qualitative case study approach to better understand the benefits of an online learning management system in the Malaysian context. The author notes that many Malaysian educators use available social networks to support learning in their classrooms. She notes that social networks in education present disadvantages, and she uses in-depth interviews to illuminate student perspectives on the advantages of an alternative: the Edmodo LMS (a product also in wide use in precollege settings in the United States). This research provides insights into the specific advantages identified by her interviewees and employs some rigor to ensure reliability across these cases.

In the next paper, "Impact of a Web-Based Adaptive Supplemental Digital Resource on Student Mathematics Performance," by Laurie Sharp of West Texas A&M University and Marc Hamil of Canyon Independent School District, we find an evaluation of a tool to support student performance with state-mandated annual standardized mathematics assessments in precollege settings. The study finds that the use of the tool explains significant proportions of variance in outcomes on state mathematics assessments among elementary and middle school users but not students in high school. The assessment was conducted only on high-level users of the tool, and the authors caution that additional research needs to be conducted with others, including assessing the impact of use by gender, race/ethnicity, socioeconomic status, and special student populations. These results are suggestive and do require additional study.

Next is "Computer Science Students' Attitudes Towards the Use of Structured and Unstructured Discussion Forums in Fully Online Courses" by Moanes Tibi of Beit Berl College, Israel. In this paper the author investigates students' attitudes toward the use of structured and unstructured discussion forums in fully online computer science courses. The paper also considers students' suggestions that might help in redesigning such forums for an improved learning experience. Perhaps not too surprisingly, students had significantly more positive responses about participation in the structured forums compared to those who participated in the unstructured ones.

The following article, "The Relationship Between Instructor Servant Leadership Behaviors and Satisfaction With Instructors in an Online Setting," is by Faris George Sahawneh of West Kentucky Community and Technical College and Lorraine Benuto of the University of Nevada. In this study the authors investigate a leadership philosophy they hypothesize to be more supportive of online learning. They note that the "servant leader" model prioritizes behaviors that are compatible with instructor traits found effective at meeting the needs of online students, including, for example, empathy, giving feedback, authenticity, empowerment of others, and building community. Utilizing the Servant Leadership Questionnaire (SLQ) and the Student Evaluation of Teaching (SET) survey, they found a positive correlation between student satisfaction and five components of servant leadership (but not necessarily those we might expect): altruistic calling, emotional healing, wisdom, persuasive mapping, and organizational stewardship. Concluding that this is the first study in which the relationship between individual servant leadership behaviors and online student satisfaction was examined empirically, they recommend additional research in other contexts.

The next paper, "Comparing Student Performance on Proctored and Non-Proctored Exams in Online Psychology Courses," by Lee William Daffin and Ashley Jones of Washington State University, investigates issues of academic integrity. The authors report that the literature in this area produces mixed findings about whether students are more likely to cheat online. They identify a variety of weaknesses in the literature, including small sample sizes, self-reported data, and limited class contexts. They propose to improve upon the literature by offering an investigation with a larger sample size ($N = 1{,}694$), more objective measures, and additional classroom contexts. The study hypothesized that students would earn higher scores and take more time to complete non-proctored exams than proctored exams. Data support these hypotheses. Results indicate that students score higher and take more time on non-proctored than proctored exams. The conclusions suggest that proctoring seems to be the key to reducing cheating. Alternatively, online course designers could follow decades of instructional-design advice not to depend on high-stakes assessments in non-proctored online settings. Course designs that use alternative means of assessment hold promise to make learning more authentic and to assess learning at more advanced levels on Bloom's taxonomy. As the authors conclude, we are fortunate not to be stuck with a choice between cheating and proctoring "if we, as educators, are willing to put the time into course development."

Next is "Examining the Reliability and Validity of a Turkish Version of the Community of Inquiry Survey" by Yusuf Ziya Olpak of Ahi Evran University and Ebru Kilic Çakmak of Gazi University, Turkey. In this paper the authors investigate a translated version of the CoI instrument, which is designed to measure student reports of in-depth and significant learning in the online environment. The authors carry out both exploratory and confirmatory factor analysis of the translated version with data collected from more than 1,100 students. As in the original CoI version they investigated, the Turkish version of the survey has 34 items: 13 related to teaching presence, 9 items related to social presence, and 12 items related to cognitive presence. The study concludes that the new version of the survey can be used as a tool to relate international research with national studies and to develop suggestions for future improvement.

Concluding this section is "The (Lack of) Influence of Age and Class Standing on Preferred Teaching Behaviors for Online Students" by Shannon Kennan and Paula Bigatel of Penn State University, Susan Stockdale of Kennesaw State University, and Jennifer Hoewe of the University of Alabama. In this study the authors investigate widespread perceptions that older, nontraditional students require or appreciate instructional approaches that reflect adult learning theories. Students in the study were asked to rate the importance of 35 teaching behaviors, identified through prior research to reflect best practices in online instruction. Results suggest that only seven teaching behaviors were consistently related to differences in age and class standing among online students, and those behaviors do not fit neatly within the assumptions frequently made about adult learners.

The final section of this issue contains three papers that investigate aspects of learner engagement. The first of these, "An Online Engagement Framework for Higher Education," is by Petrea Redmond, Amanda Heffernan, Lindy Abawi, Alice Brown, and Robyn Henderson of the University of South Queensland, Australia. The authors present a conceptual model that draws on recent literature to provide a richer and more useful definition of engagement in online learning environments. Utilizing a constant comparison method to investigate the literature, the paper analyzes emerging themes and identifies five key elements of online engagement. This is a nuanced contribution at a time when student engagement has become an overused buzzword in need of conceptual clarification.

The following article in this section is "Engagement Matters: Student Perceptions on the Importance of Engagement Strategies in the Online Learning Environment" by Florence Martin of the University of North Carolina Charlotte and Doris U. Bolliger of the University of Wyoming. In this study the authors focus on one model, Moore's Interaction Framework. This study examines student perception on various engagement strategies used in online courses based on the framework. In all, they surveyed 155 students on a 38-item instrument on learner-to-learner, learner-to-instructor, and learner-to-content engagement strategies. Learner-to-instructor engagement strategies seemed to be most valued among the three categories. The results have implications for faculty, instructional designers, and future research.

Closing out this issue is "Online Student Use of a Proximate Community of Engagement at an Independent Study Program" by Darin Oviatt, Charles Graham, and Randall S. Davies of Brigham Young University and Jered Borup of George Mason University. In this study the authors investigate which aspects of their conceptual model for community are most frequently used by students, which members of the supplemental community investigated interact most with students, and what differences in outcomes occurred based on whether students were engaged in credit recovery (summer school) or other uses of independent distance education (e.g., electives). In addition to answering these questions, they provide more nuance as to conditions under which students who interact with a PCE may receive the learning advantages associated with collaborative communities without sacrificing the flexibility of an independent study course.

We invite you to read, share, and cite these articles and to help us to continue to advance the field of online learning.

Comparing the Factors That Predict Completion and Grades Among For-Credit and Open/MOOC Students in Online Learning

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Abstract

Online education continues to become an increasingly prominent part of higher education, but many students struggle in distance courses. For this reason, there has been considerable interest in predicting which students will succeed in online courses and which will receive poor grades or drop out prior to completion. Effective intervention depends on understanding which students are at risk in terms of actionable factors, and behavior within an online course is one key potential factor for intervention.

In recent years, many have suggested that Massive Online Open Courses (MOOCs) are a particularly useful place to conduct research into behavior and interventions, given both their size and the relatively low consequences and costs of experimentation. However, it is not yet clear whether the same factors are associated with student success in open courses, such as MOOCs, as in for-credit courses—an important consideration before transferring research results between these two contexts. While there has been considerable research in each context, differences between course design and population limit our ability to know how broadly findings generalize; differences between studies may have nothing to do with whether students are taking a course for credit or as a MOOC.

Do learners behave the same way in MOOCs and for-credit courses? Are the implications for learning different, even for the same behaviors? In this paper, we study these issues through developing models that predict student course success from online interactions, in an online learning platform that caters to both distinct student groups (i.e., students who enroll on a for-credit or a noncredit basis). Our findings indicate that our models perform well enough to predict students' course grades for new students across both of our populations. Furthermore, models trained on one of the two populations were able to generalize to new students in the other student population. We find that features related to comments were good predictors of student grades for both groups. Models generated from this research can now be used by instructors and course designers to identify at-risk students both for-credit and MOOC learners, with an eye toward providing both groups with better support.

Keywords: prediction modeling, predictive analytics, online learning, student achievement, learning analytics, higher education, distance education

Almeda, M.V., Zuech, J., Baker, R.S., Utz, C., Higgins, G., & Reynolds, R. (2018). Comparing the factors that predict completion and grades among for-credit and open/MOOC students in online learning. *Online Learning, 22*(1)**,** 1-18. doi:10.24059/olj.v22i1.1060

Comparing the Factors That Predict Completion and Grades Among For-Credit and Open/MOOC Students in Online Learning

Online learning has become increasingly prevalent in higher education, and it is important for educators and researchers to address the challenges associated with this learning setting. In recent years, the research on online learning has diverged into two subcategories, with researchers focusing on the efficacy of for-credit courses and MOOCs. While there are plenty of studies on either for-credit courses or MOOCs, little has been done investigating how findings from one subcategory can help inform the other. Bridging this gap would be valuable, as Massive Online Open Courses (MOOCs) are a particularly useful place to conduct research into behavior and interventions, given both their size and the relatively low consequences and costs of experimentation. At the same time, the different goals held by MOOC learners, many of whom never intend to complete the course they start (Koller, Ng, Do, & Chen, 2013), may result in different patterns of behavior being associated with course completion—a risk to researchers attempting to translate findings between courses.

The present paper asks whether MOOC findings are applicable to for-credit students as well by studying student success across two distinct populations (i.e., students who enroll on a for-credit and noncredit basis) who are engaging with the same course materials and instructor. By controlling for these key aspects of the learning experience, we can avoid confounds and focus on the differences (or similarities) between for-credit and MOOC learners, comparing online behaviors and student outcomes between these two student groups. Specifically, we develop classification and regression models that predict student course completion in an online learning platform for each of our distinct populations. We then study whether the same models and corresponding features apply across contexts.

In the following sections of our paper, we examine recent research on MOOCs and for-credit courses, emphasizing the gap in the literature about whether findings are comparable to each other across these contexts. The Methods section discusses the data sets we use in our analysis as well as the course platform, and the algorithms applied to predict student success in our for-credit and open courses. In the Results section, findings from the classification and regression models for each of the student populations are given, followed by results on the generalizability of these models. Lastly, in the Discussion section, we explore the implications of our findings to help instructors and researchers of different populations identify and support struggling online learners.

Review of Related Literature

Many students struggle in distance and online courses. There is increasing evidence that students enrolled in online courses have higher drop rates (Diaz, 2002; Tyler-Smith, 2008) than in traditional classroom settings where instructors can offer support through face-to-face interactions. The overall low completion rates for online courses raise concerns about eventual student success.

As instructors have fewer opportunities to directly interact with students enrolled in online courses (Beard, 2002; Zhang, 2006), it becomes more difficult for instructors to determine whether all students are on a path to success. One approach that can support students is to use learning analytics. Several previous projects have used analytics to predict whether a student will pass or fail an online course or program. Early projects focused on demographic data and assignment performance (Zafra & Ventura, 2009; Arnold & Pistilli, 2012). However, these features are predictive but not always actionable.

As a result, many researchers have begun to use more granular features of student interaction to predict student achievement in online courses. In one example, Whitmer (2012) found a significant relationship between student usage of a learning management system (LMS) and their achievement. Specifically, they found that participation in online assessment activities, such as completing auto-graded quizzes, had the largest effect in terms of prediction of final grades. In another example, Romero, López, Luna, and Ventura (2013) predicted students' final performance on a course from participation in online discussion forums. They found that students who passed the course actively participated in the forum, posting messages more frequently and writing messages of higher quality as measured by the instructor's evaluation. In a third example, Andergassen, Guerra, Ledermüller, and Neumann (2014) found that the duration of participation in online activities (i.e., the total amount of time spent between the first and last assignments of the course) significantly predicted students' final exam scores. In a fourth example, Baker, Lindrum, Lindrum, and Perkowski (2015) discovered that students with higher grades were more likely to access the course e-book early in the semester, with access to course materials even as early as before the start of the semester being predictive of eventual grade.

Parallel to this research within for-credit courses, there has been increasing work in determining whether students will complete a MOOC, where completion rates are typically lower than in for-credit courses, in part because many learners enter MOOCs without the goal of completing at all (Koller et al., 2013), and grades do not matter as much as whether students complete the course with the certificate. For example, researchers have investigated whether course completion can be predicted by posting behavior and social network participation on course discussion forums (Yang, Sinha, Adamson, & Rose, 2013; Jiang, Warschauer, Williams, O'Dowd, & Schenke, 2014). Students were less likely to drop out when their posts spanned a longer duration between the first and the last post of the current week—suggesting positive impacts from more continual participation (Yang et al., 2013). Students were also less likely to drop out when they interacted with a greater number of students in online discussions. Similarly, Jiang et al. (2014) predicted whether students would earn a certificate of normal completion (basic track) or distinction (scholarly track) from their posting behavior in course discussion forums. Students were more likely to earn a certificate of distinction than normal completion when they actively participated in the forum in the first week. In another example, Morris, Hotchkiss, and Swinnerton (2015) predicted completion rates based on student demographics. Higher completion rates were associated with higher prior educational attainment and prior online experience.

Of course, in considering this work, it is important to note that most of the work on student success in MOOCs has focused on completion with a certificate. Using completion rates to indicate student success in a MOOC is by no means a perfect nor comprehensive criterion. In particular, some have argued that using completion as the metric of student success in open courses obfuscates the various reasons students enroll in a MOOC. Whereas traditional courses take considerable effort to enroll in, cost money, and typically have penalties of various sorts for withdrawing, MOOCs are easy and free to enroll in and have no penalty for withdrawal. As such, it has been argued that many students take MOOCs with more of a goal of sampling or learning specific material (Clow, 2013). However, recent studies suggest that many students who enroll in a MOOC on a noncredit basis have expectations similar to those seen in a traditional course, demonstrating high and sustained levels of engagement. Specifically, Shrader, Wu, Owens-Nicholson, and Santa Ana (2016) found that many noncredit learners watch a considerable percentage of videos and earn high points on quizzes, which are arguably potential indicators of a desire to pass the course. Additionally, while MOOC completion rates can be low, many participants intend to complete. For example, in a study of nine HarvardX courses, precourse surveys indicate that, on average, 58% of students intend to finish the course, 25% intend to audit, 3% intend to browse, and the remaining 14% are uncertain of their goal. Even with many learners having goals other than completion, completion data still offer valuable information to instructors and researchers (Reich, 2014). Completing learners appear to behave differently than other types of disengaged learners, such as "sampling" learners (Clow, 2013) who access content materials only at the beginning of the course. For instance, completing learners post in discussion boards and access in-video assessments significantly more frequently than sampling learners (Kizilcec, Piech, & Schneider, 2013). In addition to this, Wang, Paquette, and Baker (2017) indicate that course completion can lead to eventual career advancement, with completers being more likely to submit scientific papers in the field they were studying and being more likely to join scientific societies aligned with the topic of the course.

As can be seen in two bodies of literature (for-credit courses and MOOCs), many of the same types of features are used when studying MOOCs and for-credit online courses, such as discussion forum participation and use of course resources. However, there has been relatively little work directly comparing for-credit learners and MOOC learners, with each individual study focusing on predicting student achievement within a specific student population—either among students who enroll for a for-credit or a noncredit (open/MOOC) basis. Simply making comparisons between papers is not sufficient to fully compare these types of environments. While there have been several studies conducted within each of these groups, the differences between the courses and learning environments studied have made it difficult to make comparisons between papers. As such, there remains a gap in the literature on how students' online interactions correspond to learning outcomes in these student populations. Do the same factors predict success in each of these contexts?

This research question becomes particularly scientifically interesting given recent research that suggests there are important differences between the behaviors of students who enroll in for-credit online courses versus MOOCs. For instance, forum participation appears to be relatively more sustained in for-credit courses (Nistor & Neubauer, 2010) than in MOOCs (Clow, 2013). As such, there appear to be different patterns of engagement between for-credit and MOOC learners, but it is not yet conclusive whether these differences are due to the differences between these learners or some other factor—for example, other features of these courses or platforms investigated across these studies. Previous studies on edX, one of the largest platforms for open

courses, consistently show low completion rates—averaging fewer than 10% of participants (Breslow et al., 2014; Ho et al., 2014). As such, it would not be surprising to find lower completion rates for open courses than for-credit courses. And it is possible that the behaviors associated with successful performance (e.g., good grades) will differ as well. However, there has not yet been work to compare the potential differences in behavior between for-credit and open course learners, and the relationship between these behaviors and student outcomes when controlling for factors such as platform, course design, and topic. Thus, investigating which factors predict student performance in both groups of learners may also be useful to help support both of these distinct student populations, as well as help us understand how course format influences student behavior and performance.

In this paper, we therefore compare online behaviors from two groups of learners with different intentions, enrolling on for-credit and noncredit bases, who are using the same course and platform concurrently. Specifically, we develop models based on student interaction and participation to predict final course grades for each population. In doing so, we identify features of student interaction and participation that are intended to be interpretable, both to support instructors in eventual interventions based on these features and for scientific interpretation of our findings. We then examine whether these automated models can generalize from one distinct student population to the other, in order to understand whether the same patterns of interaction are predictive of student success in both populations.

Methods

Data Sets

We analyze these issues in the context of data from NextThought, an interactive, online learning platform used to deliver online courses for a range of universities. The NextThought platform emphasizes community and social interaction around course materials, with features such as the ability to create threaded conversations and group-visible notes contextualized within pieces of content, such as videos and readings. Data on online interactions were collected from students who enrolled in an online humanities course at a large public university during the spring and summer terms of 2015. The course was enrolled in by both 143 for-credit students and 90 open students (i.e., those enrolled in the courses on a noncredit basis). These two groups of students took the course concurrently, sharing the same resources and discussion threads.

The interaction logs of the NextThought platform were distilled to produce the following nine features, grouped into five types. The same features were used to describe the behavior of both for-credit students and open students:

- *Readings*: number of times a student viewed readings
- *Forum*: number of times a student viewed a forum
- *Video*: number of times a student viewed a video
- *Comments*: number of comments a student created, number of top-level comments a student created (i.e., not replies to other student's comments), number of comments created in response to a student's original comment, and number of comments that were replies to other comments
- *Social interaction*: number of distinct students who replied to a given student and number of distinct students a given student has replied to

All of these features were included in our predictive analysis of students' final course performance. Students' final average grades were computed based on course requirements for each term. The syllabus specified performance criteria, which were set up by the instructor to be different between the two student populations. The for-credit students were told that an average grade of 0.70 was equivalent to a C letter grade. The open students were told that completing 200 points out of 350 points would result in receiving a badge. We followed the instructor's decision and used different standards of success for the two populations, as applying the same standards would imply applying a different standard to one of the groups than that group would normally have had outside the context of this study. MOOCs typically allow learners to drop multiple quizzes and have lower cutoffs for obtaining a certificate than for-credit courses. In order to authentically represent whether each student matched the instructor's expectation for successful performance, the instructor's chosen criteria were used as cutoffs in our models to determine whether students passed or failed the course: 0.70 for for-credit students and 0.57 (200 out of 350 points) for open students. Using these differing standards of success represents the authentic expectations set by the instructor for each group and reflects what typically occurs in most online courses, where MOOCs have lower standards for obtaining a certificate than for-credit courses have for passing.

Data Analysis

We use a predictive analytics/educational data mining paradigm (Romero & Ventura, 2007; Baker & Siemens, 2014) to interpret the performance of these two groups of students. Using this paradigm enables us to combine features of online interactions in more complex patterns and evaluate these patterns in terms of whether they are likely to generalize to new students, rather than in terms of whether findings falsify hypotheses within the current student population (Baker, 2015).

Within this paradigm, we develop a pair of models, one for each population, to predict whether students will pass or fail the course, according to the criterion set by the instructor. Each pass/fail prediction model was built using the J48 implementation of the C4.5 algorithm (Quinlan, 1993). In a J48 decision tree, a set of if-then choices is based on features of student interaction, culminating in a final probability of whether the student passed or failed the course. We assessed the J48 models using two metrics: Cohen's (1960) kappa and area under the receiver operating characteristic (ROC) curve (AUC) (Hanley & McNeil, 1982). Cohen's kappa assesses the degree to which our models are better than chance at predicting students' final course performance. A kappa of 0 indicates that the model performs at chance, and a kappa of 1 indicates that the model performs perfectly. For example, a kappa of 0.31 would indicate that the model is 31% better than chance. AUC is the probability that the algorithm will correctly identify whether a student will pass or fail in the online course. It is mathematically equivalent to the Wilcoxon statistic. A model with AUC of 0.5 performs at chance, and a model with AUC of 1.0 performs perfectly. Note that AUC was computed at the student level.

We built our models in RapidMiner 5.3 (Mierswa, Wurst, Klinkenberg, Scholz, & Euler, 2006). All of our models were developed using 10-fold cross-validation at the student level (i.e., models are repeatedly trained on nine groups of students and test on the 10th group of students), in order to assess how accurate the models and findings will be for new students.

Beyond simply predicting whether a student will pass or fail, we also built models to predict numerical course grades using linear regression with greedy feature selection, using RapidMiner 5.3. This algorithm repeatedly removes the worst-performing attribute until the Akaike (1973)

information criterion (AIC) no longer improves, creating simple models with reduced risk of overfitting (Das, 2008). All predictor variables were standardized using *z* scores to increase the interpretability of the resulting coefficients; note that this standardization procedure does not influence model goodness or predictive power. Model goodness is assessed using cross-validated correlations (Pearson's *r*) between the model and data, and root-mean-square error (RMSE) values. Positive cross-validated correlation indicates the relationship is consistent between the training and test data sets (but has no implication about the relationship's direction); negative cross-validated correlation indicates that the models obtained from the training data set are worse than chance when applied to new students.

Beyond testing the models for new students in their original populations, we can test the generalizability of the classification models between the open and for-credit students, building the model on one group and evaluating it on the other. In other words, models trained on the for-credit student population were tested on the open student population, and vice versa; goodness metrics were then calculated to determine how each of the models was generalizing to the new population. These tests allow us to compare the degree to which each model (and the patterns they capture) generalize across the two populations studied here. This also enables us to understand how similar the relationships being modeled are between data sets. In our case, model generalizability tests are important for determining whether the same features are predictive of student success across our two student populations, regardless of any potential preexisting group differences. For example, if a model trained on one population works on the other population, we can conclude that the factors that lead to course completion are similar between the two populations. Testing generalizability is better evidence than simply looking at whether the models have the same features, as often the exact models found are only slightly better than several alternate models, which may have different features.

Results

Descriptives

We found that the average proportion of final course grades was considerably higher for students who enrolled for the online course on a for-credit basis (M = 71.48, SD = 0.30) than students who enrolled on a noncredit basis (M = 31.61%, SD = 0.32).

Models Predicting Student Pass/Fail

In this section, we examine the overall predictive power of the J48 decision trees predicting whether a student would successfully pass the course, for both groups of students (for-credit and open). We analyze the model predictive power for new students, within group and across groups. We will interpret the features within these models in closer detail in a later section.

The J48 model for open students achieved a cross-validated AUC of 0.674 and a cross-validated kappa of 0.288. For students who enrolled for-credit, the J48 model achieved a cross-validated AUC of 0.685 and a cross-validated kappa of 0.470. These results show that both models are successful at predicting whether a student passes or fails, with the for-credit model appearing to perform slightly better than the model developed for the open student population. The finding that the for-credit student model performed better than the open student model is perhaps not unsurprising given that open courses likely attract a more diverse collection of students with a wider variety of reasons for enrolling in classes (Clow, 2013). These results suggest that our

models are capable of predicting student achievement for new students within each of our two distinct populations.

Across both of our student populations, the J48 models included the following features: the number of comments, the number of replies, the number of forum views, and the number of video views. As shown in Figure 1, the open student model also included additional features not incorporated in the for-credit student model: the number of top-level comments, number of comments created in response to a student's original comment, the number of reading views, and the number of distinct students who replied to a given student. Additionally, as shown in Figure 2, the for-credit model included the number of distinct students a given student has replied to, which was not incorporated in the open student model.

```
Number of top-level comments a student created <= 3
|   Number of times a student viewed readings <= 37: PASS (100%)
|   Number of times a student viewed readings > 37
|   |   Number of comments a student created = 0
|   |   |   Number of times a student viewed a video <= 7: PASS (100%)
|   |   |   Number of times a student viewed a video > 7
|   |   |   |   Number of times a student viewed a forum <= 10: FAIL (100%)
|   |   |   |    Number of times a student viewed a forum > 10: PASS (75%)
|   |   Number of comments a student created > 0
|   |   |   Number of distinct students who replied to student = 0: PASS (92.86%)
|   |   |   Number of distinct students who replied to student > 0: FAIL (75%)
Number of top-level comments a student created > 3
|   Number of comments created in response to a student's original comment <= 18: FAIL
(83.33%)
|   Number of comments  created in response to a student's original comment > 18
|   |   Number of comments that were replies to other comments <= 9: PASS (100%)
|   |   Number of comments that were replies to other comments > 9: FAIL  (100%)
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Figure 1. J48 decision tree predicting whether open-students pass or fail the course.

Percentages reflect the model's degree of certainty in an assessment. This tree can be read as follows (for example): If a student makes 3 or fewer top-level comments *and* views readings 37 or fewer times, the student is predicted to pass 100% of the time. But if a student makes 3 or fewer top-level comments *and* views readings more than 37 times *and* creates 0 comments *and* views videos more than 7 times *and* views forums 10 times or fewer, the student is predicted to fail 100% of the time.

```
Number of comments a student created <= 2: PASS (94.74%)
Number of comments a student created > 2
|  Number of distinct students a given student has replied to <= 2
|  |  Number of comments that were replies to other comments = 0: FAIL (88.89%)
|  |  Number of comments that were replies to other comments > 0
|  |  |  Number of times a student viewed a forum <= 14: PASS (100%)
|  |  |  Number of times a student viewed a forum > 14
|  |  |  |  Number of times a student viewed a video <= 44: FAIL (13.89%)
|  |  |  |  Number of times a student viewed a video > 44: PASS (100%)
|  Number of distinct students a given student has replied to > 2: FAIL (90.52%)
```

Figure 2. J48 decision tree predicting whether for-credit students pass or fail the course.

Model generalizability.

The J48 model trained on the open population performed considerably better than chance when tested upon new for-credit students, with an AUC of 0.745 and a kappa of 0.495. The J48 model trained on the for-credit population was well above chance when applied upon new open students, with an AUC of 0.629 and a kappa of 0.400. These numbers, on average, were reasonably close to the numbers the models achieved on their original data sets. Overall, these results suggest that the classification models trained on a single student population generalize well to the other student population, and that there are similarities between the factors associated with passing in the two populations.

Linear Regression Models

After modeling whether students passed or failed their courses, we generated models to predict numerical grades, both because these are useful in their own right and because the components of these models are typically easier to interpret than the internals of decision trees.

Individual-feature models. Our first step was to generate linear regression models for each data feature, taken individually, in order to understand how each feature correlates to student grade. We did this separately for each group of students (for-credit and open). Table 1 shows the relationship of each of the individual features with student achievement among the open students. For this group of students, each of our features was found to significantly and positively predict students' final average grades. In other words, every behavior was positively correlated with student grade.

Table 2 provides a summary of the relationship of each individual feature with student grades in the for-credit student population. For these students, as with the students taking the course on an open basis, each of our features had a positive and statistically significant relationship with student's proportion of final grades.

Features	Coefficient	Cross-validated *r*
Number of times a student viewed readings	0.143***	0.296
Number of times a student viewed a forum	0.185***	0.266
Number of times a student viewed videos	0.119***	0.308
Number of comments a student created	0.167***	0.293
Number of top-level comments a student created	0.207***	0.255
Number of comments that were replies to other comments	0.122***	0.314
Number of comments created in response to a student's original comment	0.126***	0.304
Number of distinct students who replied to a given student	0.150***	0.293
Number of distinct students a given student replied to	0.103**	0.312

Note. *$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

Table 1. Individual Feature Correlations to Student Grades Among Open Students. Coefficients Show Relationship Direction—All Relationships Were Positive.

Features	Coefficient	Cross-validated *r*
Number of times a student viewed readings	0.104***	0.314
Number of times a student viewed a forum	0.085***	0.187
Number of times a student viewed videos	0.093***	0.584
Number of comments a student created	0.180***	0.430
Number of top-level comments a student created	0.207***	0.678

Note. *$p < 0.05$. **$p < 0.01$. *** $p < 0.001$.

Table 2. Individual Feature Correlations to Student Grades Among For-Credit Students. Coefficients Show Relationship Direction—All Relationships Were Positive.

Features	Coefficient	Cross-validated *r*
Number of comments that were replies to other comments	0.135***	0.430
Number of comments created in response to a student's original comment	0.118***	0.345
Number of distinct students who replied to a given student	0.128***	0.394
Number of distinct students a given student replied to	0.132***	0.418

Note. *$p < 0.05$. **$p < 0.01$. *** $p < 0.001$.

Table 2 (cont). Individual Feature Correlations to Student Grades Among For-Credit Students. Coefficients Show Relationship Direction—All Relationships Were Positive.

Multiple-feature models. When we combined these features into a single model, the resultant model for students who enrolled on an open basis achieved a cross-validated correlation of 0.592, with an RMSE of 0.263. This value of cross-validated correlation was 0.28 higher than the best individual-feature model. Given this level of cross-validated correlation, the model is likely to generalize to new students better than chance.

Table 3 provides a summary of the best-fitting linear regression model for students who enrolled in online courses without credit.

Features	Coefficient
Number of times a student viewed a forum	0.101*
Number of distinct students who replied to a given student	0.124
Number of comments a student created	0.459***
Number of comments created in response to a student's original comment	-0.183*
Number of comments that were replies to other comments	-0.336***
Constant	0.316****

Note. *$p < 0.05$. **$p < 0.01$. *** $p < 0.001$. **** $p < 0.0001$.

Table 3. Final Linear Regression Model Predicting Average Proportions of Grades in the Open Student Population

As seen in Table 3, a multifeature model predicting final grades for the open students incorporated several features. The number of times a student viewed the forum and the number of comments a student created were positively correlated with the student's grade, when controlling for other variables in the model. This aligns with the results from the individual-feature models. However, the relationship between number of replies and the number of comments created in

response to a student's original comment to it reversed when controlling for other variables in the full model. This suggests that once we control for how much students view the forum (and interact with it), overall, replying to comments is not characteristic of successful students. This may in part be due to the presence of students who posted many irrelevant comments.

For students who enrolled on a for-credit basis, we again combined the original set of features into a single model using greedy feature selection. The resultant model of for-credit student achievement achieved a cross-validated correlation of 0.681 with an RMSE of 0.221, performing slightly better than the full model for open students. However, this multifeature model does not perform much better than the best individual model, which achieved a cross-validated correlation of 0.678. That feature alone—the number of top-level comments the student created—is very predictive, making it difficult for a combined model to perform much better. In fact, only one other feature, the number of times the student viewed readings, enters into the combined model.

Table 4 shows the best-fitting linear regression model for students who enrolled in online courses for credit.

Features	Coefficient
Number of times a student viewed readings	0.036
Number of top-level comments a student created	0.195****
Constant	0.715****

Note. *$p < 0.05$. **$p < 0.01$. *** $p < 0.001$. **** $p < 0.0001$.

Table 4. Final Linear Regression Model Predicting Average Proportions of Grades in For-Credit Student Population

Model generalization. We next applied each model to the other data set to understand whether the patterns that predict better grades in for-credit students also predict better grades in open students, and vice-versa. When we did so, we found that the multifeature models trained on the open student population performed well when tested on the population of for-credit students (correlation on a new data set = 0.573, RMSE = 0.472). Similar to this, our multifeature model trained on the for-credit student population also performed well when tested on the population of open students (correlation on a new data set = 0.638, RMSE = 0.471). The correlations remain respectable in both cases; however, there is substantial degradation in the RMSE values. This degradation is likely due to the overall higher average grades in the for-credit student population relative to the average grades of the open student population. As there were different cutoffs for passing in the two populations, it stands to reason that the students would set different goals, and therefore the same behaviors would be associated with different absolute grades (even as they were associated with the same relative grades).

Discussion and Conclusion

In this paper, we studied which factors in student interaction during an online course predict their success, using classification models to predict whether students succeed or fail, and regression models to predict students' numerical grades. One of our core goals was to investigate whether the same features predict student success within students taking the course on a for-credit

basis and students taking the course on an open (i.e., noncredit/MOOC) basis. While some of these features have emerged in previous studies, we believe that demonstrating their generality across for-credit and open students, when controlling for other aspects of course design and the instructor, makes a valuable contribution.

Taken individually, each of our features was a significant predictor of numerical grades within each student group and across both student populations. In other words, the same features were predictive in the two populations. One key finding is that features related to comments were significant predictors of final grades across open and for-credit students. This result corroborates previous findings that show a significant relationship between students' online comments and final course grades (Wang & Newlin, 2000; Wang, Newlin, & Tucker, 2001). More specifically, our results also reveal that top-level comments are associated with better course grades—even when controlling for other variables in the model. This finding generalizes across both open and for-credit learners. With the considerable amount of information in discussion forums, it becomes difficult for instructors of both open and for-credit courses to track and determine which specific types of comments best support students in their online learning (e.g., Mazzolini & Maddison, 2005). But if instructors know to focus on top-level comments, they can focus their efforts there. As such, studying the content of top-level comments may be a promising approach to evaluating what is engaging students within noncredit and for-credit courses. This result is also a first step toward identifying which aspects of the online learning experience are general across these two settings.

Within the open student population, both classification and regression models included the following features: number of times a student viewed a forum, number of distinct students who replied to a given student, number of comments a student created, number of comments created in response to a student's original comment, and number of comments that that were replies to other comments. In addition to these, the classification model for open students also incorporated the following features that were not included in the for-credit classification model: the number of times a student viewed readings, the number of times a student viewed videos, and the number of top-level comments a student created.

Within the for-credit student group, classification and regression models differed from each other. For-credit classification models incorporated the number of comments, number of distinct students a given student replied to, number of forum views, number of replies, and number of video views. By contrast, only the number of reading views and the number of top-level comments were included in the regression model. This finding suggests that the factors important for classifying whether for-credit students pass or fail were not necessarily the same as the predictive factors for finer-grained outcomes of student achievement. In particular, features related to videos, forums, comments, and social interaction are predictive of students' success or failure, while the combination of features related to readings and a certain type of comment is predictive of students' proportions of final grades.

All models performed well at predicting student grades or pass–fail status within both populations. Their performance was slightly better for the for-credit students for both types of models. The ability to predict student achievement from automated models of student online interactions has potential implications for educational interventions. As our findings indicate that our predictive models of students' success or failure can be applied to new students, this creates the possibility of early remediation for students who are struggling (Arnold & Pistilli, 2012). By identifying struggling students early, instructors can monitor their students' needs and provide

scaffolding before these students fall too far behind. However, as the models were not perfect, there is still a possibility of classifying students in the wrong category, suggesting that these models should be used with "fail-soft interventions," where there are limited risks associated with a student incorrectly receiving an intervention. An example of this is seen in Course Signals, an early warning system that triggers interventions designed by instructors to help students at risk of failing the course. While the interventions are recommended by an automated algorithm, they are mediated by instructors who make the final decision on whether to send a message and how to tailor it based on what they know about that specific student. In general, initial results show that the intervention was associated with higher student performance and retention, and that students who receive the intervention feel that instructors care about them (Pistilli & Arnold, 2010; Arnold & Pistilli, 2012). A similar approach was adopted by Jayaprakash, Moody, Lauría, Regan, and Baron (2014), who send instructors notifications about at-risk students and scaffold the instructors in sending struggling students emails regarding consultation hours, web-based resources on online tutoring tools, or additional practice exercises for the course materials—resulting in higher final grades than students in a control group across multiple universities. Each of these systems mitigates the risk of incorrect classification by putting the control over intervention in the instructor's hands, and by scaffolding intervention strategies with low risk of harm even when given to students who ultimately do not need intervention.

In the specific case of this course, our results show a positive relationship between top-level comments and student outcomes. NextThought affords instructors multiple opportunities for facilitating the student's creation of top-level posts. For example, by posting conversation prompts within the discussion margins of the course content, instructors can provide a model for top-level comments that students can replicate. These prompts help raise the visibility of course materials that are worthy of reflection and comments. In addition, instructors can encourage students to produce top-level comments by incorporating thought questions within nongraded reading assignments. These questions, accompanied by an invitation to post reflections in the discussion margins, provide a framework for generating top-level student comments within the course forums. Finally, when posting at the top level, students can also be encouraged to consider making comments rather than posting questions, as questions encourage responses to the original post instead of promoting other top-level comments.

More broadly, these results also have potential implications for supporting student success in universities that offer courses like this one. Given our findings, it may be valuable for course instructors to message inactive students and encourage them to start new discussion threads within forums. Sending course-related reminders may be a useful instructional strategy, as students generally respond positively to these types of emails and messages (cf. Arnold & Pistilli, 2014). Based on work by Belcher, Hall, Kelley, and Pressey (2015), another way instructors can encourage students to become thread starters is to praise them for posting a top-level comment and to summarize the content of these posts within the thread. These strategies could potentially motivate students to initiate top-level comments and think more critically about them, as they know their top-level posts will be attended to by the instructor. These instructor behaviors have also been found to promote higher levels of critical thinking within peer interactions (Belcher et al., 2015).

Models predicting student success and grade used many of the same features across both for-credit and open students. Beyond that, a model built for each group of students functioned effectively for the other group of students. As such, this result indicates that the same factors predict course completion even in different groups of students who have enrolled either on a for-

credit or noncredit basis. While these two studies likely differ in their motivations, the same factors are associated with completion in both. The relationship between interaction behaviors and success is similar for these two distinct populations of students, in terms of patterns and combinations of features as well as individual features. This finding, in turn, has implications for synthesizing literature on MOOCs and for-credit courses, which have largely been treated by researchers as disparate bodies of work. Our results suggest that many of the expanding body of findings on success in MOOC courses may be relevant to for-credit online courses, a useful finding given the much larger samples of students available in many open courses (if not in the specific course studied here).

In considering these findings, it is essential to note their limitations. One key limitation is that the research presented here was conducted in a single online course, with both for-credit and open learners, a somewhat unusual arrangement (though characteristic of the NextThought platform).

The sample of students was typical for for-credit courses but was smaller than the sample seen in many xMOOCs offered by the largest MOOC vendors, such as edX, Coursera, and FutureLearn. However, not all MOOCs are xMOOCs. In particular, the original use of the term MOOC referred to connectivist MOOCs (cMOOCs), whose design is based more on student-to-student communication, definition of questions, and selection of resources (McAuley, Stewart, Siemens, & Cormier, 2010). While the course studied here is not a cMOOC per se, it shares with cMOOCs the strong focus on student-to-student communication. It is common for cMOOCs to have sizes more comparable to what is seen in this study, rather than the massive sizes seen in xMOOCs from the largest providers. However, this specific atypicality does limit our ability to generalize our findings somewhat. As in the case with most MOOC studies, findings from a specific course are often difficult to generalize beyond the local context. For instance, while for-credit and open learners were treated as discrete sets of learners, not all online courses will necessarily apply the same categorization. With the rise of MicroMasters, students who initially enroll in a MOOC can also pursue and eventually earn a master's degree. As such, future work is recommended to test whether these models remain valid when extended to a wider sample of learners, as well as to a broader range of MOOCs. Despite these limitations, the findings from our automated models provide information on which factors of student online interactions promote achievement and learning. Additionally, our study shows which findings validated for different groups of students within the current course, and which can be replicated across additional courses. By better understanding the factors in student interaction (whether in for-credit or open courses) that are associated with greater success, we can design interventions that instructors can use to nudge students to better learning trajectories and better outcomes.

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Customizable Modalities for Individualized Learning: Examining Patterns of Engagement in Dual-Layer MOOCs

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Abstract
Dual-layer MOOCs are an educational framework designed to create customizable modality pathways through a learning experience. The basic premise is to design two framework choices through a course: one that is instructor centered and the other that is student determined and open. Learners have the option to create their own customized pathway by choosing or combining both modalities as they see fit at any given time in the course. This exploratory mixed-methods study sought to understand the patterns that learners engaged in during a course designed with this pathway framework. The results of the quantitative examination of the course activity are presented, as well as the categories and themes that arose from the qualitative research. The results of the analysis indicate that learners value the ability to choose the pathway that they engage the course in. Additional research is needed to improve the technical and design aspects of the framework.

Keywords: MOOCs, personalized learning, engagement, learning pathways

Crosslin, M., Dellinger, J.T., Joksimović, S., Kovanović, V., & Gašević, D. (2018). Customizable modalities for individualized learning: Examining patterns of engagement in dual-layer MOOCs. *Online Learning, 22*(1), 19-38. doi:10.24059/olj.v22i1.1080

Customizable Modalities for Individualized Learning: Examining Patterns of Engagement in Dual-Layer MOOCs

Various approaches have been undertaken in Massive Open Online Courses (MOOCs) to transfer control over the learning experience to MOOC participants in a manner that allows these participants to create a personal learning pathway. A dual-layer MOOC design is one approach that involves creating two complete and complementary learning pathway "layers" for the course, with each pathway focusing on different epistemological modalities. The intent is to allow MOOC

participants to navigate the course in a way that best suits their particular learning interests by utilizing one modality, both modalities, or a custom combination of either modality at different time frames in the course. Following any pathway through the course would count as completing the course. A dual-layer MOOC might have an instructor-centered modality focused on traditional content delivery and discussion paired with a student-driven modality focused on networked and social learning. This study investigates the experiences of participants in the Data, Analytics, and Learning MOOC (DALMOOC), a course delivered with edX in fall 2014. Using a mixed-methods approach, shown to be preferred in MOOC research (Gašević, Joksimović, Kovanović, & Siemens, 2014), course participant patterns of engagement were analyzed to investigate the differences between participation strategies, as well as to identify participants that utilized different pathways through the course. After initial quantitative analysis of course participation activities, a subset of participants were invited to answer a set of follow-up open-ended survey questions in order to provide more depth to the analysis of their patterns of engagement. Additionally, online discussion postings and social media activity during DALMOOC were analyzed. The main goal of this study is to examine differences in participation strategies across both course modalities as well as to utilize study findings to refine, improve, and focus future research and design of the dual-layer model of MOOCs.

Background

Dual-layer MOOCs have their genesis in the two main frameworks that arose from the different delivery approaches that have shaped MOOC growth over the past 10 years. The first framework is connectivism, which arose at about the same time as the first MOOC. In fact, the original course (to later be labeled as a MOOC) was initially designed to be offered online covering the emerging theory of connectivism (Fini, 2009).

Connectivism is a theory of learning proposed by George Siemens and Stephen Downes to address complexities in the learning process that existing theories did not fully address. According to Siemens (2005),

> connectivism is the integration of principles explored by chaos, network, and complexity and self-organization theories. Learning is a process that occurs within nebulous environments of shifting core elements—not entirely under the control of the individual. Learning (defined as actionable knowledge) can reside outside of ourselves (within an organization or a database), is focused on connecting specialized information sets, and the connections that enable us to learn more are more important than our current state of knowing. (p. 6)

Connectivism is a student-driven learning framework in that it views learners as a node in a network of learning connections, with each connection and node being of equal value and power in the overall design of learning (Siemens, 2005).

In order to explore the possibilities of connectivism, Siemens and Downes offered an open online course called Connectivism and Connective Knowledge (CCK08). Since this course was offered to anyone that wanted to register, the total number of participants swelled to well over 2,300 (Rodriguez, 2012). The success of CCK08 led Dave Cormier to coin the term *Massive Open Online Course* in order to later describe the course (Dabbagh et al., 2016). For the following few years, most MOOCs were connectivist in nature (Daniel, 2012).

In 2011, Stanford University offered a different form of MOOC. A group of popular courses were to be offered online with open registration. One of the most popular ones was the Artificial Intelligence course with over 160,000 learners registered (Cabiria, 2012). Soon, hundreds of courses were offered based on the model that Stanford had implemented. Initially, Siemens viewed these courses with optimism, saying, "I love this! Stanford University Artificial Intelligence is being offered as an open online course" (Siemens, 2011, para. 1). However, it was soon noted that a distinct power dynamic informed the design of these courses (Anders, 2015; Daniel, 2012; Rodriguez, 2012). These new forms of MOOC were more focused on the instructor rather than the networked learner and involved watching videos and taking computer-graded tests over social interactions and collaborative knowledge building.

These new MOOCs were based on a broad framework of learning design called *instructivism*. According to Porcaro (2011), "instructivists, whether behaviorist or cognitivist, are ontologically objectivist and realist, and epistemologically empiricist…. They see learning as simply mapping the real, external world onto the minds or behaviors of the student" (p. 41). Instructivism can cover a wide range of instructional strategies, from information transfer to class discussions. The main focus of instructivism is that the teacher is in control of the course, including content to be covered, learning activities to be engaged in, and the final assessment of learner performance. These two frameworks, instructivist and connectivist, informed the design and delivery of the dual-layer DALMOOC.

In order to differentiate between the original form of connectivist MOOC and the newer form of instructivist MOOC, Downes coined the terms *cMOOC* and *xMOOC* (Kovanović, Joksimović, Gašević, Siemens, & Hatala, 2015). Connectivist MOOCs were labeled cMOOCs, while the more instructivist MOOCs were labeled xMOOCs, meaning "MOOC as eXtension of something else" (Downes, 2013a, para. 5). Stephen Downes differentiates between the two by stating that a "cMOOC is designed as a network…while an xMOOC is based on a central course site and content that will be followed by all students" (Downes, 2013b, para. 25).

In 2014, a MOOC on learning analytics was offered in the edX learning management system. As its name implies, edX is closely aligned with the MOOCs that some label as xMOOCs. A team meeting of over 20 people was held at the University of Texas at Arlington to design the Data Analytics and Learning MOOC (DALMOOC). At the meeting for this team (dubbed a *DesignJam*), the decision was made to mix cMOOC and xMOOC modalities in a manner that would support both frameworks. The dual-layer model emerged out of the work of this team.

The dual-layer model is based on several structural considerations. The main consideration is that learners can choose their preferred framework, instructivist or connectivist, at any point in the course (Crosslin & Dellinger, 2015). This is an expansion of the recent work in personalized learning that allows learners to choose their learning pathway rather than the instructor (Reddy et al., 2015) or technology (Lin, Yeh, Hung, & Chang, 2013). The second consideration was that the transition between these frameworks would be well described in a visual syllabus and supported through various centralized and distributed technologies and digital spaces (Crosslin & Dellinger, 2015). The visual syllabus is based on the idea of using a graphic representation of the course in order to assist learners with grasping the course concepts, similar to work by Nilson (2009) and Biktimirov and Nilson (2003). Finally, any personalized pathway that learners chose during the course would count as a valid approach to completing the course (Crosslin & Dellinger, 2015). This is an expansion of the work by Bell (2011) and Calvani (2009), which examines how different theories of learning have different uses at different times for different learners in different contexts.

In support of these considerations, several tools and design strategies were utilized to support learners in the course. The first strategy was to introduce a course metaphor to help learners understand the modality choices available to them in the course. The metaphor chosen for DALMOOC was based on the movie *The Matrix*, with a "blue pill" visual cue assigned to the traditional instructivist modality and a "red pill" visual cue assigned to the nontraditional connectivist modality. The second strategy was to create a visual syllabus that included these visual cues as well as graphic maps and charts to explain the course tools and structure. The third was to focus the course content on a set of open-ended competencies in order to give learners greater flexibility in navigating course structure.

Several different technologies were utilized to support both frameworks in DALMOOC. The instructivist modality was supported in the edX learning management system, with videos, content, and discussion forums specifically designed to guide learners through the recommended instructor content. The connectivist modality was supported by ProSolo, a competency-based networking tool that connects learners with each other and social networks like Twitter, enabling learners to create their own connections and competencies. Weekly Hangouts were organized by the course instructors, who also actively engaged with social media (mostly on Twitter, but some activity occurred on Facebook and a Google Group) and the edX discussion forums. Likewise, the course instructors encouraged the course participants to write blog posts about what they learned in or about the course. Additionally, instructors added three tools in the edX learning management system to help learners navigate the course content. First, QuickHelper is a discussion tool that analyzes forum-post content in order to connect learners with questions to learners who would have the answers. Second, Bazaar (https://www.cs.cmu.edu/~cprose/Bazaar.html) is a real-time communication tool that pairs learners into small groups and then leads them through a guided discussion script written to help them learn the content for that week. Finally, instructors embedded an intelligent tutoring system, authored with Cognitive Tutor Authoring Tools (CTAT) (Aleven et al., 2015), into the edX platform through the use of the IMS Learning Tools Interoperability (LTI) specification. This CTAT-based tutor supported activities related to predictive modeling in Weeks 5 and 6 of the course.

Problem Statement

While there have been a few studies on DALMOOC (Dawson, Joksimović, Kovanović, Gašević, & Siemens, 2015; Rose et al, 2015; Crosslin & Dellinger, 2015) looking at the different aspects of student engagement, the researchers identified a need for more research into the participant experiences in DALMOOC through a lens of learner engagement. Previous studies examined data that the learners left behind in the course, but none of these studies questioned learners after the conclusion of the course in order to determine their opinions about how they engaged with the course or why they chose those patterns. Therefore, the gap in knowledge that was identified was the lack of insight into learners' opinions about why they chose the patterns that they engaged with in the course content and activities.

Methods

This study analyzes the activity of the learners in the tools that they utilized in DALMOOC. Additionally, several DALMOOC participants were selected to provide additional data via open-ended survey questions in order to gain deeper insight into their course activities and motivations. To accomplish these research objectives, this study examines the patterns of engagement and

participant experiences in the 2014 DALMOOC. The study focused on participants that utilized both edX and ProSolo platforms. The research questions for this study are the following:

1. How long did participants engage in DALMOOC?
    a. How much time did they engage with the content through the completion of assignments/competencies?
    b. How much time did they spend watching videos?
2. Of the MOOC participants who logged into the edX platform, how many also utilized ProSolo?
    a. How much time did they spend in one platform versus the other?
    b. How many chose to utilize both platforms?
3. What were participants' experiences with and thoughts on the customizable pathways through the DALMOOC?
4. In what ways would participants refine, improve, and change the design of dual-layer MOOC models?

Participants

DALMOOC attracted more than 23,000 participants from around the world with various professional and cultural backgrounds. There was no cost to participate in the MOOC. Participants in this study certified that they were all over the age of 18 and were informed that their participation would be part of a research project. The course design was open to all registered participants, meaning that anyone who registered could see posted work and communication. Participants did not earn formal credit for completion of the course, and grades were not assigned. To receive a certificate of completion, participants were required to complete 70% of the 26 competencies available in the course.

Instrumentation and Data Sources

This mixed-methods study had two phases. Since the first phase focuses on quantitative data while the second phase collects qualitative data, this study is categorized as an exploratory mixed-methods research design (Creswell, 2011). The first phase analyzed stored data from the MOOC to quantitatively identify weekly (Monday–Sunday) patterns of engagement by users that participated in both pathways, as well as their social media engagement patterns. This analysis included general course and participant counts of completed assignments/competencies, logins, videos watched (split into quartiles), mean/average time active in the edX and ProSolo platforms, and counting and examining participant social media posts. ProSolo allowed course participants to link their Twitter account with their ProSolo account, which then aggregated their tweets in a manner that allowed other participants to read them. Likewise, through the use of syndicated web feeds (also known as RSS), ProSolo aggregated the participants' blogs, which were then shared with others through daily digests. These daily digests mirrored the functionality of an RSS aggregator called gRSShopper, which was developed by Stephen Downes and used in early cMOOCs. Python, R, and the igraph library in R were used to complete the analysis. The second phase identified 10–30 potential qualitative opportunities from disaggregated data by identifying MOOC participants that had varying participation patterns. Then the phase concluded by asking structured qualitative questions of the chosen participants about their use of social media and overall course engagement. Open-ended questions were administered through an online form in Qualtrics. A total of 12 MOOC participants completed the online questions. Survey participants

were assigned pseudonyms to insure anonymity. None of the responses from the 12 participants were discarded.

Procedure

The first phase also consisted of descriptive analyses of selected statistics from the DALMOOC. Due to the open nature of the course, this study utilized convenience sampling by analyzing data from all registered learners in the first stage and then questioned all participants that self-selected to participate in the second phase. Data gathered from the open-ended questions in the second stage were coded for emerging patterns and themes using a content analysis approach. Content analysis was selected because it is a controlled analysis of text within the context that the text was originally communicated in, thereby preserving some of the advantages of quantitative content analysis from communication science (Mayring, 2000). Additionally, because theory and knowledge of the relationship between engagement and individualized learning in MOOCs is very limited, classical (or conventional) content analysis was conducted with the goal of inductive category development (Hsieh & Shannon, 2005; Mayring, 2000). For content analysis in this study, researchers utilized etic coding in order to identify categories and themes, which were then used to answer the research questions. Etic coding was selected because the researchers wanted to connect the new setting of a dual-layer MOOC to the existing theoretical frameworks of connectivism and instructivism. According to Lett (1990), "Etic constructs are accounts, descriptions, and analyses expressed in terms of the conceptual schemes and categories regarded as meaningful and appropriate by the community of scientific observers" (p. 130). Two of the researchers coded the categories and themes separately and then compared their codings for agreement. Finally, the questions also included constant-comparative analysis (Miles & Huberman, 1994; Strauss & Corbin, 1990) while developing a more detailed discourse analysis to examine trends and themes within and across the data set.

Results

The data for this study comes from DALMOOC, offered from October 20, 2014, through December 22, 2014. This 9-week course focused on an introduction to learning analytics methods and approaches, including the general learning analytics data cycle, social network analysis, text mining, and predictive modeling. The different pathways offered in the course were not completely separated. Competencies completed in ProSolo were submitted to edX. Similarly, in Weeks 5 and 6, ProSolo users logged in with their edX accounts for learning activities with the CTAT-based tutor, as the version of ProSolo at the time did not support IMS LTI integration, and access to the CTAT-based tutor was only possible through the edX platform.

Course Participation

The course attracted 23,330 participants, with 13,535 showing any sign of activity in the course (e.g., watching a video or submitting a competence). In the first week, 6,993 and 1,025 participants were active in edX and ProSolo, respectively (see Figure 1 and Figure 2). Participants were considered active when they performed any activity (e.g., viewed a video, posted a message, created a competency) within a given week. As typical in MOOCs, the participation rate dropped significantly in the first few of weeks, with around 1,400 participants being active in edX from Week 6 onward (Figure 1). A similar pattern was observed in ProSolo, with around 60 participants being active from Week 7 onward (Figure 2).

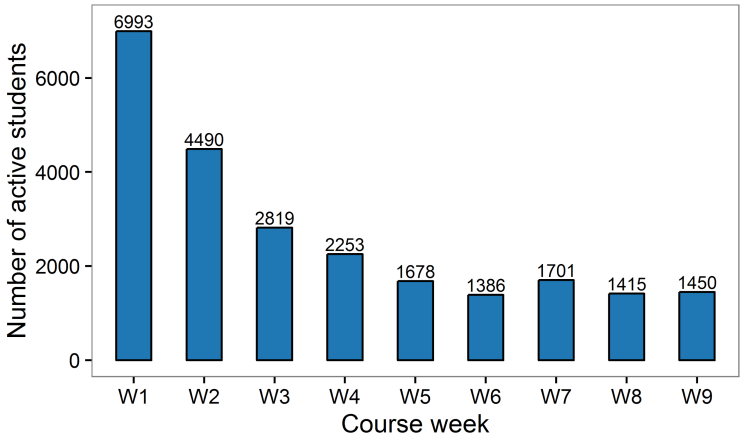

Figure 1. Number of active edX participants per week.

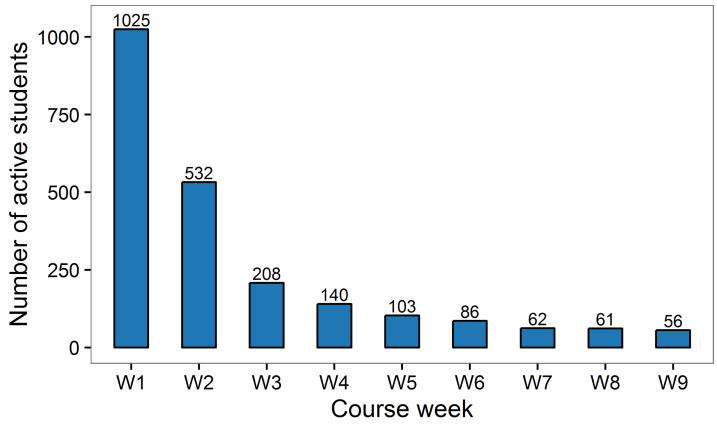

Figure 2. Number of active ProSolo participants per week.

One of the most interesting groups that emerged in this study were those who were active in both platforms over the whole or some segment of the course. Figure 3 shows the number of participants per week who used both platforms. As Figure 3 demonstrates, most of the ProSolo participants also used the edX platform, which was in large part due to how the course was structured.

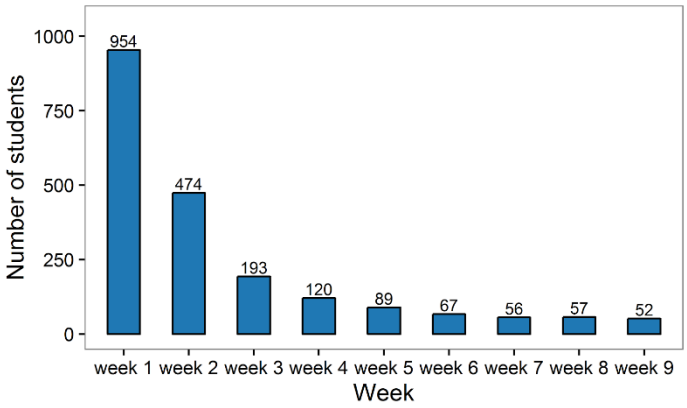

Figure 3. Number of participants active in both platforms per week.

Also of interest is the percentage of active participants in both of the learning platforms (as represented in Figure 4 and 5). Originally, ProSolo had a higher percentage of active participants than edX (Figure 4). However, ProSolo weekly attrition rates were higher than in edX, which can be explained, at least to some extent, by the availability of the CTAT intelligent tutor exclusively in edX. However, the percentage of active participants from the previous week (Figure 5) after the initial drop increases steadily from Week 3 onward. This suggests that attrition rates got lower and lower, and that there were populations of participants who regularly accessed both edX and ProSolo platforms.

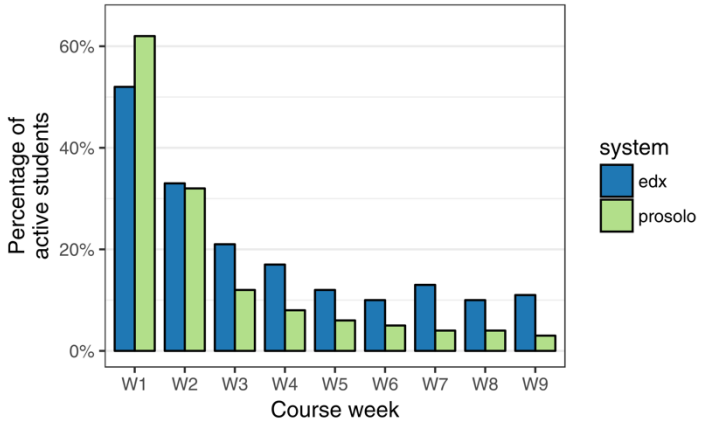

Figure 4. Percentage of active participants each week for edX and ProSolo platforms of the DALMOOC.

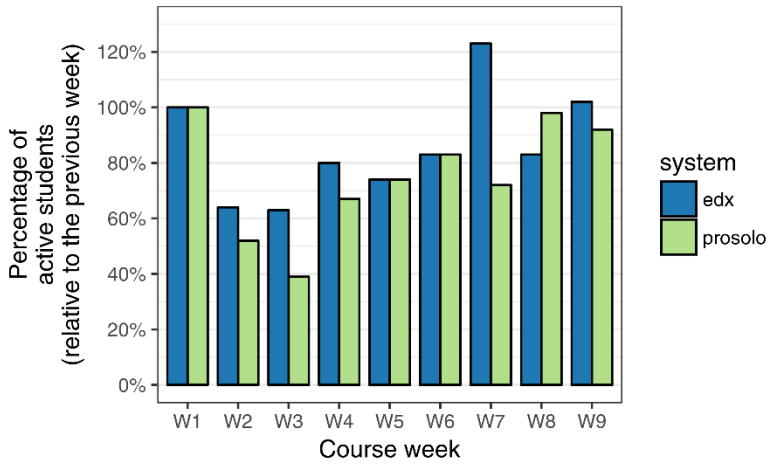

Figure 5. Percentage of active participants calculated from the previous week.

Figure 6 further depicts participant participation patterns. In line with general trends observed in the available MOOC literature (Kizilcec, Piech, & Schneider, 2013), participants tended to be less active as the course progressed. However, although the total number of active participants constantly dropped, it is indicative that the general pattern of participation remained the same. Specifically, the ratio between the number of participants who were engaged for one, two, or more days within a week remained mostly the same throughout the course. Within the first few weeks of the offering, the majority of participants engaged only during a single day in a week, with very few participants engaged for more than four days. Here, participants were considered active if they performed any activity (e.g., watching a video, posting to a discussion forum).

Toward the end of the course, there were no participants actively engaged with the course content for more than three days in a week.

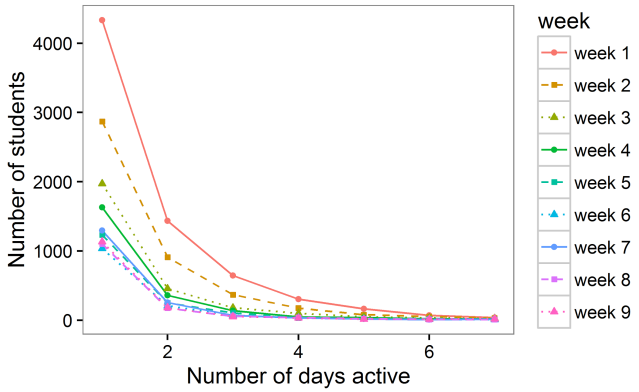

Figure 6. Number of participants with number of days they were active within every course week.

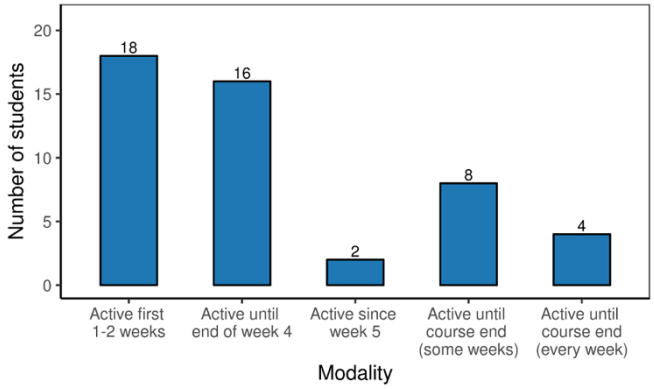

Figure 7. Number of participants within different modalities of engagements.

Besides the general description of participant engagement patterns, this study also sought to discover different modalities of participation for those who engaged with both platforms (Figure 7). The largest number of participants (18) were active for only one or two weeks, or for the first four weeks of the course (16). Only four participants were active on both platforms every week until the end of the course, while eight were active more sporadically until the end of the course. Finally, two participants were active on both platforms since the middle of the course (start of Week 5) until the course end. From these numbers, it is likely that largest two groups of participants active within both platforms represent course participants who aimed at investigating the advantages of different course modes (i.e., cMOOC vs. xMOOC). Specifically, it is likely that these two groups of participants were primarily interested in investigating features of both platforms before choosing one or the other for the remainder of the course (or dropping the course).

Open-Ended Question Coding Results

The qualitative research phase involved asking a series of 13 structured questions. The responses to these questions were coded for categories and themes. The categories that emerged are explained in Table 1. Some of the more important categories to note are that participants

generally noted a positive experience in the course, that many participants recognized the benefits of the choices that the dual-layer model afforded, and that many diverse pathways were noted for a large number of reasons. However, many participants were also forthcoming with how the course or design could be improved. Many of the categories fell into these areas, which led to the themes that emerged during analysis. These themes are explained in the next section.

Categories	Supporting statements
Question 1: *Can you tell me about your overall experience in the DALMOOC?*	
Interest in the dual-layer design	"the novel combination of the two kinds of MOOCs that thrilled me" (Taylor) "I was very interested in the dual-layer approach at first" (Landry)
Importance of instructor/peer interaction in course	"I also loved the hangouts and when instructors interacted through social media" (Charlie) "The greatly motivating engagement of the facilitators enabled me to gain a deep impression of how advanced this field is already" (Taylor)
Majority expressed some type of positive experience	"This MOOC ranks at the top among the very best experiences" (Parker) "It was a great experience that I enjoyed very much - it was one of my favourite MOOCs" (Jordan) "To sum up, DALMOOC course was a great experience" (Charlie)
Problems or frustrations with design/functionality of course design and tools	"I do like the approach, but it simply felt like too many hoops at times" (Landry) "At first, I felt overwhelmed and I also found ProSolo difficult to manage, but the video tutorials [for the use of ProSolo] helped me a lot" (Charlie)
Question 2: *What was your impression of the red-pill/blue-pill metaphor?*	
Most found metaphor helpful	"It was a fine pop-culture metaphor" (Landry) "The metaphor made sense to me" (Casey) "The metaphor helped me to understand the course structure" (Charlie)
Those that didn't find it helpful were confused over meaning of metaphor	"Not being a movie-goer, I had to ask colleagues, and then I thought it fits" (Taylor) "I don't recall it being used elsewhere, so it was lost to me" (Parker)
Question 3: *Can you describe your pattern of engagement in this course (how much you used the red-pill ProSolo pathway versus the blue-pill edX pathway)?*	
Most participants attempted both pathways	"I would start with the blue pill to simply see the content.... After that I would go learn on my own and tinker" (Landry) "I used both pathways" (Charlie) "50/50" (Emery)

Preference for blue-pill layer due mostly to not understanding ProSolo	"I must admit, I never really found out how to fully utilize the feedback system of ProSolo" (Morgan) "My first impression was that ProSolo wasn't very intuitive when I tried to find the same contents of a week as in edX" (Jordan)
Technical problems with ProSolo and integrated tools	"I found the interface somewhat limiting" (Parker) "there were some bugs and so I had to use the edX platform to use discussion forum" (Charlie)
Some preferred to start in edX and progress to ProSolo	"after a while I've got to use more ProSolo because I didn't understand how to operate on it at first.... after a while I became more enthusiast of ProSolo" (Hayden) "I would start with the blue pill to simply see the content, to check my own understanding, and then see what I could do in ProSolo to demonstrate competencies/etc." (Landry)

Question 4: *What was your rationale for using the pathway that you choose?*

Likes safe, familiar, manageable linear pathway	"the edX pathway was more familiar and offered more privacy" (Jessie); "I took the pathway I knew best (edX) and with which I already had good experiences before" (Jordan) "sometimes it was due to time, where I would simply do what was outlined in edX to move through the week quickly" (Landry)
Tended to start in edX but ventured into ProSolo if time allowed	"when I saw something that didn't interest me in edX, I would see what I could do instead in ProSolo…. if I had more time, ProSolo and self-directed activities" (Landry) "Get experience with both and take full advantage of the course"(Emery)
Liked self-guided, social, exploratory connectivist pathway	"I also like to interact with other students and search for people that share the same interests" (Charlie) "As a self-driven learner/researcher, I find the idea of creating peer-groups to spur on my studies fantastic" (Parker)

Question 5: *What was your rationale for not utilizing a different pathway?*

Unclear expectations and structure in the course	"I did not understand much of the educational terminology used at the beginning of the course" (Jessie) "It was confusing and difficult for me to keep track of my progress" (Casey) "Time and unclear expectations for how my own work would actually be viewed as contributing to the 'grades' of the course" (Landry)
Took too much time or effort to figure out new tools or structure	"This was far beyond my ability at the time" (Jessie); "using multiple websites can be time-consuming" (Hayden) "It's difficult to filter what is valuable from what is not" (Hayden)

Question 6: *What might be a reason or reasons a course designer/instructor would want to utilize multiple pathways?*	
Modality choice is helpful to address different learner preferences	"different types of students might learn more in different settings" (Jessie) "some learners might be experienced self learners, others might need the feel of an active (small?) community - in our MOOC, the community in ProSolo was much smaller" (Jordan) "I think it was a good way to create my own experience" (Charlie)
Question 7: *What might be a reason or reasons a course designer/instructor wouldn't want to utilize multiple pathways?*	
A theoretical reason might be that teachers prefer linear modality for control	"the instructors prefer that students can be guided through a linear path of material" (Charlie) "if the instructor has a standardized, orderly, old-fashioned comprehension of what teaching should be, then only one path for everyone might be useful" (Hayden)
A theoretical reason might be that due to context, other paths could be better in specific cases	"it could be bring the students out of their comfort zone or simply if the instructors have a specific view on optimum learning" (Morgan) "learners who just want to take the course in order to learn the topic might be extra stressed when they don't understand the pathway logic (and don't care about it) and spend a lot of time searching" (Jordan)
Question 8: *What learning strategies, personal feedback, or motivational techniques did you utilize while participating in this course?*	
Instructor and social presence helped, especially on social media	"I was very impressed with the excellent engagement of all course facilitators - that (and fellow students) made the difference for me to stay on course even in difficult weeks" (Jordan) "Twitter helped, and the hangouts were good when I could view them" (Landry)
Personal learning goals of higher achieving students increased motivation	"My initial motivation was intrinsic (interest in the topic Learning Analytics).... After some weeks when I had the impression that the course level of difficulty was o.k. for me, I decided to do the assignments in order to get the edX Honor Code certificate" (Jordan) "the main motivation probably is to think how learning this is feeding my identity as a lifelong learner" (Hayden)
Question 9: *Do you feel that you have a higher or lower level of control over your learning strategies, personal feedback, and motivational techniques? What rationale do you have for your rating?*	
Self-regulation improves learning experience due to background, interest, and desire for autonomy	"in all MOOCs I feel that I have a lot of control over my learning strategies, personal feedback and motivational techniques" (Jessie) "I have the impression that I have a high level of control over my learning strategies etc. due to my profession" (Jordan)

Other participants wanted more guidance, feedback, motivation, etc. from instructor/course	"I do sorely lack in motivational techniques for additional learning, such as MOOCs" (Landry); "I feel I have a higher level of control but at the same time I was looking for some feedback of my understanding" (Morgan) "It seems to me that ProSolo helps to relieve the learning from this, as I perceive them, limiting factors" (Hayden)

Question 10: *In what ways did the dual-layer design of the course (including videos, tools, flow, activities, etc.) influence your learning strategies, personal feedback, or motivational techniques?*

Participants were able to pick most meaningful path	"because of this structure, the MOOC became deeper in meaning (not just another MOOC), the live feeling was more powerful, the hard work and excellent engagement of the facilitators was very visible" (Jordan) "although I preferred to use the edX environment as my primary pathway, I liked exploring the ProSolo environment and sometimes found helpful content there" (Jessie)
Layer choice allowed for flexibility, self-regulation, and modality opportunities	"I really enjoyed the way that I could choose the path and tools to enhance my learning" (Charlie); "it was like a bouquet of opportunities" (Morgan) "I was allowed to pick as much as I wanted, so my strategy was supported" (Taylor)

Question 11: *In what ways did your learning strategies, personal feedback, or motivational techniques affect the layer of the course that you choose?*

Interested in collaborating with others that share interests	"I like to interact with other students and search for people that share the same interests" (Charlie) "I loved it and enjoyed finding the work of others who participated in a similar manner" (Parker)
Wanted learning pathway tailored to personal preferences	"I prefer a more structured approach so that is why I was most comfortable with the edX pathway" (Casey) "I love to read and search for other references in sites, blogs, MOOCs and so on" (Charlie) "I want to reduce the cognitive workload, the multitasking, and the information overload, no matter if I lose understanding in the process of the topics.... I believe that the traditional path provides this" (Hayden)

Question 12: *In what ways did the design of the course (including videos, tools, flow, activities, etc.) affect which layer of the course that you choose?*

Course design worked better for some more than others	"some social activities were too much skewed towards the rapid end of the spectrum, and so I adapted my engagement to reduce this activity" (Taylor) "since I did both, I got the most of these materials available to my learning" (Emery)
External or technical issues affected coursework	"unfortunately (mainly due to time reasons) I didn't use the ProSolo functions to connect with others and only wrote some status updates" (Jordan) "the videos were too demanding, so I was able to skip it" (Taylor)

Question 13: *What else would you like to share that would be useful?*	
Interesting, great course experience	"DALMOOC was a very interesting learning experience" (Jessie) "it was a great learning experience" (Charlie) "the idea of a final concept map project was inspired" (Jessie)
Technical or design difficulties with ProSolo, Google Hangouts, and social connections	"unfortunately (mainly due to time reasons) I didn't use the ProSolo functions to connect with others and only wrote some status updates" (Jordan) "the videos were too demanding, so I was able to skip it" (Taylor)
Suggestions for improvements	"the daily digest didn't seem to appear very often" (Jessie) "better documentation and stability of ProSolo" (Landry) "ProSolo is a project I would like to use in the future, but more work needs to be done to bring the interaction to a level capable of meeting the needs of diverse learners" (Parker)

Table 1. Open-Ended Question Coding Results

Emerging Qualitative Themes

The preceding categories were analyzed through content analysis for similarities and synthesized into emerging themes. The two themes that were identified were "learners like customizable pathways that allow personal preferences, but this introduces time-consuming complexity" and "in order to support personal preferences, learners need scaffolding, as well as a course that is free from design or technical difficulties." A few categories did not fit into either of these themes but did not form a cohesive theme of their own.

The first theme includes participants that preferred the instructivist modality, the connectivist modality, or a mixture of both. Participants in general expressed appreciation for the ability to utilize their preferred modality, even if they seemed confused about the general structure of modality choice. In general, most were aware of the choices available to them and were thankful for the ability to make that choice. However, most participants were also aware of the additional time required to understand and make modality choices. This is an important learning design consideration that should be taken into account in customizable modality pathway design.

The second theme is closely connected to the first theme. The additional time that is introduced into modality choice is connected to dealing with design or technical limitations, or to participants scaffolding themselves by learning about considerations specific to each modality. However, these time issues do not have to be left completely up to the participants to overcome. As the discussion section will explore, there are many ways that course designers and instructors can work to leverage both of the themes uncovered in this analysis to improve the design of customizable modality pathway courses in a manner that improves the overall course experience for learners.

Discussion

At the time of its offering, DALMOOC provided participants a unique experience through the use of a dual-layer framework. Setting up the modules in a way that allows participants to choose their path through a course raises interesting implications for learning theory, design, and analytics. Some implications that need examination include

1. how instructivist and connectivist approaches coexist in the same learning space (e.g., an online course);
2. how learners interact with peers, content, and instructors/facilitators in a space that utilizes both approaches;
3. how learners choose to navigate a relatively free space that also includes a traditional, instructor-led pathway;
4. how to best scaffold courses using a dual-layer framework to elucidate the notion of customizable modalities without simultaneously overwhelming learners;
5. how different personal backgrounds inform selected pathways;
6. how to encourage learners to take ownership of how they learn;
7. how to integrate different approaches and tools in one space without creating excessive limitations;
8. how to develop the process of collecting, measuring, analyzing, and reporting data in this framework; and
9. how to use data to provide real-time and/or targeted, personalized feedback. A number of these implications are addressed by the results of this study, which provide valuable insight into the four research questions.

Regarding the first and second research questions (the length of engagement and the number of learners who spent time in both platforms), DALMOOC followed similar trends of MOOCs regarding the decline in participation over the length of the course (Onah, Sinclair, & Boyatt, 2014). This is not surprising given that increasing retention was not a core objective of the course, which was designed as a research project from the beginning of the development process. The decline in participation in edX, ProSolo, and simultaneous use of both platforms is similar to the instructivist pathway attaining and finishing with the greatest number of active users. The decline in the total number of connectivist pathway users from Week 1 to Week 9 was approximately 94.5%, whereas the instructivist pathway was approximately 79%. It is interesting to note that the decline in the total number of those who participated in both was almost identical to the connectivist path, at approximately 94.5%, even though the number of active participants using both pathways tried ProSolo more in Week 1. This may be reflective of the novelty of the connectivist approach and the ProSolo tool, as people tried it and either moved more into what they were more comfortable with or experienced a barrier, such as technology issues.

Additionally, the second question asked why someone might choose one path over another. The quantitative data illustrates greater use of the instructivist path overall, but there were a significant number of participants that tried the connectivist path or utilized both. The qualitative data suggests that there was initial interest in the idea of multiple pathways given their novelty and that the blue-pill/red-pill metaphor helped them visualize the innovative course structure. Participants believed that modality choice addressed different learner preferences, and some liked being able to pick their own path. Some participants used edX as the starting place because it followed a more traditional learning pathway (and was therefore perceived as being safer, familiar, and more manageable) and later moved into ProSolo. Those that tended to remain in the

instructivist platform suggested that technical issues and unfamiliarity with the connectivist approach and new tools introduced a barrier. The time that it took to learn and complete tasks, coupled with new content, also reduced participant engagement in both pathways. The implications of this for practitioners is that any attempt to allow modality choices in educational settings should be well designed, explained, and supported in order to help learners feel comfortable with making modality changes. Additionally, practitioners should look at an instructivist modality as one that provides a safer, more familiar pathway for learners to either start with before making a new modality choice or restart with after choosing.

It is important to note that the participants took DALMOOC on their own time and not as a required course. It is anticipated that for-credit online courses utilizing the dual-layer framework would reveal different patterns. MOOCs typically have a very low completion rate, and the literature consistently notes that most people taking MOOCs are educated adults who are interested in learning certain skills or enrichment (Dillahunt, Wang, & Teasley, 2014; Ho et al., 2015; Jordan, 2015; Reich, 2014). Therefore, participants who receive no credit can pick and choose what they want to learn and ignore things that they perceive are not interesting or are too difficult to reasonably master. Given the differences in motivation and other driving factors, it will be interesting to see how dual-layer frameworks could operate in for-credit university courses.

Finally, the results do offer insight into the third and fourth research questions (pertaining to participant experiences as well as refining, improving, and focusing future research and design of dual-layer MOOC models). These results yield several implications for practitioners interested in flexible learning models. First, scaffolding is essential for learners (Hmelo-Silver, Duncan, & Chinn, 2007; Kirschner, Sweller, & Clark, 2006). This scaffolding must start at the beginning but also needs to be subtle enough to keep participants focused without distracting them from progressing, especially for those who are used to traditional, instructor-led courses. The qualitative data suggests some confusion with an explicit dual-layer explanation, as participants may be unfamiliar with terminology and theory, and might be resistant to trying new things. Second, there needs to be a central, integrated space for both layers to coexist. Crosslin (2015, 2016a) has mentioned the idea of creating a neutral zone, being a place (1) for MOOC participants to start; (2) that exposes biases, epistemologies, and ontologies behind pathways to help inform learners when they should choose one modality over another; and (3) allows learners to mix and match tools, services, and even courses through a learning map. This place could allow learners to fully understand what choices mean and provide a truly personalized experience (Dabbagh & Kitsantas, 2012). Additionally, having one space like this would help collect data more effectively and efficiently, eliminating the need to mine multiple sources. The challenge is creating the infrastructure in a way that is free of limitations, like many traditional learning management systems have. A third consideration is the improvement of tools to connect participants over the first iteration of DALMOOC. Participants mentioned that QuickHelper and Bazaar were limited, as few people were successfully paired in the course. The social and feedback features of ProSolo also proved problematic in terms of usability and number of users. The creators of these tools are aware of this feedback and have been improving their tools accordingly. Finally, learning analytics could help inform automated and personalized feedback in the course, as some participants wanted, but the open nature of the connectivist side challenges notions of uniform assessment.

Conclusion

The relatively new nature of the dual-layer framework creates several intriguing avenues for investigation into the learning process. Many learners are not accustomed to a level of choice and self-determination or the regulation that these choices require. This is highlighted by the emerging themes that spoke to how the dual-layer framework added complexity that introduced the need for higher levels of scaffolding and technical support to aid learners in adjusting to the new design. Therefore, many of the discussion points and themes uncovered in this study are subject to change as the idea of learning pathways gains acceptance in educational circles. Additionally, as this study highlights, new technology and design methodologies are needed to fully support true learner choice. The quantitative data indicated that many learners were interested in exploring different pathways to course completion, while the qualitative results revealed several areas for improvement in dual-layer design and technology in the future. Research into other dual-layer courses, such as the Humanizing Online Learning MOOC (HumanMOOC), have yielded similar themes and recommendations (Crosslin, 2016b). As technology and design limitations are diminished, new insights into learner-centered design could possibly be gained through the customizable modality pathway design framework. Therefore, further research and experimentation with this framework is warranted in the future.

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No Significant Difference—Unless You Are a Jumper

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Abstract
Much of the e-education literature suggests that no significant difference exists in aggregate student learning outcomes between online and face-to-face instruction. In this study, an empirical model is developed to forecast the grade that individual students would have most likely earned in the alternate class setting. Students for whom the difference between the actual grade received in one class format (for example, online) and the forecasted grade in the other class setting (for example, face-to-face) is one full letter grade or higher are called "jumpers." The findings reported in this study indicate that while about half of the students in the sample would have received essentially the same grade in either setting, as many as 42 percent are jumpers (meaning a positive or negative potential change of at least one full letter grade). This discovery has important implications for student choice and advisement in universities where students are free to choose between taking a particular course either online or face-to-face.

Keywords: Predictive model, online education, F2F education, student advisement, improving student performance

Fendler, R.J., Ruff, C., & Shrikhande, M.M. (2018). No significant difference – unless you are a jumper. *Online Learning, 22*(1), 39-60. doi:10.24059/olj.v22i1.887

No Significant Difference—Unless You Are a Jumper

The rapid growth in online education over the past fifteen years (Allen & Seaman, 2014) has motivated substantial research concerning the efficacy of online relative to traditional, face-to-face learning. Since Russell (1999) coined the term "no significant difference," numerous empirical studies report that final course grades of students who take online courses are essentially the same as for students who take the same course in a face-to-face setting. An implication of the no significant difference hypothesis is that if learning outcomes are the same in both settings, then the choice of whether to take a class in a traditional format or online is, in terms of learning, unimportant.

Many of these studies, after controlling for individual factors, compare the average grade on a common evaluation instrument used in each class setting. An important limitation of these findings is potential differences in individual performance that may cancel out in the aggregate. Specifically, if half of all students perform worse in an online class than they would have if they had instead taken the same class in a traditional setting, and the other half perform better, overall statistics may show no significant difference. However, for those individual students, the difference is very significant.

The purpose of this study is to forecast the grade, based on individual characteristics and learning styles, that a student would have most likely received if they had taken a class in an alternative setting (i.e., online or face-to-face). Students for whom the difference between the actual grade received and the forecasted grade is one full letter grade or higher are called "jumpers." Identifying jumpers and their characteristics have important implications for student choice and advisement, especially in universities where students are free to choose between taking a particular course either online or face-to-face.

Review of Related Literature

Russell (1999), based on a bibliography of 355 studies conducted between 1928 and 1998, concludes that no significant difference exists in final course grades between traditional and technology-aided instruction. This expansive review shows that students, instructors, and course design, as opposed to course setting or format, are the major factors that determine success, or lack of success, in a class. Not surprisingly, Russell's inference of no significant difference has created a deep literature, both confirming and refuting the conclusion.

Confirming No Significant Difference

Several recent studies that support the no significant difference hypothesis (and also provide excellent reviews of the prior literature on this subject) include Iverson, Colky and Cyboran (2005), Larson and Sung (2009), Euzent, Martin, Moskal and Moskal (2011), Murcock, Williams, Bruce and Young (2012), and Means, Toyama, Murphy, Bakia and Jones (2010). Iverson et al. (2005) examine the performance of graduate students in an online versus traditional introductory course in training and development. Although the authors find significant differences in how students evaluated the different class settings and the impact of the class on student intent to transfer learning, they report no significant difference in learning outcomes between delivery modes.

Larson and Sung (2009) evaluate student success in an introductory management information systems course across three different course delivery systems: online, blended, and face-to-face. They compare results on the same final exam used in each course and on final course average. Their research shows no significant difference between any of the delivery modes for either measure.

Euzent et al. (2011) consider student performance in two very large ($N > 300$) sections of an introductory economics course. One of the sections was taught in a traditional face-to-face manner and the other was conducted online using lecture capture videos. All other aspects of the two courses—in particular, course content, the instructor, assignments, and exams—were identical. The authors find no significant difference between the two courses in terms of either performance or student satisfaction.

Murdock et al. (2012) compare the acquisition of basic counseling skills of students who completed an online introductory counseling course to those who took the same course taught by the same instructor in a traditional face-to-face setting. Their data indicate no significant difference in the counseling skills developed by students in each setting. This finding is particularly interesting because counseling is an activity normally considered to require human interaction and experiential activities, which are difficult to achieve online.

Finally, Means et al. (2010) present a US Department of Education (USDOE) meta-analysis of over one thousand empirical studies of online learning published between 1996 and July 2008. This report is an updated and more statistically rigorous extension of Russell (1999). Nonetheless, the overall conclusion of the report is essentially the same. The USDOE finds that when an online course is properly designed and conducted, learning outcomes are not significantly different from those produced in a traditional, face-to-face classroom setting.

Refuting No Significant Difference

Acceptance of no significant difference is not universal. Several studies report significant differences in student learning outcomes between online and face-to-face course formats. Bertus, Gropper and Hinkelmann (2006) examine student performance in face-to-face versus online classes for graduate finance majors. Controlling for student characteristics, including GPA, the authors report that online students perform significantly better than face-to-face students. Connolly, MacArthur, Stansfield, and McLellan (2007), in a three-year study comparing online to face-to-face delivery, investigate student performance in a graduate-level computing class. In an extensive study involving over 4600 students, the authors report that online students consistently outperformed face-to-face students. Dutton, Dutton, and Perry (2001) find that students who took an online computer science course purposely designed to be as similar as possible to a traditional lecture delivery course performed significantly better. However, they also report that online students who were struggling up to the university's drop date were more likely to drop the course than comparably performing students in the traditional course.

Whereas the aforementioned studies report that online learning is superior to face-to-face learning, other studies find the opposite effect. Controlling for a host of student characteristics including GPA, gender, age, grades on course prerequisites, math background, SAT scores, and outside distractions, Anstine and Skidmore (2005) conclude that learning outcomes for online students are significantly lower than for traditional students. Bennet, Padgham, McCarty and Carter (2007) find that students in a face-to-face setting earned higher grades in a microeconomics class, yet online students performed better in a macroeconomics class. The authors suggest that this difference may be due to the fact that microeconomics is a more quantitative (e.g., math equations and graphs) subject matter, whereas macroeconomics tends to be more qualitative, or conceptual, in nature.

The Importance of Choice

One particularly controversial aspect of the USDOE conclusion is an assumption that students have no choice over whether to take a particular course online or face-to-face. That is, the finding of no significant difference depends on students being directly placed in a given learning environment. In fact, much of the current growth in online course offerings occurs in large universities offering an online section of a course that is also offered in a traditional format (Allen & Seaman, 2014). In these settings, students are free to choose which delivery mode they prefer.

Gratton-Lavoie and Stanley (2009) investigate the characteristics of students who took an online versus a face-to-face introductory economics course. They report significant differences in age, gender, marital status, number of dependents, prior coursework, GPA, and projected major. Their raw data show that online students performed much better than face-to-face students. However, after controlling for individual characteristics, they find no significant difference in learning outcomes between the two groups.

Johnson and Palmer (2015), compare the learning outcomes of students who were free to choose between taking a linguistics course either face-to-face or online. This study finds that the online students performed significantly worse. Indeed, the course average for the online class was a full letter grade lower than for the face-to-face class. This significant difference, however, is most likely explained by the fact that the average GPA of students in the online class was between 0.255 and 0.424 points lower than that of students who took the face-to-face class for the different semesters that the courses were conducted.

Helms (2014) reports a similar finding in an introductory psychology course. Those students who chose to take the online section of the course had significantly lower GPAs. They also had more outside distractions (family and job) and time constraints than the students who chose to take the class in a traditional setting. Not surprisingly, the online students demonstrated significantly lower course performance.

Both studies suggest that some students choose online courses because they believe an online version of a class will be easier than a face-to-face version. These students often have lower GPAs or they are unable to devote the time needed to successfully complete a college level course. Unfortunately for these students, most do not realize that online learning is very challenging and will most likely require more time and discipline than a comparable face-to-face class (Stanford-Bowers, 2008). Indeed, as suggested by Helms (2014), improved advisement systems for online education are needed.

Student Characteristics Impact Performance in Online Courses

When students are allowed to choose whether to take a particular course online or face-to-face, each format will most likely be comprised of students with unique characteristics. Jaggars (2014) reports that most students choose to take difficult courses in a face-to-face setting and take what they believe will be easy courses online. Fendler, Ruff and Shrikhande (2011) note that females, non-majors, and students with lower GPAs are more likely to choose an online undergraduate core course in finance than the same course taught in a face-to-face setting.

Diaz and Cartnal (1999) note that students with different learning styles tend to choose different settings. Specifically, the authors find that independent learners more often chose to take an online class while dependent learners more often selected the equivalent face-to-face class. A unique feature of this study is that the authors use the Grasha-Reichmann Student Learning Styles Scales (GRSLSS) to measure student learning characteristics. Diaz and Cartnal argue that the GRSLSS (Grasha, 1992) is especially useful for assessing learning preferences in an online course because: (1) it is one of the few learning styles measures designed specifically for college students and (2) it includes a measure for the importance of social interaction, which studies show to be an important aspect of learning for some students (for an excellent review of this literature, see Muilenburg & Berge, 2005).

Several studies discuss a link between individual student characteristics and outcomes in online courses. Yukselturk and Bulut (2007) observe that women perform significantly better than men in an online setting. The authors surmise that a possible explanation for this finding is that women tend to adapt to an online learning environment better than men, but they offer no specific outside evidence to support this assertion. Colorado and Eberle (2010) report that student age and GPA are important determinants of success in online courses. The authors suggest that older and more academically gifted students have the critical thinking and self-regulation skills needed to succeed in an online course.

A large literature discusses relationships between various learning style measures and student performance in online courses. These studies vary by the chosen student learning styles measure, but many indicate that learning styles play a significant role in online performance. Johnson (2007), which uses the Felder and Spurlin (2005) Index of Learning Styles, reports that active learners struggled when placed in online study groups but thrived in face-to-face groups, and reflective learners tended to underperform in online settings. The author also notes that visual learners tended to earn higher scores on quizzes and exams that were given online. Lu, Jia, Gong, and Clark (2007) use the Kolb Learning Style Inventory (Kolb, 1985). They report that in an online environment, convergers and assimilators achieved significantly higher levels of learning than divergers and accommodators. Employing the VARK learning styles model (Fleming, 2001), Eom, Wen, and Ashill (2006) find that learning outcomes are related to learning styles of students. In particular, the authors report that in their data set of 397 college students who completed at least one online course, students with visual and read/write learning styles reported that they learned more in an online course than students without these preferences.

Individual Risk Tolerance Levels

As most students are relatively unfamiliar with online classes, the decision about whether to take a course in an online format as opposed to a face-to-face format is arguably a relatively risky decision. The role that an individual's risk-tolerance level plays in how students make decisions has been explored across several academic fields. Examples of risk taking within a classroom include speaking up in class, openly challenging the teacher's and classmates' beliefs, innovative thinking, and choosing to accept more difficult problems and assignments. Clifford (1991) argues that risk taking in education should receive the same type of research attention that risk taking receives in other fields, such as economics and psychology. A key part of this line of research is the use of self-assessment questionnaires to provide baseline levels of students' risk-tolerance levels. Clifford finds that learning outcomes can be improved by having students engage in an optimal level of freely chosen educational risk.

In a study of undergraduate English majors at a Chinese university, Wang and Lin (2015) create a self-assessment questionnaire to determine student risk-tolerance levels. The authors find that student risk-tolerance levels are strongly correlated to performance in two of the three measured learning outcomes. Robinson and Bell (2012) investigate risk-tolerance levels and academic risk taking by pre-service teachers in the online portion of a blended class. The authors postulate that active participation in the online format may be viewed as risky by students who are traditionally more familiar with face-to-face interactions in a traditional setting. Using a 12-item self-assessment questionnaire to measure student risk-tolerance levels and a rubric to quantify actual risk taking by students in their contributions to online discussions, Robinson and Bell find a statistically significant relationship between self-reported risk and actual academic risk taking within the class. Specifically, those students who indicate that they are more likely to engage in risky activities in general do, in fact, take more risks in an education setting.

In economics, researchers in the area of human capital theory have proposed that risk taking is positively associated with individuals seeking more education. The theory would suggest that, ceteris paribus, individuals with higher risk tolerances are now more likely to forego essentially known income in exchange for potentially higher, but unknown, income in the future. Belzil and Leonardi (2013) recognize that the amount of investment in additional education is a complex decision, one that balances time, money, effort, talent, and the uncertainties around future labor markets. Using the 1995 Bank of Italy Survey of Income and Wealth that covers 8135 Italian

households, the authors find that individuals with higher risk tolerances are more likely to obtain additional schooling. Jung (2015) strengthens these results by untangling the endogeneity problem associated with the possible relationship between education levels and risk attitudes; he shows that more education leads to less risk tolerance, with risk tolerance measured via a Likert scale answer to a single question regarding the individual's attitude to risk.

Risk taking is also a major topic in finance literature. Of particular interest to this study is behavioral finance research that explores the relationship between risk-tolerance levels and investors' potentially bad decisions. In a study of the investment portfolios of German investors, Dorn and Huberman (2005) show that an individual's response on a self-assessment questionnaire measuring risk tolerance is the main driver of both portfolio diversification and trading within the individual's investment account which, they argue, strongly supports the effectiveness of self-assessment questionnaires to measure individual risk tolerance. Further, the authors find that more risk-tolerant investors hold less diversified portfolios and trade more frequently, activities that have been shown to harm investment outcomes. The authors also find a strong correlation between risk taking and investor overconfidence. Barber and Odean (1999) argue that the explanation for this excessive trading by some investors, which is well documented to hurt investment performance, may lie in investor overconfidence: the simple but well documented idea that humans are generally overconfident in their abilities and knowledge and, thus, tend to make poor decisions. Logically, this concept of overconfidence may also apply to students choosing between the unknown, risky online course and the known, more certain face-to-face course.

Objective and Research Questions

If students with different characteristics or different learning styles are more likely to perform better or worse in an online course, then these students should be advised (prior to taking the course) accordingly. Sound advisement is particularly important if, as noted in Johnson and Palmer (2015), Helms (2014) and Fendler, Ruff and Shrikhande (2011), students often choose to take an online course for the wrong reasons (for example, they believe it will be easier or they have many outside distractions).

Therefore, the primary objectives of this study are twofold. First, to empirically investigate the impact that individual demographic, personality, and learning style differences exert on student performance in different class settings (online versus face-to-face). The second objective is to forecast the potential grade difference between class settings.

The specific research questions addressed in this study are:

1. Do individual student characteristics, such as learning style, GPA, gender, planned major, course load, collegiate experience, and risk preference, influence how a student performs in a given course setting?
2. Do individual student characteristics influence performance differently in diverse settings?
3. If a student who chooses to take the course in an online setting had instead taken the course in the face-to-face setting, would that student's grade have been the same, significantly higher, or significantly lower?
4. If a student who chooses to take the course in a face-to-face setting had instead taken the course in the online setting, would that student's grade have been the same, significantly higher or significantly lower?

Methods

To investigate these research questions, a regression equation using outcomes (i.e., course grade) as the dependent variable, and personal characteristics (specifically, demographic data, ability, learning styles, and risk-tolerance score) as the independent variables, is estimated for a group of students who took a course in a face-to-face setting. A second, similar regression equation is estimated for another group of students who took the same course in an online setting. The coefficients of the classroom regression equation are then used to forecast the grade that each student who took the online version of the course would have earned (based on their individual characteristics) if they had instead taken the face-to-face class. Similarly, the online regression equation is used to forecast the grade that each student who took the classroom version of the course would have earned if they had instead taken the online class. Finally, the forecasted grade in the alternative setting is compared to the actual grade received in the chosen setting.

Setting

The data used for this study were drawn from 504 students: 219 students who took an undergraduate course in finance in a traditional classroom setting and 285 students who took the same course online. The face-to-face and online sections of the course were purposely designed to be as similar as possible in all ways except setting. Specifically, the course was rigorously structured. All sections of the course used the same textbook, shared a common syllabus, and followed the same weekly calendar. A course coordinator oversaw all aspects of the course and met with section instructors weekly to ensure as much uniformity as possible between all sections of the course.

The course evaluated was a core course in the business curriculum. All business students, regardless of major, must take this fifteen-week course. Eighty-two percent of the students in the study were juniors, fifteen percent were seniors, and the rest were sophomores. Students were allowed to choose the class setting they preferred and had substantial flexibility to switch sections through the end of the second week of the semester.

The data were collected over two semesters. The online class had an average enrollment of 120 students per semester. Several face-to-face sections of about 30 students per section were taught each semester at various day/time combinations.

Sample Instrument

The dependent variable used in the regressions is final course grade. The course average was determined as follows: 10 percent quiz average, 10 percent problem-set average, 20 percent first exam grade, 20 percent second exam grade, and 40 percent final exam grade. Quizzes, problem sets, and mid-term exams were similar but differed some between classes and formats. For example, each individual instructor made up their own quizzes, problem sets, and mid-term exams. Also, all face-to-face class exams were completed in the classroom during regular class hours, while all online students took their exams via the online learning management system. The final exam, however, was identical for all students in all sections of the course. This evaluation instrument was a comprehensive, carefully proctored, closed-note, closed-book exam that all students took in a physical classroom on the same day at the same time. Final averages were converted to letter grades as per strict guidelines provided by the course coordinator.

Because finance is heavily math oriented, assessment of all quizzes, problem sets, and exams used to determine the final course grade (in both the online and face-to-face sections) was

primarily objective. That is, student answers were either right or wrong. Thus, grading was very similar between course settings and, because the course was highly standardized, from semester to semester.

The university provided final course letter grades for all students in the sample. The translation of numerical course average to letter grade was specified to each section instructor by the course coordinator. Letter grades were translated into numerical values as defined in Table 1 to use in the regression equations. These are the same point values that the university uses to calculate a student's GPA.

Letter Grade	Points Equivalent	Letter Grade	Points Equivalent	Letter Grade	Points Equivalent
A+	4.3	B	3.0	C-	1.7
A	4.0	B-	2.7	D	1.0
A-	3.7	C+	2.3	F	0
B+	3.3	C	2.0		

Table 1. Translation of Course Letter Grades to Numerical Values

Data Collection

Prior approval from the university's IRB was received for this research project. The university provided GPA, gender, major, total hours of college credit completed, semester course load, and percent of coursework completed at the school for each student in the study. This data was linked with individual survey data (described below), and all student specific identifiers were removed to strictly protect student anonymity.

Additionally, all students were asked to complete the Felder-Soloman Index of Learning Styles (ILS) questionnaire and a risk tolerance assessment quiz during the second week of class each semester. Participation in the research study, indicated by completing these instruments, was voluntary. An incentive of receiving a grade of 100 on a quiz was offered and an alternative for earning this same grade was offered to students who did not choose to participate.

The ILS survey, described in Felder and Spurlin (2005), is an online questionnaire that measures student learning preferences on four dimensions (Active vs. Reflective, Sensing vs. Intuitive, Visual vs. Verbal, and Sequential vs. Global). Each Felder-Soloman learning style is summarized in Table 2.

Learning Style	Definition
Active Learners	Improve retention and understanding of information by discussing or explaining it to others.
Reflective Learners	Prefer to think about the material first then, after reflection, formulate ideas and opinions.
Sensing Learners	Like learning facts and solving problems using well-established methods; strongly prefers seeing connections to the real world.
Intuitive Learners	Like discovering possibilities and relationships; like innovation and abstract information. Dislike memorization and routine calculations.
Visual Learners	Remember what they see; for example, pictures, diagrams, flow charts, demonstrations.
Verbal Learners	Get most out of written and spoken explanations.
Sequential Learners	Gain understanding in linear, logical steps.
Global Learners	Learn in large jumps, randomly absorbing material until they suddenly "get it."

Table 2. Felder-Soloman Inventory of Learning Styles

The survey has 44 total questions, with 11 questions related to each of the four learning-style dimensions. Each short question has only two answer choices. Two example questions from the survey are listed below:

1. I understand something better after I:
   a. try it out.
   b. think it through.
2. When I think about what I did yesterday, I am most likely to get:
   a. a picture.
   b. words.

Figure 1. Example Questions from the Felder-Soloman Index of Learning Styles questionnaire

Each student's learning preference is classified along a learning style spectrum where learning style (LS) scores can range from -11 to +11 in 2-point intervals. For example, if a student answers all 11 of the Active/Reflective questions in a way that indicates "active" for every question, and thus "reflective" for 0 questions, the student receives an Active/Reflective value of -11 + 0 = -11. If the student's answers indicate "active" for 4 questions and "reflective" for 7 questions, the student receives an Active/Reflective value of -4 + 7 = +3.

A negative score indicates a preference towards the first learning style; a positive value indicates preference towards the second learning style. For example, a score of -7 on the Active vs. Reflective LS, means a student has a fairly strong preference for active learning. A score of +3 on the same LS scale indicates a relatively weak preference for reflective learning.

Validity and reliability of the ILS has been confirmed by Livesay, Dee, Nauman and Hites (2002) and Zywno (2003). These studies report that test-retest correlation coefficients for all four scales of the ILS survey vary between 0.7 and 0.9 for an interval of four weeks after the test is administered and between 0.5 and 0.8 for intervals of up to eight months after administration.

These coefficients are all significant at the 0.05 level. Zywno (2003) reports that Cronbach alpha coefficients for the ILS, which measure reliability, exceed the criterion value of 0.5 for all measures.

The risk tolerance assessment quiz that all participants completed is an online questionnaire available through Rutgers New Jersey Agricultural Experiment Station (https://njaes.rutgers.edu/money/riskquiz/). This survey has been used by over 200,000 educators, researchers, financial advisors and their clients (Grable & Lytton, 1999). Risk assessment scores can range from 13 to 47. Higher scores indicate increased risk tolerance. For a discussion concerning validity and reliability of the index, see Gilliam, Chatterjee, and Grable (2010).

Data Analysis

A comparison of mean values and standard deviations for all variables in the sample is presented in Table 3. The final column in the table indicates whether differences in mean values between the online group and the face-to-face group is significant. T-statistic tests were done for the continuous variables and Chi-square tests were conducted for binary and learning style variables (Winer, Brown & Michels, 1971).

Final course score is the average of converted letter grades to GPA point totals. All courses at the university are 3 credit hours. Business majors are classified as either quantitative (finance, accounting, actuarial science, CIS) or qualitative (marketing, management, general business, other). Percent coursework at the university reflects transfer credit and AP credit relative to coursework completed directly at the university. As an urban state university, approximately 35 percent of the students in the sample completed their initial year at a junior college or smaller school in the state.

As shown in Table 3, average values for the two groups are similar in some areas and quite different in others. The online group has a higher average course grade than the face-to-face group (2.92 versus 2.40, respectively). This result seems to suggest that online students have higher learning outcomes, although that is not necessarily the case. The course grade is comprised of three components: midterm exams (40 percent), quizzes and problem sets (20 percent), and the comprehensive final exam (40 percent).

As noted above, the final is a common, in-class, carefully proctored exam. The average grade on this common instrument is essentially the same in both groups (implying no significant difference on a common evaluation instrument). The average grade on quizzes and problem sets is also essentially the same in both settings, since these are used mainly as learning assignments as opposed to evaluation instruments. The average grades on midterm exams, however, are significantly higher for the online group. For this group, strictly timed exams were conducted online, but students were allowed to complete the exams anytime during a 3-day period. The average grade on midterm exams for the online classes is nearly a full letter grade higher than the average grade on the final exam. Such a discrepancy between midterm and final exam grades does not exist for the face-to-face group. The higher grades on online exams may reflect the challenges with monitoring online cheating (Harmon & Lambrinos, 2008) or it may be due to the fact that online students can use books, notes, and other materials to take online exams while face-to-face students are not allowed to use such materials. Additional research is needed to determine the precise reason.

	Online Group		Face-to-Face Group		Mean Difference Significant?
Number of observations	219		285		
Continuous Variables	**Mean**	**S.D.**	**Mean**	**S.D.**	
Course Grade	2.92	0.87	2.40	1.24	Yes (1% level)
College GPA	3.09	0.41	3.08	0.43	No
Term Course Load (in hrs.)	12.58	3.80	12.32	3.44	No
Total Hours College Credit	117.29	29.33	111.21	27.15	Yes (5% level)
% Coursework at Univ.	60.89%	30.48%	65.39%	30.75%	No
Risk Assessment Score	26.32	4.65	26.63	4.53	No
Binary Variables	**Percent of Total**		**Percent of Total**		
Major (% Quantitative)	48.86%		46.67%		No
Gender (% Female)	61.64%		48.77%		Yes (at 1% level)
Learning Style Variables	**Percent of Total**		**Percent of Total**		
Active Learners	19.18%		25.61%		No
Neutral Act./Ref. Learners	61.64%		56.49%		No
Reflective Learners	19.18%		17.89%		No
Visual Learners	47.03%		55.09%		No
Neutral Vis./Vrb. Learners	44.29%		37.54%		No
Verbal Learners	8.68%		7.37%		No
Sensing Learners	48.40%		55.44%		No
Neutral Sen/Int. Learners	42.47%		36.84%		No
Intuitive Learners	9.13%		7.72%		No
Sequential Learners	36.07%		37.19%		No
Neutral Seq./Glo. Learners	57.08%		57.89%		No
Global Learners	6.85%		4.91%		No

Table 3. Group Descriptive Comparison Statistics

Other large non-LS differences in mean values are observed for total hours of college credit and gender. The average number of hours completed by a student in the online group was 117.3 hours, whereas for the face-to-face group it was 112.2 hours. This difference is significant at the 5% level. Also, more females (61.6 percent to 48.9 percent) chose to take the online course than the face-to-face course. This difference is significant at the 1% level. The authors are not sure why this occurs, but this pattern has been noted for this particular course at the university for many years.

The LS variables, while not statistically significant, seem to suggest that students with different learning styles may choose different course settings. Active Learners, Visual Learners, and Sensing Learners seem more likely to choose the face-to-face setting, whereas Reflective Learners, Verbal Learners, Intuitive Learners, and Global Learners appear to be more likely to select the online class.

Potential Limitations

The authors recognize several limitations of this study. One potential limitation of the empirical results is that all of the students in the online group received their instruction from one instructor. On the one hand, this has the advantage of providing a consistent representation of the

online class; on the other hand, it does not reflect the variety of online instructional approaches that a student may face across online courses taught by various instructors. In addition, different instructors in the face-to-face sections may introduce an instructor effect in the non-online course group. Such potential differences in face-to-face versus online classes is a limitation that should be further explored in future studies.

Though care was taken to align the online class with the face-to-face class, differences still inevitably exist (in particular, the online class size was 120 students and the face-to-face average class size was 30). Another potential limitation of the empirical results is that the studied course is a highly quantitative course with a focus on solving math-oriented problems. Thus, the results of this study may not apply well to a more qualitative course. Put differently, the analysis presented in this paper opens the avenue for similar studies comparing face-to-face with online settings for purely qualitative courses.

A third potential limitation of this study is that the sample set is based on students at an urban university who do not generally live on campus and very likely work full or part time. Thus, the results of this study may not apply well to, for example, a school where students generally live on, or near, campus and are full time students. The students at these two different types of schools may have very differing reasons for selecting an online version of a course over a face-to-face version, or vice versa.

Finally, it is possible that some students preregistered for sections of the course that, once the semester started, they realized was not their preferred setting. Even though the drop/add policy at the university is lenient, it is possible that at least some students were prevented from switching. Thus, due to possible constraints on the registration process, choice is not truly 100 percent. While this is a potential limitation of the analysis, it is likely difficult to resolve given that most business schools have similar if not more stringent constraints on student movement across sections and between different class settings, especially after the term begins. On the positive side, this limitation strongly supports development of policies that implements advising in a pre-emptive manner to guide students into the most appropriate setting given their overall profiles rather than merely letting students choose the setting.

Results

OLS Regressions

Ordinary least squares regression coefficients for all variables in the model are presented in Table 4. Final course score is the dependent variable. Based on the R-Square values of .455 for the online regression and .459 for the face-to-face group regression, the regressions are quite robust in that they explain nearly half of the variation in grades between students in each setting. As expected, the regression coefficient for college GPA is highly significant (at the 1% level) and positive in both the online and face-to-face regressions; that is, for both groups of students, the students with higher overall GPAs tended to earn higher grades in the class. As also expected, the quantitative majors performed significantly better (at the 1% level) than non-quantitative majors in both groups. The variables capturing the students' percent of their coursework completed at the university and their course load in hours during the semester are both positive and significant at the 1% and 5% levels respectively for the face-to-face group, but not significant for the online group. By contrast, the variable capturing the students' total hours of college credit is positive and significant at the 10% level for the online group regression, but not significant for the face-to-face group.

	Online Group		Face-to-Face Group	
Variable	**Coefficient**	**T-Stat**	**Coefficient**	**T-Stat**
Intercept	-1.4236	-2.84*	-4.3318	-6.25*
Risk Assessment Score	-0.0176	-1.67***	0.0041	0.32
Active Learning Style	0.0218	0.18	-0.1646	-1.16
Reflective Learning Style	-0.2186	-1.80***	-0.1702	-1.09
Sensing Learning Style	0.0167	0.17	0.1117	0.89
Intuitive Learning Style	-0.1468	-0.85	0.0413	0.18
Visual Learning Style	0.1891	1.93***	0.1940	1.59
Verbal Learning Style	0.1070	0.62	-0.0071	-0.03
Sequential Learning Style	0.0153	0.15	0.1423	1.17
Global Learning Style	-0.0088	-0.05	0.1461	0.52
Total Hours College Credit	0.0028	1.72***	0.0021	0.96
% Coursework at Univ.	0.1781	1.12	0.4674	2.42**
College GPA	1.3352	11.59*	1.6830	11.53*
Major (Quant. = 1)	0.2003	2.05*	0.3279	2.69*
Gender (Female = 1)	-0.1749	-1.80***	-0.0251	-0.21
Term Course Load (in hrs.)	0.0151	1.18	0.0491	2.76*
Equation Statistics:				
Number of Observations	219		285	
R-Square	0.4554		0.4594	
Adjusted R-Square	0.4151		0.4292	
Notes: *Significant at 1% level; **Significant at 5% level; ***Significant at 10% level				

Table 4. OLS Regressions with Final Course Score as the Dependent Variable

Interestingly, the coefficient for the risk assessment score is negative and significant at the 10% level in the regression for the online group, indicating that the greater an individual's risk tolerance level, the worse they tended to perform in the online version of the class; the same variable is not significant in the face-to-face regression. The online group finding corresponds with the literature discussed earlier concerning investors. Dorn and Huberman (2005) find that investors with high levels of risk tolerance earn lower rates of return due to holding less diversified portfolios and high transaction costs due to frequent trading. Barber and Odean (1999) argue that investors with high risk tolerance levels are overconfident and this leads to poor decision making. The significant negative coefficient for risk assessment score for the online group in the current study implies that students with high levels of risk tolerance may be overly optimistic in assessing their ability to succeed in an online class. Basically, they are more apt to make poor decisions concerning the setting for which they are best suited.

For students in the online group, the coefficient for the variable measuring reflective learning style is negative and significant at the 10% level, indicating that reflective learners tended to perform worse in the online class than non-reflective learners. Likewise, for students in the online group, the coefficient for the variable measuring visual learning style is positive and significant at the 10% level, indicating that visual learners tended to perform better in the online class than non-visual learners. Both of these findings correspond with similar results reported in

Johnson (2007). Neither of these variables—reflective learning style or visual learning style—are significant in the face-to-face regression.

Finally, females tended to perform worse (significant at the 10% level) in the online group than males, but no significant gender performance differences are observed in the face-face group. The gender relationship for online students in the current study is opposite of the association reported in Yukselturk and Bulut (2007).

Predicting Jumpers

Table 4 reveals several significant differences between the regressions for the two different settings. First, the intercepts are highly dissimilar (-1.4236 for the online regression and -4.3318 for the face-to-face regression), especially given the fact that the dependent variable values only range from 0 to 4.3. Second, some variables significant in one regression are not significant in the other. Specifically, risk assessment score, reflective learning style, visual learning style, total hours of college credit, and gender are significant in the online group regression but not in the face-to-face group regression. On the other hand, percent of coursework completed at the university and term course load in hours are significant in the face-to-face group regression but not in the online group regression. Finally, the signs on several of the coefficients differ between equations. In particular, a higher risk assessment score, a more intuitive learning style, and a greater global learning style are associated with a lower course grade (and vice versa) in the online group regression but a higher course grade (and vice versa) in the face-to-face group regression. Conversely, a more active learning style and a greater verbal learning style are related to a lower course grade (and vice versa) in the face-to-face group regression but a higher course grade (and vice versa) in the online group regression.

These differences suggest that student characteristics may influence performance differently depending on the setting (i.e., online versus face-to-face). To further investigate this notion, the other setting equation was used to forecast grades for each student had they taken the class in the opposite format. That is, online student data were inserted into the face-to-face group regression to forecast the grade each online student would have most likely earned if they had instead taken the face-to-face class. Likewise, face-to-face student data were inserted into the online group regression to forecast the grade each face-to-face student would have most likely earned if they had instead taken the online class.

First, though, grade distributions were normalized to account for the difference in mean grades assigned in the two learning settings. As the mean final grade in the online group is 2.92 and the mean grade in the face-to-face group is 2.40, comparison of forecasted grades to actual grades would produce biased results without first adjusting for this fundamental difference in the final grade distributions. Thus, for the online students, the distribution of their forecasted face-to-face grades across the various grade categories (A+ through F) was scaled to match that of their actual online grades. For instance, students with the highest 3.2 percent of the forecasted face-to-face model scores were assigned the grade of A+ as their forecasted face-to-face grade to match the same percentage (3.2 percent) of the online students that actually earned an A+ in the class. Similarly, the next highest 16.9 percent of the students in terms of forecasted face-to-face scores were assigned an A grade to match the percentage of A grades actually assigned in the actual online classes. As the distributions across the various grade categories were equalized, the mean of the actual online final grades (2.9) equaled the mean of the forecasted face-to-face final grades for these online students. A similar process was followed for the face-to-face students, with the

mean final grade of their forecasted online grades matching the 2.4 final grade mean of their actual face-to-face class grades.

The forecasted grade was then compared in the other setting to actual grade received. A difference between forecasted and actual grade equivalent to one letter grade unit (i.e., from A- to B+ or from C to C+) is called a "jump" of one unit. If the forecasted and actual grades are the same, the jump is 0. However, if the actual grade is two units from the forecasted grade (for example, actual grade is B+ and the forecasted grade is B-), then jump is designated as 2. And a difference between an actual grade and a forecasted grade of three units (for example, an actual grade of C+ and a forecasted grade of B+) is designated as a jump of 3. Jumps do not indicate positive or negative, but merely the potential magnitude of the change.

Note that no suggestion is being made that the forecasted value is the actual grade a student would have received in the alternate class setting. Obviously, many factors determine a student's grade in a class; indeed, more than half of the variation in grades is unexplained by the regressions. However, the regressions do suggest that individual factors—such as gender, learning styles, and course load—seem to influence student performance differently in each setting and the jumper's variable is designed to capture the potential magnitude of this difference.

Table 5 presents the distribution of jumpers between each setting. Jumps of 0 mean no change in grade. Jumps of 1 could be caused by any number of factors not captured by the model as well as random error. A jump of 2 (for example, receiving a C instead of B- or an A- instead of a B if the other format had been chosen) may capture real differences or may still be due to model misspecification. Choosing to be conservative, the authors of this study consider only jumps of 3 or greater to be meaningful.

Thus, the results presented in Table 5 suggest that for up to 68.5 percent (i.e., 24.2 percent + 28.3 percent + 16.0 percent) of students who chose to take the online class and for as many as 58.3 percent (i.e., 18.3 percent + 22.1 percent + 17.9 percent) of students who chose to take the face-to-face class, the outcome of their decision would essentially be unchanged. Their final course grade would have been more or less the same in either class setting.

	If Online Students Instead took Face-to-Face Class		If Face-to-Face Students Instead took Online Class	
Jump	**Raw Number**	**Percent of Total**	**Raw Number**	**Percent of Total**
0	53	24.20%	52	18.25%
1	62	28.31%	63	22.11%
2	35	15.98%	51	17.89%
3	47	21.46%	45	15.79%
4	13	5.94%	26	9.12%
5 or more	9	4.11%	48	16.84%

Table 5. Distribution of Jumpers

Jumps of 3, 4 or greater represent a change in grade of a full letter amount or more. For instance, a student who received a final letter grade of B would have most likely received an A (and perhaps even higher) or a C (and perhaps even lower) in the other class format. Table 5 shows that for 31.5 percent (i.e., 21.5 percent + 5.9 percent + 4.1 percent) of students who chose to take

the online class and for 41.7 percent (15.8 percent + 9.1 percent + 16.8 percent) of students who chose to take the face-to-face class, choice of class setting was highly significant.

Theoretically, then, for a student completing this course in the first semester of their junior year, a negative jump of exactly 3 letter grades in this one course would have reduced the student's overall GPA by approximately 0.03 points (for instance, moving a 3.0 GPA to a 2.97). In the extreme, though, suppose a student could select between online and face-to-face for all classes and this student systematically chose the wrong format across all classes. The student's GPA would then move from a 3.0 to a 2.0.

Jump Up or Jump Down?

The direction of these highly significant jumps is also very important. Specifically, if the majority of the large jumps are positive, then it would appear that most students chose to take the "wrong" class format. Alternately, if most of the large jumps are negative, then students made wise choices.

Table 6 shows the percent of each group that moved in the positive or negative direction. Of the 69 online students who would have jumped 3 or more grade units had they instead taken the face-to-face class, 50.7 percent would have performed worse and 49.3 percent would have performed better. Thus, for the online students, a roughly equally split exists between those who chose the "wrong" class setting and those that chose the "right" class setting. Similarly, of the 119 face-to-face students who would have jumped 3 or more grade units if they had instead taken the online class, approximately half would have performed worse and half would have performed better.

	If Online Students Instead took Face-to-Face Class		If Face-to-Face Students Instead took Online Class	
Jump Direction	**Raw Number**	**Percent of Total**	**Raw Number**	**Percent of Total**
Negative Large Jump	35	50.72%	60	50.42%
Positive Large Jump	34	49.28%	59	49.58%

Table 6. Direction of Movement for Highly Significant Jumpers

Implications and Future Research

The findings reported in this study have important implications for student choice and advisement. Whereas it may be true in the aggregate that no significant difference exists between the performance of students who take a class in an online setting and those who take a class in a traditional face-to-face setting, this study demonstrates that, for any individual student, choice may be very important. For the sample used in this study, 31.5 percent of the students who took the online course and 41.8 percent of the students who took the face-to-face course would have received a grade of at least 3 full grade units higher or lower if they had chosen to take the class in the other format.

Such important differences cannot be ignored because they "wash out" in the aggregate. Exploring the notion that online learning may not be equivalent to face-to-face learning (and vice versa) for individual students is not equivalent to rejecting the format. Instead, this research points to the importance of proper advisement processes for students trying to decide whether to take a class online or face-to-face.

Assuming that the final grade is the most important consideration for students, a relatively large subset of students who chose the online class instead of the traditional class made a less optimal choice. Of those online students who would have performed differently in the face-to-face format, approximately half would have experienced improvement of at least a full letter grade. For example, a student who received a C in the online class would have earned a B or better in the traditional class.

Undoubtedly, many factors influence the format a student chooses. Online classes are convenient and they provide time-constrained students with significant coursework flexibility. Some students may consider these benefits worth the cost of receiving a lower grade.

However, efficient cost/benefit analysis requires that both the costs and the benefits be fully understood before the decision is made. Accordingly, schools should consider creating a model like the one described in this study that would allow students to forecast the possible grade difference in taking a class online versus face-to-face. A unique model would need to be created for every class, but as long as it is simple for students to determine the input variables, student decision making would be greatly improved. Better, more informed decisions about class format will most likely reduce the high drop rates currently characteristic of many online classes. In addition, students who choose to take a class where the forecasted grade is lower may decide to expend additional effort in that format to improve their grades. Creating and providing students with such a model, and analyzing its impact on student behavior, represents an interesting area for future research.

Another area for future research is to more fully investigate whether the jumpers have specific characteristics that set them apart from non-jumpers. Such analysis may be quite complex, however, since there are three different groups (students who jump up, students who do not jump, and students who jump down) in two different class settings (online versus face-to-face). More than likely, a larger data set would be needed to properly identify all unique factors. Nonetheless, such a study would be very interesting, especially a more in-depth analysis of the role that risk plays in driving the performance of jumpers versus non-jumpers in the two different settings.

Conclusion

This study of over 500 students demonstrates that whereas no significant difference may be true in the aggregate, for any individual student the choice of whether to take a class online or face-to-face may be very important. Using a multivariate regression model to forecast the grade that a student would have most likely earned (based on prior academic performance, unique personal characteristics, and preferred learning styles) in the other class setting, potential grade differences for each individual student between each class format are computed. Differences between actual and forecasted grade are classified as "jumps." A student is said to jump by 1 unit if the change in letter grade is one designation (for example, from A to A- or from C to C+), by 2 units if the change in letter grade is two designations (for example, from A to B+ or from B- to C), and so on. Students for whom the potential change in grade is one full letter or higher (i.e., a jump of 3 or more) are designated as jumpers. To these students, the difference in potential grade between class formats is most likely very meaningful.

The specific research questions asked, the process used to examine each question, and the answers suggested by this study are summarized in Table 7.

Research Question	How data analyzed; answer to question
1. Do individual student characteristics such as learning style, GPA, gender, planned major, course load, collegiate experience, and risk preference influence how a student performs in a given course setting?	Two multivariate regressions—one for the online students and one for the face-to-face students—were estimated with course grade (proxy measure of student performance) as the dependent variable and student learning styles, GPA, gender, planned major, course load, collegiate experience, and risk preference as the explanatory variables. The overall significance of the regressions and the significance and signs of the various explanatory variables suggest an affirmative answer to this question.
2. Do individual student characteristics influence performance differently in different settings?	Each independent variable coefficient in both multivariate regressions mentioned above was compared. Whereas some independent variables were significant in one regression, they were insignificant in the other. Additionally, the signs of some variable coefficients were positive in one regression and negative in the other. These differences, coupled with the relatively high R-square values for both regressions, indicate an affirmative answer to this question.
3. If a student who chooses to take the course in an online setting had instead taken the course in the face-to-face setting, would that student's grade have been the same, significantly higher or significantly lower?	The face-to-face regression equation was used for each online student to forecast the grade that the student would have most likely earned if he/she had instead taken the face-to-face class. Actual grades received are then compared to forecasted grades to identify "jumpers"—students whose grade difference would have been a full letter grade or more. For the data set analyzed, 31.5 percent of all online students were jumpers.
4. If a student who chooses to take the course in face-to-face setting had instead taken the course in the online setting, would that student's grade have been the same, significantly higher or significantly lower?	The online regression equation was used for each face-to-face student to forecast the grade that the student would have most likely earned if he/she had instead taken the online class. Actual grades received are then compared to forecasted grades to identify "jumpers"—students whose grade difference would have been a full letter grade or more. For the data set analyzed, 41.7 percent of all face-to-face students were jumpers.

Table 7. Research Questions and Data Analysis Summary

A deeper probe of jumper groups indicates that approximately half of the jumpers who took the online version of the course would have received a higher grade if they had instead taken the face-to-face version of the class; likewise, about half of the jumpers who took the face-to-face version of the class would have earned a full letter grade or higher if they had taken the online course. Thus, in terms of learning, these students appear to have chosen the wrong version of the class.

Indeed, for these individuals in particular, this research study suggests that students could benefit tremendously if they possessed the information provided by a forecasting model prior to choosing a particular class setting (i.e., online or face-to-face). Developing an advisement model that a student could use to predict the possible magnitude and direction of performance between different course formats represents fertile ground for future research. Because each online course is distinct and student characteristics impact online learning differently in different subjects (Xu and Jaggars, 2013), each predictive model will be unique. However, as shown in this study, much of the data required are simple to collect and the predictive model is easy to create. Providing students with this type of information will allow them to make more informed decisions which may improve online retention rates. Additionally, this information may motivate greater student effort in situations where the jump is negative but the student chooses the setting for a particular reason (e.g., choose online for convenience and flexibility).

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Breaking Barriers Through Edmodo: A Qualitative Approach on the Perceptions of University of Malaya Undergraduates

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Abstract

With the advancement of digital technology, software and applications are overwhelmingly accessible to teachers and students. Digital designs for teaching and learning are highly encouraged by scholars as they prepare students of today for the demands of the future workforce. Thus, many educators use available social networks for their classrooms. However, the use of social networks in education presents disadvantages, as their invention is geared toward social networking purposes. Therefore, it's important to ask whether social learning platforms, such as Edmodo, provide a better alternative. The research aims to elucidate strategies for and advantages of executing Edmodo in education. The research employs purposive sampling, which led to sample of a total of four undergraduates from a prestigious Malaysian university. The research frameworks are on the theories of constructivism, hermeneutics, symbolic interactionism, and interpretivism, which focus on the process of meaning making and one's interpretation of a phenomenon. It aims to generate insights and sharing through in-depth interviews using interview protocol, photographs, and concept maps. The study executes open coding to identify emerging themes; axial coding, which focuses on finding the themes' consistency; and selective coding, whereby core categories are selected in order to illuminate Edmodo's effects. The findings are presented in a narrative manner. The pedagogical implications pertain to how Edmodo breaks barriers by enabling students to access learning resources beyond the classroom and empowering student-centered learning through novelty of tasks, suitable learning environment, and mobility.

Keywords: Edmodo, education, online learning, social learning platform, teaching and learning strategy

Mokhtar, F.A. (2018). Breaking barriers through Edmodo: A qualitative approach on the perceptions of University of Malaya undergraduates. *Online Learning, 22*(1), 61-80. doi:10.24059/olj.v22i1.1026

Breaking Barriers Through Edmodo: A Qualitative Approach on the Perceptions of University of Malaya Undergraduates

Teaching millennials calls for a change in educational approach from a conventional to a more comprehensive, communicative, and technological one. Educators move forward day by day to ensure they have the best pedagogies and teaching methods that involve more social context in learning (Woo & Reeves, 2007). Consequently, technology has been progressing rapidly to aid in the learning process (Stracker, 2011). In this paper, four undergraduates' journeys in exploring Edmodo while doing tasks on the site are presented. The objective is neither to model expert teaching nor to teach any specific subject but to discover thoughts and opinions that the participants have constructed, which will lead to understanding how this tool can be used and by what means it is beneficial in online learning.

Further, a survey conducted in 2013 revealed that 96% of students admitted using Internet access for social networking strategies, and 50% of discussions on social online platforms are schoolwork related (Rivero, 2013). These figures illustrate that students are usually online using social platforms while discussing assignments with peers via the same providers. For example, Facebook is used by students to stay in touch with classmates, resulting in students becoming more intimate and friendly with one another (Tidwell & Walther, 2002). As teachers also use Facebook as a medium for conducting lessons and interacting with students, they disclose more information about themselves and seem approachable, which leads to higher levels of anticipated motivation, affective learning, and a comfortable classroom climate (Mazer, Murphy, & Simonds, 2007). Despite these positive claims, Facebook does not help in setting boundaries between professional and personal matters, such as the appropriateness of the amount of shared information by teachers and the balance between academic discussion and social media activities on the site.

Besides Facebook, Twitter is also a social platform, where users "tweet," or post statuses with a maximum of 280 characters (Sulleyman, 2017). Other users are able to view, "retweet," comment, or "favorite" the tweet posted. Shachter (2011) proposes Twitter as an opportunity for learners to engage with peers outside of the classroom and to share personal thoughts about lessons learned. However, the evident weaknesses of Twitter in education are its character count limitations and buttons that are designed for social media purposes. On the other hand, a school in Birmingham used Skype as a teleconferencing tool to communicate with partners from Indiana and Columbia. A newspaper article entitled Kid to Kid Connection (2011) covered the story, stating that students made friends beyond their comfort zones and achieved learning outcomes. While Skype is a freemium instant messaging, video, and voice communication platform where basic services are free of charge while more advanced features must be paid for and can be downloaded on laptop or smartphone, it poses limitations as well owing to quality issues when the number of participants in a meeting or conference exceeds 25 (Moore, 2017). Another hindrance is the lack of collaborative instructional strategies, which resulted in lengthening the learning process for teacher and students (Beldarrain, 2006). Besides these limitations, educational institutions are struggling with issues pertaining to the privacy and security of educators and students on the social networks (Electronic Education Report, 2014). As a result, many schools block social networking sites due to the lack of adequate control and monitoring mechanisms (Rivero, 2013). The situations above prompted this study to look into Edmodo, a social learning platform, in order to determine its potential to become an alternative to the aforementioned social networks.

Review of Related Literature

Edmodo was launched in 2008 as escapism to issues such as professional versus private, security, functional buttons, and others because the aforementioned issues became hindrances in online learning, particularly in social networking platforms. In addition, Edmodo simultaneously implements a "bottom-up" approach by targeting individual educators to use the application rather than getting entire educational institutions to sign up (Geron, 2011). This grants educators the liberty to choose instead of forcing them into using an unfamiliar social learning platform. Edmodo (2018) further illuminates its main aim on their website as follows:

> Edmodo is a global education network that helps connect all learners with the people and resources needed to reach their full potential.

Since its inception in 2008, Edmodo has been housing millions of users worldwide, comprised of teachers, students, and parents. As of March 2016, over 63 million users have been actively working together in regard to academic affairs (Edmodo, 2016). Edmodo was designed to protect the privacy and security of students and teachers by providing a closed, private platform in which they can collaborate, share content, and leverage educational apps to augment in-classroom learning (Business Wire, 2014). Edmodo also organizes an online global educator conference known as EdmodoCon that attracts more than thirty thousand virtual attendees annually (Business Wire, 2014). The conference caters to idea sharing and collaboration among some of the world's most creative educators. Moreover, EdmodoCon is a free, live-streamed 11-hour event highlighting innovative educators who wish to showcase various ways to employ Edmodo with other digital tools in classrooms. Additionally, Dalsgaard (2008) claims that the integral point of a social network is the mixture of personalization and socialization; with Dalsgaard's notion in mind, it can be argued that the greatest innovation of online learning is when a social network is blended into education; therefore, Edmodo has been deemed one of the best platforms for social networking and academic affairs (Akbar, Purwarianti, & Zubir, 2013).

In addition, Edmodo is user-friendly and easy to navigate and has multiple useful functions for learning purposes, including Reading, Assignments, and Paper-Studying (Tomassini, 2013). Edmodo as a social networking site can be incorporated into the curriculum and within teachers' locus of control (Anbe, 2013). Further, students who participated in a study related to Edmodo showcased fours skills while using the platform—namely, remembering, applying, evaluating, and creating (McClain & Brown, 2013). Another advantage of Edmodo is the leniency for students to be mobile while participating in a class's online discussions (Chandler & Redman, 2013). Edmodo is revealed to be a portal that has modest features, an intuitive interface, and media richness, and does not need hosting or a server (Thien et al., 2013).

As educators are urged to seek suitable digital designs for teaching and learning strategies due to the advent of technology (Stracker, 2011), it may evoke a keen interest in Edmodo as a medium for engaging students. Moreover, supplementing face-to-face instruction with web-based activities will increase interaction and creativity among students and subsequently increase student interest and self-learning (Amrein-Beardsley, Foulger, & Toth, 2007; Vernadakis, 2012). Additionally, UNESCO (2004) urges students to concentrate on the significance of lifelong learning; to continuously upgrade knowledge and skills, to think critically, and to take initiative so as to adapt to global change. Therefore, this paper seeks to explore Edmodo's functions that support making education accessible to students, due to the need for 21st-century learners to stay updated and relevant, which calls for incorporation of digital designs in education.

Purpose of Study

This paper aims to do the following:

1. Illuminate Edmodo's potential to help students enhance their learning curve.
2. Find ways Edmodo may assist students in improving their learning experience.

Methods

This study stems from curiosity about discovering alternatives to social networking applications, as the use of social networks poses limitations in educational settings. Therefore, Edmodo was chosen as the tool for the study due to the advantages claimed by its developers and educators (Edmodo, 2014; Akbar et al., 2013; Hung & Khine, 2006). The research focuses on perceptions of undergraduates from a Faculty of Education at a prestigious local university concerning the potential of Edmodo in educational environments.

Research Model

Constructivism, as defined by Crotty (1998), states that meaning is not discovered but constructed and that people derive meanings differently despite being exposed to the same phenomenon. In this sense, participants were encouraged to construct personal perceptions regarding Edmodo without any prior expectations or predetermined views. Meanwhile, hermeneutics is participative and cannot be produced by the researcher (Crotty, 1998). Hermeneutics is one of the theoretical backgrounds that permit participants to project their own thoughts on Edmodo through their work, comments, and encounters on the platform, which are gathered later for analysis. Symbolic interactionism, on the other hand, focuses on interpretations of environments through actions (Crotty, 1998), which allows the researcher to observe the process of interpretations on the subject matter through which the participants construct their actions (e.g., body language, facial expressions, and gestures). Additionally, the Darwinian perspective postulates emotions as evolved phenomena with important survival functions that have been selected for because they have solved certain problems we have faced (Darwin, 1965). In constructivism's paradigm, the individual is not a passive recipient of a set meaning but an active, resourceful, and reflective participant in the construction of meaning (Charon, 2001). All of these theoretical frameworks in the cognitive approach are suitable for the purpose of this study in disclosing meanings and perceptions of participants via interviews, projection of thoughts on Edmodo, and interpretations by means of actions.

Sampling. Purposive sampling was employed in order to yield the best understanding in this study (Fraenkel & Wallen, 2003). Therefore, four undergraduates, with pseudonyms of Rose, Fatin, Farah, and Emme, from the Faculty of Education at the University of Malaya were selected as participants for this six-month research. This research used Edmodo for language learning and aimed to capture participants' views regarding its implementation. Participants were chosen due to their status of being both students and future teachers who could reflect on and utilize existing knowledge in comparing teaching methodologies learned from the course with the relevance of using Edmodo for education. The research draws heavily on the qualitative study method that focuses on examining the perceptions of participants. Furthermore, researchers were advised to conduct interviews to gather data qualitatively because perceptions collected in quantitative representations do not clearly ascertain students' reasons for their beliefs (Gamble et al., 2013).

Data analysis and procedure. The instruments included the researcher (Yin, 2011), interview protocols (Jacob & Ferguson, 2012), concept maps (Malek, 2002), and photographs (Dzakiria, 2008). This study examined the subject matter with interpretive and naturalistic approaches in order to explore the participants' views in the most natural manner. Inductive logic was employed because it allows issues, categories, and themes to emerge from the experiences of participants in the study (Dzakiria, 2004). It was crucial to approach the phenomenon in a natural setting, without any presumptions, to ensure neutrality in reporting the data. In order to comprehend participants' views in the most comprehensive way possible, qualitative research provided the appropriate approach. Further, Creswell (1998) describes qualitative study as an inquiry process of understanding that explores an area of study.

The study then executed open coding to identify the emerging themes; axial coding, which focused on finding the themes' consistency; and selective coding, whereby core categories were selected in order to explain Edmodo's effects (Strauss & Corbin, 1990). *Open coding* is a process that consists of naming and categorizing a phenomenon via intense examination of the data (Strauss & Corbin, 1990). As this study included photographs, data was skimmed through and categorized into possible main ideas that would connect it to the interviews' central themes. The next advancement in the classification of data is known as *axial coding*. Using this method, data was triangulated to confirm the interrelationships between themes and ensure consistency. This process is similar to open coding but with more details and attempts to narrow down the categories, subcategories, and properties of the said categories and subcategories (Strauss & Corbin, 1990, p. 97). Next, selective coding involved choosing core categories that would represent smaller categories and subcategories of the aforementioned core categories. These core categories, in which each has its own smaller elements and central ideas, have the ability to answer all the research questions and accomplish the objectives of this study (Strauss & Corbin, 1990).

Throughout the process of perusing data and findings, the interpretive method was adopted (Walsham, 1993) because it allowed interpretation of data from the researcher's point of view while revealing multiple realities of the participants involved. The interpretive perspective relies on the notion that qualitative research should reveal multiple realities of the people involved, as opposed to capturing the objective reality. This is due to the fact that objective reality can never be captured (Denzin, 2010). The narrative approach became the technique for conveying information, ensuring factuality that mirrors upon the participants' point of views (Lauritzen & Jaegar, 1997).

Ethical issues. For the purpose of this research, two areas of ethics were considered: consent and the confidentiality of participants' personal information, because a researcher must acquire consent to avoid conflicts of interest (Corti, Day, & Backhouse, 2000), University of Malaya (as the selected site for this study) had been informed of the research's nature, procedure, and intended sampling. Acquiring permission from the institution concerned was a highly significant part of the ethical considerations; therefore, the university was approached prior to contacting the participants.

Subsequently, informed consent forms were acquired from the participants at the beginning of the research. The form illuminated the scope of study, duration, risks, compensation, and confidentiality. In this way, participants had knowledge of the structure of the research they would be participating in. Providing informed consents allowed for honesty and

transparency, as participants were aware of what was expected of them throughout the course of study (Sieber, 1993).

Meanwhile, the participants' confidentiality was assured. In this research, participants and the researcher were involved in informal meetings where discussions about their perspectives took place. Therefore, full disclosure from the participants was required in order to explore their deepest thoughts, which could involve sensitive issues to outsiders (Dzakiria, 2008). Hence, protecting their shared opinions and personal information was a priority.

Reliability and validity. Concept maps were used to represent participants' closing thoughts on Edmodo in a simpler form and was one of the methods used to ensure reliability for triangulation of data. The use of concept mapping in this study helped participants to organize their final thoughts and made it easier for the researcher to comprehend their conclusions (Solvie & Sungur, 2006). Concept maps were utilized to compare and contrast the themes that emerged from the interviews. To ensure validity, the researcher reaffirmed the emergent themes gathered from analyses with the participants by inquiring if the research findings and interpretations were parallel to participants' perceived views. Responses obtained from the participants indicated that the research findings are indeed equivalent to the perceptions they conceived and shared about Edmodo. Figure 1 shows their replies regarding the research findings:

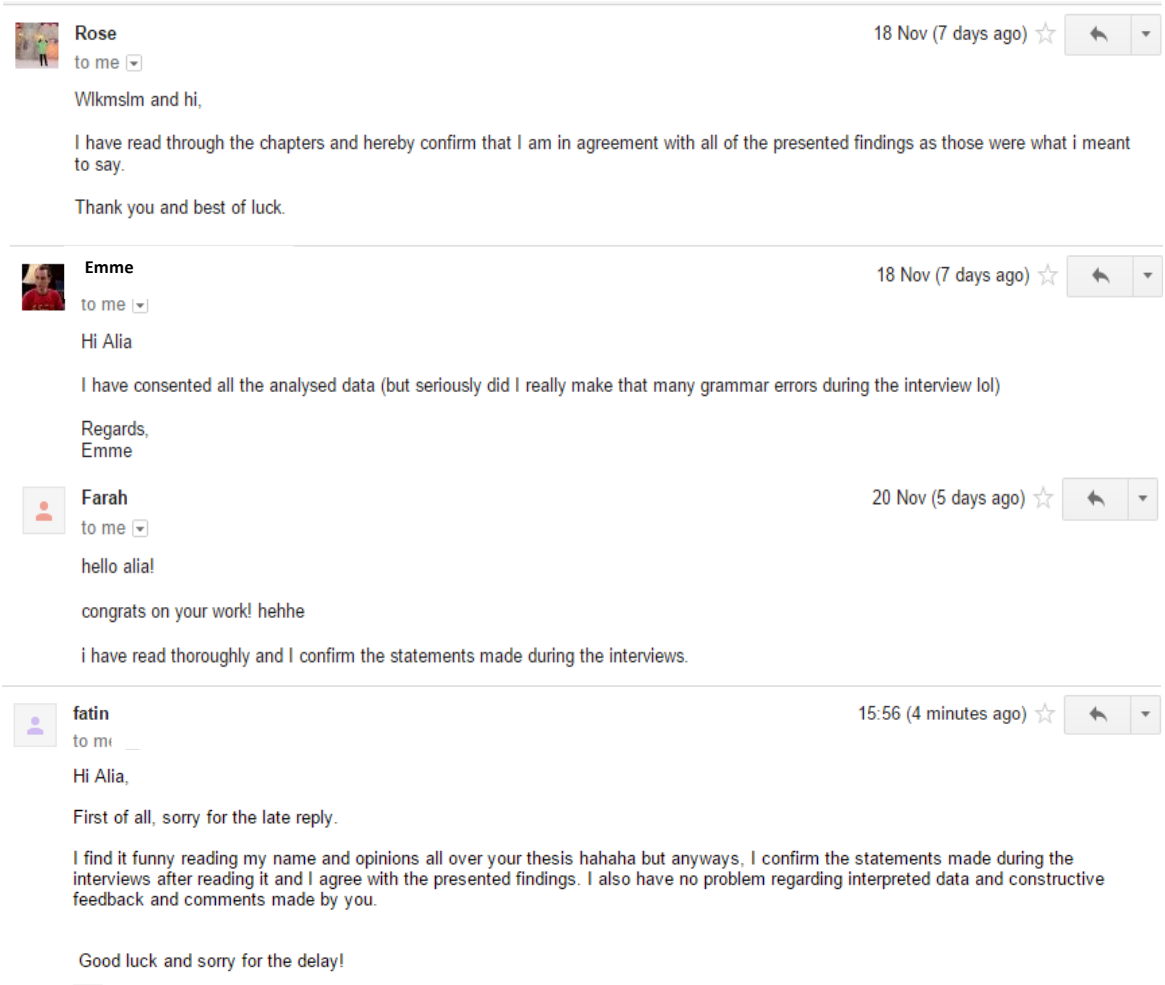

Figure 1. Participant responses to inquiries regarding validity of research findings.

Results

Ensuring the implementation of appropriate digital designs and students' access to education outside of the physical classroom are crucial for their learning outcomes. This research revealed three significant features of Edmodo that may enhance learning experiences—namely, novelty of tasks, favorable learning environment, and mobility.

Novelty of Tasks

One of the many ways Edmodo helps to break barriers in the conventional classroom is by offering an abundance of tasks that are within teachers' and students' locus of control, which is an element not available in social network platforms. The participants shared one of the features that aids in enhancing learning experience, which is quick buttons for creative assessments (Hung & Khine, 2006). Choices of assessments on Edmodo may vary depending on teachers' objectives for the lesson and include options such as fill in the blanks, multiple-choice questions, true-false, short answer, matching, poll, assignments, and many others. These materials allow teachers to create resourceful tasks and engage students in activities beyond the confined classroom. Additionally, participants agreed that Edmodo may help reducing workload, as teachers do not have to print worksheets, make copies, distribute them to students, and discuss the answers in the next lesson. Rather, teachers can simply create assessments and post them on Edmodo, while concurrently allowing students to do the assessments at their own pace and comfort. Moreover, at the end of the task, Edmodo will show the correct answers along with areas/questions that students answered incorrectly, which will indirectly help by giving students constructive and corrective feedback they need in order to progress in learning effectively.

Below are excerpts where participants shared their views on the advantages of engaging activities on Edmodo. A participant named Fatin commented that interactive quizzes that provide feedback at the end of the task serve as good ongoing exercises for summative assessments. Meanwhile, Emme contended that quizzes evoke a feeling of excitement as students are completing it:

> Quizzes help make learning interactive. You (the researcher) also gave us the fill-in-the-blank task, which in my opinion, such assessment offers freedom for the students to give answers, and in the last part of the task they'll know about their overall performance. Through this way, they are learning in an informal environment and able to improve themselves too at the end of the task. Plus, it has time limit, it's good because it teaches students to answer questions within the time given, therefore it's a good preparation and practice for summative assessments. (Fatin)

> I learned that we can do quizzes through Edmodo and finish it within the time given. Generally, it's exciting because it makes students focus and think faster. (Emme)

Additionally, Figure 2 illustrates the corrective feedback for students upon finishing the assigned quiz where Edmodo shows the questions and answers along with indications on which questions students answered wrongly.

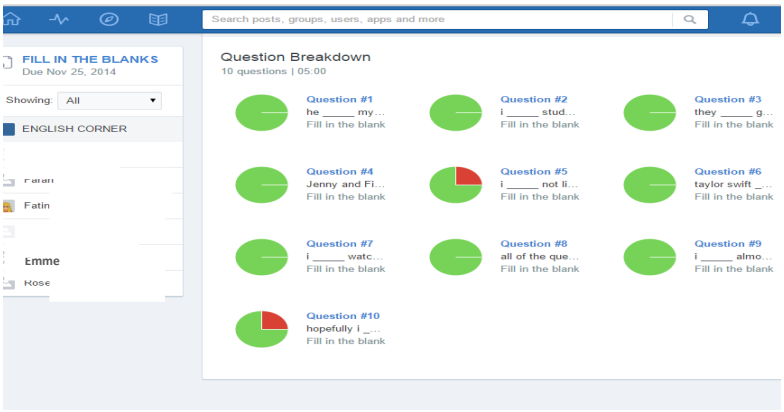

Figure 2. Corrective feedback.

In addition, a participant named Farah said that besides quizzes, the poll is another noteworthy feature on Edmodo which makes teaching and learning interactive as well as less time-consuming as opposed to gathering feedback by going through every student in the classroom:

> Quizzes are really fun and the 'poll' feature is also noteworthy because you can get quick opinions just by voting. (Farah)

Further, Figure 3 demonstrates how the poll feature appears on the platform, which is followed by the comments section, whereby students may discuss and interact with peers about the poll posted. All of these aspects contribute to be a form of novelty of tasks on Edmodo.

Figure 3. Edmodo poll.

Participants further commented on the "reaction" and "badges" buttons, where teachers may give immediate response and feedback. In a physical classroom, teachers usually give feedback, compliments, and comments in the exercise books after assessing the work submitted by students (Woroniecka, 1998). Edmodo uses the same idea for teachers to give responses, but in a digital form. Giving credit to students when it is due is significant, as it boosts their intrinsic motivation to do better and learn from their mistakes. These features are an example of gamification, whose goals are to maximize enjoyment and engagement through

capturing the interest of learners and inspiring them to continue learning (Kiryakova, Angelova, & Yordanova, 2014).

A participant shared that gamification on Edmodo is appealing and engaging when she wants to respond on a post's thread, while another participant named Fatin thinks gamification is an excellent approach to giving feedback to students as well as providing students with the emotional support they need in their learning process:

> In terms of fun, there's a 'reaction' button, I thought that is cute and quick as you can give emoticons as a response on the thread. (Farah)
>
> Teachers can give compliments to students if they participated in discussions because it has a feature where it can give badges to students. It's similar to drawing 'stars' in their exercise books after checking and marking their assignments. I do think students like to be praised and those badges may boost confidence and motivate them to accomplish tasks. (Fatin)

Figure 4 displays how gamification looks on Edmodo, where each reaction carries a meaning in order to help students and teachers to easily understand what the reaction/emoji means.

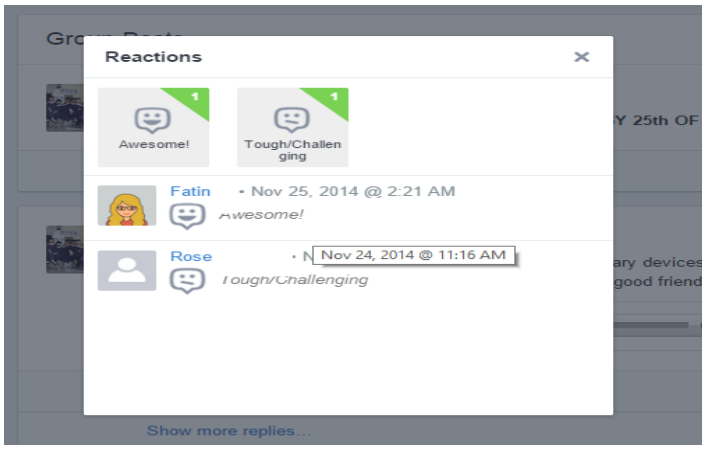

Figure 4. Reaction button.

Contrary to the drilling of reading and writing activities in a physical classroom, which cause students to be easily bored (Wang, 2007; Chu, 2001), Edmodo offers various types of assessments that will be appealing and attractive to enhance students' learning experiences. Participants further remarked on these features on Edmodo that assist in the creation of innovative and authentic assessments:

> If the teacher posts music clips, you can listen to it as well. You (the researcher) asked us to listen to the friendship song (one of the assessments), I listened to it many times as the song was nice and I learned about the messages and themes the singer wants to convey. Besides, it's entertaining as you get competitive with your friends, you can observe who did best and who already sent in their work. (Farah)
>
> Edmodo also has a feature where you can create many kinds of tasks, thus I believe students will not get bored doing different virtual activities. (Fatin)

Authentic and diverse assessments are deemed prominent in assisting students in their learning outcomes. Engaging students beyond the physical classroom and allowing them to improve themselves via virtual tasks are excellent teaching and learning strategies in guaranteeing better results in education. Participants' emotions regarding the novelty of tasks may be linked to the aforementioned Darwinian perspective, which postulates emotions as evolved phenomena with important survival functions that solved certain problems we have faced (Darwin, 1965). Edmodo's features are profoundly helpful for improving students' retention rate, engrossing them in the lessons, and fulfilling their emotional needs when teachers provide positive reactions.

Favorable Learning Environment

Edmodo's involvement in the learning process can be manifested via the suitable learning environment it provides. For example, its atmosphere is conducive to learning due to positive feedback, acceptance, climate, and culture, resulting in peer tutoring and student engagement. In addition, students feel at ease conversing and conducting discussions among themselves due to the reassuring and informal setting of the virtual classroom:

> Through Edmodo, students can see the lessons become quite informal; it's more on acquisition of knowledge and learning process. They know that learning doesn't stop in class, there's a website they can independently explore to do tasks and improve themselves. (Emme)

> It's both formal and informal at the same time. It seems like you are logged in to your social networking site but the content is educational. (Fatin)

Figure 5. Example of student engagement.

Emme and Fatin posited that Edmodo provides an informal environment and extended lessons after school hours, which resulted in providing a safe haven for learning as well as feeling welcomed and independent in navigating their learning process. In Figure 5, we may discern how participants openly shared their feelings and personal recollections. Such activity indirectly helps to create strong engagement among students in the lesson. We can also witness how they conversed naturally in an informal manner yet were able to use proper language items, indicating that they know how to communicate effectively with the target audience. Fatin also

added that such an environment may help some struggling students who refuse to talk in public due to lack of confidence:

> Its informal environment enhances learning by helping students who are shy to talk, not participating in class and lack of confidence to express their opinions. For example, when the teacher assigns tasks on Edmodo, maybe those students will get to express and exchange ideas better. Later on, it will boost their confidence level and will be able to speak comfortably in public.

Figure 6. Learning environment.

Likewise, Figure 6 supports the idea that Edmodo offers a favorable learning environment where participants get to share their thoughts while benefitting from the activity. In addition, Edmodo is able to convey a momentous change in terms of learning experience. The atmosphere that it provides is said to be healthy and refreshing, as described by Farah and Emme.

The essence of Farah's following response is that Edmodo allows a getaway from the normal physical classroom situations, while Emme stresses the importance Edmodo's capacity to facilitate healthy discussion, because she feels most at ease debating and conveying her ideas without upsetting classmates or friends with her honest opinions:

> I found that in terms of learning; it's new, refreshing and fun. When I said it's new, it's because Edmodo is a social learning platform and not the conventional classroom. (Farah)

> I think Edmodo provides a healthy environment because if I were to discuss with my friends whom I know well, some of them might get offended with what I say and really get emotional at certain point. Thus, I prefer not knowing personally whom I am interacting with on Edmodo because the conversation becomes more neutral as other commentators could be strangers or merely online classmates whom I do not meet or friends with outside of the learning platform. Besides that, I can have a nickname on Edmodo and be more comfortable in sharing my opinions without having to be worried about my identity known to others or upsetting my peers. (Emme)

Additionally, Farah's concept map is bursting with her perceptions of Edmodo as being fun and interactive as she comments on the tool's flexibility in allowing pictures and songs to be shared, good practice for language skills, competitive in a healthy way, and having benefits in terms of peer review. Her concluding concept map elaborately illustrates how she views Edmodo as a suitable tool for students' education.

Figure 7. Farah's concept map about Edmodo: Fun and interactive.

Retrospectively, analyzing participants' opinions shows that Edmodo is conceived to be a refreshing site that provides a healthy learning environment, which consequently implies that Edmodo is apt for teaching and learning purposes. It turns into a change agent and motivator in transforming traditional instructional models by permitting learners to be actively involved in their learning inside and outside of the classroom (Wallace, 2014; Dobler, 2012).

Mobility

Allowing students to be mobile and connected to their education is another integral theme in improving students' learning strategies. Mobility is reckoned as an important characteristic for learning because it allows students to learn at own pace and face less disruption in their daily schedules because they may easily log into Edmodo using any Internet-connected digital device:

> More freedom as I can be mobile, do tasks anywhere at any time. (Farah)
>
> You can even log in through your mobile phone, so I think it's made easier rather than meeting face to face. It makes learning easier and more interactive. (Fatin)

Edmodo enables seamless learning opportunities in different situations, as it is available on mobile phones, iPods, iPads, or any other smart gadgets (Lu & Churchill, 2013). This has become one of the prominent advantages of implementing Edmodo, because both educators and students will get the chance to acquire constant access to education, assignments, progress, updates, and announcements.

Additionally, Fatin intensely appreciated advantages from such a learning platform due to her hectic schedule. According to her, the site gives her an opportunity to stay connected and be involved while maintaining her agenda as an active student on campus:

> Edmodo enhances learning and takes education to a whole new level. I find it flexible because you can do tasks anytime and anywhere because I am actually quite a busy student as I am involved with sports and other activities. This site encourages me to do assessments and tasks according to my time. I can plan when and how to do my tasks, therefore it is very convenient for me. (Fatin)

Figure 8. Illustration of Edmodo's mobility.

Figure 8 depicts how Edmodo looks on a smartphone. The overall outlooks on mobile devices are very minimalistic, yet within students' locus of control. This means the features on mobile version are not as clear or fully available compared to the desktop version. However, despite the limitations, the mobile version still manages to support important features, such as posting, updating, responding, and viewing threads. Consequently, Edmodo's mobile version provides a good learning experience while allowing students to be flexible with their daily schedule yet connected to their education anytime and anywhere. The theme of the importance of mobility may be associated with the chosen theoretical approach in the study, whereby the cognitive perspective emphasizes the connections between thought and emotion. This perspective views all emotions as being dependent on appraisal, the process by which events in the environment are judged as good or bad by those who experience them (Arnold, 1960). Participants in this study evidently prefer to have more freedom and autonomy as to when and how they may enhance their learning experience; therefore, constructivism is the apt theoretical approach because it is able to explain participants' emotions pertaining to the theme of mobility (Charon, 2001).

In a nutshell, these three core themes help in assisting students to remain connected to their education. The supports are Edmodo's capacity to allow mobility, provide a favorable learning environment, and offer novel tasks, which resulted in students feeling relaxed and engaged. These features permit students to gain a sense of tranquility, learn appropriate skills, and be amused while they are on the site (Thien et al., 2013). Due to all of the themes identified above, participants deemed Edmodo to be properly equipped to help students stay connected and retain information longer.

Discussion

Edmodo is an example of a social learning platform that converts the practice of conventional teaching and assists in the quest of knowledge seeking when it is employed to conduct assessments after classroom hours by broadening the amount of resources available to the students, especially with the advancement of Internet and web-based applications (Rais & Hashim, 2004). Through Edmodo, students can go beyond the textbook while having an authentic learning experience, and ensuring engagement with students' learning curve can further be enhanced with properly designed assessments (Hung & Khine, 2006). Edmodo provides a feature where interactive assessments can be easily made; it is all just a click away. As students facilitate their own discussions and learning, the educator's role is to monitor the progress and ensure no students fall out of the topic or deviate from the focus of the tasks assigned. At present, rote learning is no longer appropriate; therefore, providing diverse assignments is important. Students who are engaged and immersed with their learning curve will share more of their recollections in terms of their personal experience, new inputs that they encounter, photos, documents, and many other things, as there is a sense of trust in the online community (Anderson, 2010).

Meanwhile, Hung and Khine (2006) state that "engagement with learning is likely to mean engagement with technology" (p. 9). The notion denotes that learners need to be engaged with technology in order to have a holistic and encouraging engagement with learning. Moreover, the practice of individual competition can be decreased by having more collaborative efforts with peers. Group work is often disregarded when teachers are more concerned about individual achievements, which stimulates competition between individual students (Slavin, 1995). Therefore, two-way interactions on Edmodo may give students a voice and liberate them to have autonomy on their personal learning curve (Wahit & Mohd, 2013). In addition, allowing students to gain an access to their education helps in lowering negative perceptions, low cognitive achievements, and undesirable attitudes (Victori & Lockhard, 1995).

Further, participants posited that one of the most supportive features of Edmodo is the capacity for students to be mobile while having freedom to access the site anytime and anywhere. Appraisal on this particular feature transcends what participants in this study commented, as other researchers similarly obtained and emphasized on the same theme: mobility (Chandler & Redman, 2013; Lu & Churchill, 2013). Further, mobility enables seamless learning opportunities, which bring students closer to their education (Bledsoe & Simmerok, 2013). In review, mobility is an essential aspect that permits learners to always have the capacity to access their education at their convenience. Additionally, in the digital world we live in today, providing continuous openings for students to be mobile while connected to their learning experience should be easily made possible, particularly with the advancements of Web 2.0 tools, social learning networks, and many others.

Besides these benefits, students' attitudes have been proven to be a strong motivation for the use of online social platforms (Shittu, Gambari, & Sule, 2013), and perceptions collected in qualitative representations do visibly ascertain students' reasons for their beliefs (Gamble et al., 2013). Therefore, through this study on Edmodo, we have been enlightened on many features that are usually available on social learning platforms, which may assist in ensuring optimum learning outcomes. We have also learned how and why such feelings emerge. Moreover, the participants explicitly illustrate their learning experience on the site, which is significantly beneficial in understanding how online learning takes place and what method is preferred by learners.

Limitations and Recommendations

Even though Edmodo provides support for students to gain more access and autonomy, it is also noteworthy that every learner does have their own preferences in learning. Lamboy (2003) criticizes how universities have been slow in planning for students' diverse learning styles and adopting new technologies for teaching tactics. This is supported by Dille and Mezack (1991), who argue that technology does have a tremendous relation to students' learning style preferences, which consequently leads to their academic performance. In many cases, Edmodo can be one of the possible solutions to equip and expose students to an out-of-classroom experience, yet what is ideal is a matter of perspective and preference of individuals (Pasch, Langer, Gardner, Starko, & Moody, 1995).

Future studies regarding the use of social learning platforms through Edmodo should attempt to acquire a larger number of participants and diversify their backgrounds. Besides that, other learning materials, such as mathematics, biology, arts, and other subjects, should be tested on the site as well. Time constraint is the main restriction, because with more time, perhaps additional effects or opinions can be obtained. Perceptions of teachers should also be an interesting realm of study related to the implementation of Edmodo. In a nutshell, future studies should look into Edmodo over a longer period with students from several institutions as well as with more participants and researchers from other fields besides language.

Conclusion

In a nutshell, besides the advantages that Edmodo offers users through the diversity of features, it ultimately helps to close the gap between students and their access to education. Wider access to one's education demands willingness to take on more responsibilities and to explore on one's own. Therefore, all of the available options on the site may assist the teaching and learning process and transform students' learning curve to be more comprehensive, holistic, and complete. Digital natives of today would very much appreciate the implementation of social learning platforms, such as Edmodo, because of the benefits they offer. The pedagogical implications of this research are related to how Edmodo may enable students to access learning resources beyond the classroom, and empower student-centered learning. Additionally, with the increased use of technological tools in education, practitioners may find this work interesting as an alternative for students' perusal. This paper has illuminated the techniques Edmodo may assist students' engagement in learning, which essentially is accomplished through a variety of tasks, a suitable learning environment, and mobility. It is evident that Edmodo closes the gap between students and access to their education through the methods described above.

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Impact of a Web-Based Adaptive Supplemental Digital Resource on Student Mathematics Performance

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Abstract
Much literature has presented evidence that supplemental digital resources enhance student performance with mathematics. The purpose of this study was to explore the impact of a web-adaptive digital resource, Think Through Math©, on student performance with state-mandated annual standardized mathematics assessments. This study utilized a quantitative research design and conducted multiple regression analyses among 723 students from a north Texas school district that showed high-levels of use with Think Through Math© during the 2015-2016 school year. Data from Think Through Math© reports and annual standardized mathematics assessments were collected and analyzed from elementary, intermediate, junior high, and high school campus levels. Results of the multiple regression analyses were reported for each campus level, as well as several statistically significant and positive associations.

Keywords: K-12, web-based adaptive instruction, mathematics, digital resources

Sharp, L.A., & Hamil, M. (2018). Impact of a web-based adaptive supplemental digital resource on student mathematics performance. *Online Learning, 22*(1), 81-92. doi:10.24059/olj.v22i1.1133

Impact of a Web-Based Adaptive Supplemental Digital Resource on Student Mathematics Performance

Annual standardized assessments have become the predominant means through which student learning is measured in the United States. Numerous studies have ascertained that traditional supplemental digital resources, such as apps, websites, videos, and software, are effective tools to enhance student performance with mathematics (e.g., Boster et al., 2007; Foster, Anthony, Clements, Sarama, & Williams, 2016; Kiriakidis & Geer, 2014; Securro, Jones, Cantrell, & Blackwell, 2006). While these studies have presented research-based findings to substantiate the positive effects associated with the use of supplemental digital resources during math instruction, the literature has also pointed to possible disadvantages. For example, supplemental digital resources may be cost-prohibitive for schools, as well as time-prohibitive for teachers

(Clark & Whetstone, 2014). Also, supplemental digital resources may have limited effects on student subpopulations, such as underperforming students and English language learners (Rutherford et al., 2014). Moreover, perceptions related to the benefits and value of supplemental digital resources among teachers may influence how they implement and use these resources with students (Martindale, Pearson, Curda, & Pilcher, 2005).

In Texas, student performance in reading, mathematics, writing, science, social studies, English I, English II, Algebra I, biology, and U.S. History is measured annually through the State of Texas Assessments of Academic Readiness (STAAR) program (Texas Education Agency, 2016a). Within the content area of mathematics, students are assessed in Grades 3-8 and also complete end-of-course (EOC) assessments for Algebra I. Beginning in 1999, Texas enacted state legislation, currently known as the Student Success Initiative (SSI), which ties grade advancement for students in Grades 5 and 8 to successful completion of the required STAAR mathematics assessments (Texas Education Agency, 2016b). As schools implement these requirements for students to move to the next grade level, Texas sanctioned the development of various supplemental digital resources to support performance with mathematics among all students with the Texas Students Using Curriculum Content to Ensure Sustained Success (SUCCESS) program (Texas Education Agency, 2016c).

Through the SUCCESS program, Think Through Math© was designated as one of the state-funded vendors to support mathematics instruction for students in Grades 3-8 and Algebra (Texas Education Agency, 2016c). Consequently, a large number of school districts in Texas have provided students with access to Think Through Math© (Think Through Learning, Inc., 2016b). Designed as a web-based adaptive digital resource, Think Through Math© provides supplemental math instruction that aligns with the state-mandated curriculum accessible at any given time. Unlike traditional supplemental digital resources that have been used to support mathematics instruction (i.e., apps, websites, videos, and software), Think Through Math© uses a guided instructional framework that includes many levels of support. This guided instructional framework begins by administering an initial placement test in order to determine each student's level of understanding and gauge their readiness level for instruction. Once this level has been determined, students receive individualized instruction as they advance through interactive, adaptive lessons. During each lesson, students receive instant feedback and also have access to live, qualified math specialists. Throughout the school year, there are also benchmark assessments that the teacher may assign to students in order to obtain a measure of their growth and performance. In order to evaluate the effectiveness of Think Through Math©, this study sought to explore the following question: What impact does high usage of Think Through Math© have on student performance with STAAR mathematics assessments?

Methods

Participants

The population of this study included male and female students who were enrolled in 3rd grade – 8th grade and Algebra I classes throughout a school district located in northern Texas. Participants were selected based upon their level of usage with Think Through Math© during the 2015-2016 school year. Think Through Math© reports were reviewed and revealed that high-level users with the supplemental digital resource were associated with specific teachers at four different school campus levels (see Table 1). Based upon this trend, identified high-level users were categorized by the district's campus level: elementary, intermediate, junior high, and high school.

Grade Group	Grade Levels	Number of Students (*N*)
Elementary	Grade 3	90
Intermediate	Grade 5 & Grade 6	315
Junior High	Grade 7 & Grade 8	259
High School	Algebra I	59

Table 1. High Usage Think Through Math© Users by Campus and Grade Level

Data Collection & Analyses

Data collected for this study included 2015-2016 STAAR mathematics assessment results, which included STAAR scale scores, STAAR performance standards (i.e., Level I: Unsatisfactory Academic Performance, Level II: Satisfactory Academic Performance or Level III: Advanced Academic Performance), and STAAR progress measures (i.e., Not Met, Met, and Exceeded). Data available from Think Through Math© usage reports were also collected, which included each user's:

- initial performance level resulting from the initial placement test (i.e., below level, on level, or above level);
- performance level resulting from most recent benchmark completed (i.e., below level, on level, or above level);
- number of lessons attempted;
- number of lessons passed by scoring an 80% of higher on the pre-quiz or a 70% or higher on the post-quiz;
- percentage of successful completion for on grade level lessons;
- percentage of successful completion for below grade level lessons;
- number of lessons passed by pre-quiz (i.e., scored 80% or higher);
- pre-quiz average;
- post-quiz average;
- average number of problems attempted;
- average number of earned points;
- average number of times that the "Help" feature was accessed during lessons;
- average number of times that the "Live Help" feature was accessed during lessons;
- total amount of time spent in lessons;
- total amount of time spent in lessons during school hours; and
- total amount of time spent in lessons weekdays outside of school hours and all day Saturday and Sunday.

Data collected were entered into IBM SPSS Statistics 22 software, and data sets for each campus level were created for multiple linear regression analyses. STAAR scale scores were assigned as the dependent variable, and data obtained from Think Through Math© reports were operationalized and assigned as independent predictor variables (see Figure 1). Missing values in each data set were treated using pairwise deletion, which included all data except for specific missing values during analyses (Field, 2013). The following null hypotheses were established:

$H_0$1: Think Through Math© usage does not have an impact on student performance with STAAR mathematics assessments at the elementary campus level.

$H_0$2: Think Through Math© usage does not have an impact on student performance with STAAR mathematics assessments at the intermediate campus level.

$H_0$3: Think Through Math© usage does not have an impact on student performance with STAAR mathematics assessments at the junior high campus level.

$H_0$4: Think Through Math© usage does not have an impact on student performance with STAAR mathematics assessments at the high school campus level.

Dependent Variable	Independent Predictor Variables
STAAR Scale Scores	Initial Performance Level Most Recent Benchmark Performance Level On Grade Level Pass Rate Below Grade Level Pass Rate Math Helps Live Helps Total Math Time School Time Evening/Weekend Time *Lessons Attempted **Total Lessons Passed **Lessons Passed by Pre-Quiz **Pre-Quiz Average **Post-Quiz Average **Problems Attempted **Earned Points

Figure 1. Variables for multiple regression analyses. Correlations were revealed among seven independent predictor variables. The independent predictor variable with one asterisk was retained for analyses, and independent predictor variables with a double asterisk were removed from analyses.

Each data set was examined separately to ensure that all assumptions for a multiple regression analysis were satisfied (Osborne & Waters, 2002). Initial analyses of each data set revealed the presence of multicollinearity, which detected correlations among seven independent predictor variables. Upon closer inspection of these variables, it was determined that each provided information related to user performance with lessons. Based upon this redundancy with information, Lessons Attempted was retained as an independent predictor variable and the other six were removed from additional analyses with each data set (see Figure 1). After these modifications were made, follow-up analyses confirmed that each data set satisfied all assumptions for a multiple regression analysis. With each separate analysis (i.e., elementary campus level, intermediate campus level, junior high campus level, and high school campus level), all 11 independent predictor variables were entered into the regression model at the same time (Field, 2013).

Results

Elementary Campus Level

A multiple regression analysis was conducted to test the following null hypothesis: Think Through Math© usage does not have an impact on student performance with STAAR mathematics assessments at the elementary campus level. Descriptive statistics for this analysis were reported in Table 2.

	n	*M*	*SD*	*β*	*t*	*p*
STAAR Scale Score	83	1629.08	98.48			
Placement Performance Level	83	2.72	1.06	0.15	1.58	.12
Most Recent Benchmark Performance Level	83	3.75	0.64	0.05	0.57	.57
Lessons Attempted	83	69.94	38.00	0.27	2.90	.01
On Grade Level Pass Rate	83	0.87	0.13	0.35	2.73	.01
Below Grade Level Pass Rate	83	0.91	0.15	0.24	1.87	.07
Math Helps	83	24.80	32.17	-0.18	-1.14	.26
Live Helps	83	1.93	6.31	0.09	0.57	.57
Total Math Time	83	10:34	7:55	0.15	1.16	.25
School Time	83	10:12	7:58	-0.15	-1.16	.25
Evening/Weekend Time	83	1.47	3:17	-0.20	-1.20	.05

Table 2. Results—Elementary Campus Level

Results showed that Think Through Math© usage explained a significant amount of variance in student performance ($n = 90$) with the Grade 4 STAAR Mathematics assessment ($F(10, 72) = 10.91$, $p = 0.00$), with an adjusted R^2 of .547. These findings suggested that the model accounts for approximately 55% of variance in students' STAAR mathematics assessment scores than would be explained by chance. Based on this finding, the null hypothesis was rejected. As shown in Table 2, this analysis further showed two statistically significant and positive relationships with Think Through Math© independent predictor variables:

- Lessons Attempted ($\beta = .27$, $t(82) = 2.90$, $p = .01$); and
- On Grade Level Pass Rate ($\beta = .35$, $t(82) = 2.73$, $p = .01$).

These findings indicated that these two aspects of Think Through Math© usage have predictive ability on students' STAAR mathematics assessments at the elementary campus level.

Intermediate Campus Level

A multiple regression analysis was conducted to test the following null hypothesis: Think Through Math© usage does not have an impact on student performance with STAAR mathematics assessments at the intermediate campus level. Descriptive statistics for this analysis were reported in Table 3.

	n	*M*	*SD*	*β*	*t*	*p*
STAAR Scale Score	297	1735.07	130.57			
Placement Performance Level	297	2.46	0.80	0.14	2.85	.01
Most Recent Benchmark Performance Level	297	3.05	1.09	0.21	4.78	.00
Lessons Attempted	297	85.53	38.50	0.24	6.01	.00
On Grade Level Pass Rate	297	0.76	0.22	0.51	9.03	.00
Below Grade Level Pass Rate	297	0.91	0.13	-0.02	-0.33	.74
Math Helps	297	25.83	33.30	0.04	0.71	.48
Live Helps	297	1.76	4.87	-0.10	-1.88	.06
Total Math Time	297	10:35	7:49	-0.04	-0.98	.33
School Time	297	12:09	8:18	0.18	4.34	.00
Evening/Weekend Time	297	3:01	3:29	-0.08	-2.09	.04

Table 3. Results—Intermediate Campus Level

Results showed that Think Through Math© usage explained a significant amount of variance in student performance ($n = 315$) on the Grade 6 STAAR Mathematics assessment ($F(10, 286) = 48.19$, $p = 0.00$), with an R^2 of .628. These findings suggested that the model accounts for approximately 63% of variance in students' STAAR mathematics assessment scores than would be explained by chance. Based upon this finding, the null hypothesis was rejected. As shown in Table 3, this analysis further showed five statistically significant and positive relationships with Think Through Math© independent predictor variables:

- Placement Performance Level ($\beta = .14$, $t(296) = 2.85$, $p = .01$);
- Most Recent Benchmark Performance Level ($\beta = .21$, $t(296) = 4.78$, $p = .00$);
- Lessons Attempted ($\beta = .24$, $t(296) = 6.01$, $p = .00$);
- On Grade Level Pass Rate ($\beta = .51$, $t(296) = 9.03$, $p = .00$); and
- School Time ($\beta = .18$, $t(296) = 4.34$, $p = .00$).

These findings indicated that these five aspects of Think Through Math© usage have predictive ability on students' STAAR mathematics assessments at the intermediate campus level.

Junior High Campus Level

A multiple regression analysis was conducted to test the following null hypothesis: Think Through Math© usage does not have an impact on student performance with STAAR mathematics assessments at the junior high campus level. Descriptive statistics for this analysis were reported in Table 4.

	n	*M*	*SD*	*β*	*t*	*p*
STAAR Scale Score	220	1709.10	137.26			
Placement Performance Level	220	2.65	1.02	0.19	2.98	.00
Most Recent Benchmark Performance Level	220	2.84	1.11	0.30	4.52	.00
Lessons Attempted	220	72.15	38.97	0.25	5.47	.00
On Grade Level Pass Rate	220	0.71	0.23	0.36	4.84	.00
Below Grade Level Pass Rate	220	0.84	0.16	0.13	2.02	.04
Math Helps	220	27.90	34.16	-0.62	-1.16	.25
Live Helps	220	1.76	4.39	0.03	0.57	.58
Total Math Time	220	11:50	7:13	-0.02	-0.52	.61
School Time	220	13:20	6:27	0.01	0.34	.74
Evening/Weekend Time	220	6:46	6:00	-0.10	-2.50	.01

Table 4. Results—Junior High Campus Level

Results showed that Think Through Math© usage explained a significant amount of variance in student performance ($n = 259$) on the Grade 7 STAAR Mathematics and Grade 8 STAAR Mathematics assessments ($F(10, 209) = 48.52$, $p = 0.00$), with an R^2 of .699. These findings suggested that the model accounts for approximately 70% of variance in students' STAAR mathematics assessment scores than would be explained by chance. Based upon this finding, the null hypothesis was rejected. As shown in Table 4, the analysis further showed five statistically significant and positive relationships with Think Through Math© independent predictor variables:

- Placement Performance Level ($\beta = .19$, $t(219) = 2.98$, $p = .00$);
- Most Recent Benchmark Performance Level ($\beta = .30$, $t(219) = 4.52$, $p = .00$);

- Lessons Attempted (β = .25, $t(219) = 5.47$, p = .00);
- On Grade Level Pass Rate (β = .36, $t(219) = 4.84$, p = .00); and
- Below Grade Level Pass Rate (β = .13, $t(219) = 2.02$, p = .00).

These findings indicated that these five aspects of Think Through Math© usage have predictive ability on students' STAAR mathematics assessments at the junior high campus level.

High School Campus Level

A multiple regression analysis was conducted to test the following null hypothesis: Think Through Math© usage does not have an impact on student performance with STAAR mathematics assessments at the high school campus level. Descriptive statistics for this analysis were reported in Table 5.

	n	*M*	*SD*
STAAR Scale Score	55	3660.55	240.79
Placement Performance Level	55	1.65	0.67
Most Recent Benchmark Performance Level	55	4.00	2.26
Lessons Attempted	55	56.18	50.32
On Grade Level Pass Rate	55	0.53	0.40
Below Grade Level Pass Rate	55	0.69	0.24
Math Helps	55	15.45	21.10
Live Helps	55	0.47	1.03
Total Math Time	55	10:50	5:51
School Time	55	10:33	5:43
Evening/Weekend Time	55	0:42	2:14

Table 5. Results—High School Grade Level

Results showed that Think Through Math© usage did not explain a statistically significant amount of variance in student performance on the STAAR mathematics assessments ($F(10, 44) = 1.84$, p = 0.08), with an adjusted R^2 of .135. These findings suggested that the model was not statistically significant; therefore, the null hypothesis was not rejected.

Campus Level Overview, Performance Levels, and Progress Measures

An overview for each campus level was created that included specific information related to the scale score state performance standards for STAAR mathematics assessments administered during in March/Spring 2016 (see Table 6). As described previously, Lessons Attempted was an independent predictor variable that had a statistically significant and positive relationship on students' STAAR mathematics assessments at the elementary, intermediate, and junior high campus levels. As shown in Table 6, students at the intermediate campus level attempted a higher number of Think Through Math© lessons (M = 85.53) and achieved higher STAAR scale scores (M = 1735.07) related to state performance standards articulated for these grade levels. Similarly, students at the high school campus level attempted the lowest number of Think Through Math© lessons (M = 56.18) and also achieved lower STAAR scale scores (M = 3660.55) related to state performance standards articulated for Algebra I.

	Lessons Attempted (*M)*	Scale Score (*M)*	Level I: Unsatisfactory	Level II: Satisfactory	Level III: Advanced
Elementary	69.94	1629.08			
4th Grade			868-1453	1457-1657	1670-2068
Intermediate	85.53	1735.07			
5th Grade			931-1487	1500-1710	1724-2091
6th Grade			1021-1523	1536-1671	1772-2188
Junior High	72.15	1709.10			
7th Grade			1007-1563	1575-1787	1798-2214
8th Grade			1005-1590	1595-1832	1854-2236
High School	56.18	3660.55			
Algebra I			1397-3473	3500-4300	4333-6110

Table 6. Campus Level Overview with Scale Score State Performance Standards

Examination of available performance level ratings among students included in data analyses presented interesting findings. As shown in Table 7, almost all of the high level Think Through Math© users at the intermediate campus level (n = 288, 96%) earned a Level II: Satisfactory Academic Performance rating. This same rating was also earned by over two-thirds of the high level users at the junior high campus level (n = 187, 80%) and more than half of the high level users at the elementary campus level (n = 56, 65%). Over 40% (n = 122) of the high level Think Through Math© users at the intermediate campus level earned the Level III: Advanced Academic Performance rating, as well as 37% (n = 32) of the high level users at the elementary campus level and 25% (n = 59) of the high level users at the junior high campus level. Conversely, Think Through Math© users at the high school campus level earned lower academic performance ratings.

	Level II: Satisfactory Academic Performance	Level III: Advanced Academic Performance	Progress Measure: Did Not Meet	Progress Measure: Met	Progress Measure: Exceeded
4th Grade	Yes: 56 (65%) No: 30 (35%)	Yes: 32 (37%) No: 54 (63%)	32 (39%)	38 (47%)	11 (14%)
6th Grade	Yes: 288 (96%) No: 12 (4%)	Yes: 122 (41%) No: 178 (59%)	31 (11%)	174 (61%)	80 (28%)
7th & 8th Grade	Yes: 187 (80%) No: 48 (20%)	Yes: 59 (25%) No: 176 (75%)	115 (50%)	98 (43%)	16 (7%)
Algebra I	Yes: 19 (54%) No: 16 (46%)	Yes: 0 (0%) No: 35 (100%)	34 (97%)	1 (3%)	0 (0%)

Table 7. STAAR Academic Ratings and Progress Measures

Finally, STAAR progress measures also revealed the greatest performance among high level Think Through Math© users at the intermediate campus level. Over 60% (n = 174) of these students demonstrated the expected amount of annual academic growth. Similarly, almost half of the high level users at the elementary campus level (n = 38, 47%) and the junior high campus level (n = 98, 43%) demonstrated the same level of expected academic growth. Further analysis with progress measure data showed that almost 30% (n = 80%) of high level Think Through Math© users at the intermediate campus level exceeded the expected amount of annual academic growth. Not surprisingly, almost all of the Think Through Math© users at the high school campus level did not meet the expected amount of annual academic growth.

Discussion

The findings from this study aligned with previous studies that demonstrated positive effects associated with the use of supplemental digital resources and students' mathematics performance among students at the elementary, intermediate, and junior high levels (e.g., Chappell, Arnold, Nunnery, & Grant, 2015; Clark & Whetstone, 2014; Kiriakidis & Geer, 2014; Martindale et al., 2005; Nunnery & Ross, 2007; Ysseldyke & Bolt, 2007). Among each campus level, Think Through Math© usage accounted for more than half of the variance in students' STAAR mathematics assessment scores than would be explained by chance. Moreover, findings reported for each campus level identified aspects of Think Through Math© that had statistically significant and positive predictive ability on students' mathematics performance with the STAAR assessments, particularly at the intermediate and junior high campus levels. Notably, two specific aspects of Think Through Math© (i.e., the number of lessons attempted and the number of on grade level lessons passed) were identified as significant and positive predictors for students' mathematics performance for all campus levels.

Findings from this study did not demonstrate positive effects resulting from Think Through Math© usage among high level users at the high school campus level. Previously published studies have revealed mixed findings related to the use of supplemental digital resources among high school students (e.g., Campuzanno, Dynarski, Agodini, & Rall, 2009; Cavalluzzo, Lowther, Mokher, & Fan, 2012; Martindale et al., 2005; Smith & Suzuki, 2015). However, this campus level included the smallest number of high level Think Through Math© users. With this in mind, it is recommended that additional research be conducted that explores the impact of Think Through Math© usage with high school students' mathematics performance.

Findings from this study have suggested that higher levels of Think Through Math© usage correspond to greater levels of performance on STAAR mathematics assessments. As shown in the campus level overview, the highest level of activity and STAAR scale scores were reported among Think Through Math© users at the intermediate campus level. Additionally, nearly all of these users achieved a satisfactory academic performance rating (i.e., Level II) and almost half achieved an advanced academic performance rating (i.e., Level III) on their STAAR mathematics assessments. Furthermore, when compared to high level Think Through Math© users at the elementary, junior high, and high school levels, users at the intermediate campus level exhibited the highest level of expected annual academic growth, as well as annual academic growth that exceeded the expected amount. These findings have presented empirical evidence that both corroborate and extend findings from previously published case studies related to Think Through Math© usage among students in Texas (Think Through Learning, Inc. 2016a).

Finally, findings from this study have pointed to the importance of sustained fidelity with implementation of supplemental digital resources. It is vital to acknowledge that "teacher adherence to and students' engagement" with supplemental digital resources have a larger impact on student

performance than time (Crawford, Carpenter II, Wilson, Schmeister, & McDonald, 2012, p. 233). It is equally important that teachers utilize supplemental digital resources with the same level of attention, diligence, and rigor as a teacher-led instructional supplement. Also, teachers must continually monitor students' progress with supplemental digital resources that are selected as extensions for mathematics instruction (Bolt, Ysseldyke, & Patterson, 2010).

As school leaders strive to use supplemental digital resources with fidelity, it is imperative that they provide teachers with initial training and subsequent professional development (Clark & Whetstone, 2014). Teachers must be familiar with the components and structure of selected supplemental digital resources as well as the corresponding guidelines for use (Crawford et al., 2012). School leaders must also recognize that the implementation of selected supplemental digital resources is heavily influenced by beliefs and perceptions among teachers (Clements, Sarama, Wolfe, & Spitler, 2015). Teachers must be familiar with the advantages associated with the use of selected supplemental digital resources as well their benefits to students (Clark & Whetstone, 2014). Therefore, school leaders should make strategic efforts to collect empirical evidence regarding the impact that selected supplemental digital resources has on student performance and share this data with teachers. Teachers are more likely to support "sustained fidelity of implementation to a program that has demonstrated improved child achievement" (Clements et al., 2015, p. 445).

Limitations

Although this study presented promising findings related to the impact that Think Through Math© usage has on student performance, there were a few limitations. First, this analysis was limited to high level Think Through Math© users. As a preliminary analysis, exploring the impact that Think Through Math© usage had on overall student performance was appropriate. However, it is recommended that follow-up studies compare the academic performance of students who have varying levels of Think Through Math© usage, including students who have none. Further, we recommend that analyses explore the impact of usage among gender, race/ethnicity, socioeconomic status, and special student populations (e.g., bilingual students, English language learners, gifted and talented learners). With this in mind, additional studies may identify optimal concentrations of Think Through Math© usage, such as the identification of an optimal number of lessons attempted or an ideal number of on grade level lessons that a student must pass, among specific groups of students.

Another limitation of this study was its exclusion of perceptions among stakeholders. Since many findings reported presented positive results related to Think Through Math© usage, it is recommended that follow-up studies utilize qualitative methods to explore how implementation of this supplemental digital resource was perceived by students, teachers, school administrators, and stakeholders beyond the school campus. Since previously published studies have highlighted the potential influence of teachers' perceptions of the use of supplemental digital resources (Clark & Whetstone, 2014; Clements et al., 2015), it is recommended that additional studies be conducted that include all stakeholders.

Author Note

This study was conducted in order to evaluate the effectiveness of Think Through Math© as a supplemental digital resource for mathematics instruction. We are not employees of the company, and we were not compensated in any way for our work. Our primary goal was to explore the value of Think Through Math© as an online teaching and learning tool

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Computer Science Students' Attitudes Towards the Use of Structured and Unstructured Discussion Forums in Fully Online Courses

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Abstract
This study aims to investigate and analyze the attitudes and opinions of computer science students at two academic colleges of education with regards to the use of structured and unstructured discussion forums in computer science courses conducted entirely online. Fifty-two students participated in two online courses. The students in each course were divided into two groups: the experimental group, which participated in a structured discussion forum, and the control group, which participated in an unstructured discussion forum. The questionnaire used for data collection consisted of closed and open-ended questions. The results revealed that the attitudes towards the use of discussion forums of students who participated in the structured discussion forum were positive compared to the attitudes of students who participated in the unstructured discussion forum. Based on the results of the study, the researcher suggests some appropriate recommendations.

Keywords: online learning; structured discussion forum; attitudes of computer science students

Tibi, M.H. (2018). Computer science students' attitudes towards the use of structured and unstructured discussion forums in online courses. *Online Learning, 22*(1), 93-106. doi:10.24059/olj.v22i1.995

Computer Science Students' Attitudes Towards the Use of Structured and Unstructured Discussion Forums in Fully Online Courses

The continued development and growth of internet-based technology has resulted in the development of many approaches to teaching and learning, manifested in various forms of online learning. In a traditional face-to-face class, students have several opportunities to interact with their instructor and to collaborate with their fellow students. Creating similar opportunities for meaningful discussion and collaboration in an online course is one of the biggest challenges of online instruction (Kelly, 2010).

Several modern computer-mediated communication (CMC) technologies can be utilized in online courses for the purpose of increasing collaborative interactions among the participants. Concurrently, the use of an asynchronous discussion forum (DF) is increasing in asynchronous

online learning (Fear & Brown, 2014; Zhou, 2015). Asynchronous DFs play a substantial role in humanizing online courses by replicating the classroom experience of information exchange and community building, not just between students and their instructor but also among the students themselves (Saadé & Huang, 2009). In addition, these forums can be used to support, encourage, and facilitate learning. DFs can be unstructured or structured. An unstructured DF is primarily used to ask questions and obtain answers and feedback from participants rather than to post planned discussion topics (Yang, Newby & Bill, 2008; Gao, 2014). In contrast, a structured DF provides well-designed and planned discussion activities with specific topics and goals (Yang et al., 2008), and has clear interaction and collaboration rules (Biesenbach-Lucas, 2004; Brooks & Jeong, 2006).

Since interaction and collaboration through DFs can be an important factor in student success, positive student attitudes towards the use of DFs are linked to positive attitudes about asynchronous online learning in general. The aim of this study is to investigate and measure students' attitudes toward the use of structured and unstructured DFs in fully online computer science courses. Specifically, the present study sought answers to the following questions: What are students' attitudes towards the use of structured and unstructured DFs? What are students' suggestions regarding the use and the structure of DFs in computer science online courses?

Review of Related Literature

Constructivism emphasizes social interaction as a basis for knowledge construction. Paloff & Pratt (2007) emphasize that "key to the learning process are the interactions among students themselves, the interactions between faculty and students, and the collaboration in learning that results from these interactions" (p. 4). Many educators agree that interaction and discussion between students and their instructor and among students themselves are critical to promote and enhance online learning (Anderson, 2003; Dalelio, 2013; Muirhead & Juwah, 2004; Palloff & Pratt, 2007; Saadé & Huang, 2009; Swan, 2002; Wegmann & McCauley, 2014). How online courses are organized, therefore, is an essential component of improved interaction and collaboration among students.

Asynchronous DFs provide opportunities for collaborative learning and teaching transactions (Kelly, 2010; Saadé & Huang, 2009) in asynchronous online courses. Participation in a DF demands that students become actively engaged with the course content and learning activities. Through interaction with their peers, students learn to negotiate the meaning of the content (Fear & Brown, 2014; Serena, 2009). DFs also allow the creation of collaborative knowledge, since learners work together, exchange information, share resources and ideas, and comment on each other's work (Gao, 2014; Preece, 2000; Serena, 2009). Markel (2001) maintained that students construct knowledge through the shared experiences that each participant brings to collaborative discussions. However, studies show that simply asking students to participate in DFs is not likely to generate an effective collaborative learning environment (Ali & Salter, 2004; Andresen, 2009; Gilbert & Dabbagh, 2005).

Unstructured and Structured Discussion Forums

A DF can be unstructured or structured. An unstructured DF does not include planned discussion, nor does it provide rules for interaction and collaboration among participants. It is primarily used to ask questions and obtain answers and feedback from participants; therefore, it

requires students to create their own discussion (Yang et al., 2008; Salter & Conneely, 2015). Unstructured DFs are sometimes used by students for personal peer communication. In contrast, a structured DF provides well-designed, organized, and planned discussion, usually set by the instructor with specific topics and goals (Yang et al., 2008). In addition, a structured DF has clear interaction, collaboration, and etiquette rules (Biesenbach-Lucas, 2004; Brooks & Jeong, 2006). Researchers have argued that a major challenge facing instructors of online courses is to structure asynchronous discussions that will engage students in meaningful discourse (Gilbert & Dabbagh, 2005; Wallace, 2003; Wozniak & Silveira, 2004).

Previous research has shown that structured DFs are more effective than unstructured DFs for the acquisition of different kinds of knowledge, in particular know-*how* (refers to the ability to do something) and know-*why* (refers to knowledge about the nature of causality in the human mind and in society) (Tibi, 2013). It has also been shown that structured DFs are more effective for the improvement of critical thinking skills (Aviv, Erlich, Ravid & Geva, 2003; Gilbert & Dabbagh, 2005; Yang et al., 2008) and collaborative skills (Tibi, 2015) than are unstructured DFs. Salter and Conneely (2015) found that structured DFs were generally perceived by students to be more engaging than unstructured DFs.

Purpose of the Study

The purpose of this study is to investigate whether the introduction of structured DFs into computer science fully online courses is effective in terms of improving students' perceptions of the learning environment and their attitudes towards the use of DFs.

Methods

Research Objectives

The purpose of the present study is twofold:

- To investigate and measure students' attitudes towards the use of structured and unstructured DFs in fully online computer science courses;
- To explore students' suggestions that might help in redesigning the DF for a better learning experience for the learners.

On the basis of these research objectives, the following study hypotheses will be examined:

Hypothesis 1: instructor feedback will significantly affect discussions in the two types of DFs (structured and unstructured).

Hypothesis 2: students of the structured DFs will share significantly more knowledge among themselves than students of the unstructured DFs.

Hypothesis 3: student perception of the overall structure and organization of the two types of DFs (structured and unstructured) will differ greatly.

Research Participants

The participants in the survey are Arab students in computer science programs at two academic colleges of education. Both colleges are located in the center of Israel and are heterogeneous in the following respects: (1) students come from different villages and towns located in north, center, and south of Israel; (2) students come from families with variable socioeconomic and educational status. All participants began post-secondary education

immediately upon completion of high school. In education colleges, students study computer science in order to teach it in elementary and junior high schools. Thus, in addition to computer science courses, students in education colleges also study courses in pedagogy and education.

In this study, two different computer science online courses with a total participant count of 52 students were examined. Both courses, entitled "*Internet Programming using JavaScript,*" had the same content and instructor. The number of enrollees in the first course was 28 students, and in the second course, 24 students. Students in each course were randomly divided into two equal groups. One group participated in an unstructured DF and was considered the control group (N=26). The other group participated in a structured DF (i.e. the treatment) and was considered the experimental group (N=26). Instruction was offered in Arabic since the instructor and all students are Israeli-Arabs.

Research Instrument

The instrument used in the survey was a questionnaire distributed to all participants during a face-to-face meeting at the end of the course. The questionnaire consisted of close-ended questions that were answered on a five-point Likert scale, ranked from 1-5 with 1 indicating "strong disagreement" and 5 indicating "strong agreement," and of open-ended questions asking students to provide their opinions and suggestions about the use of DFs in the online course.

Design of the Structured Discussion Forum. The structured DFs used in this study consisted of the following three elements: (1) preparatory instructions about individual participation, (2) instructions about group collaboration, and (3) the instructor's role in organizing the discussion. The following is a summary of steps taken to design the structured DF.

- In the first step, the instructor explained how students would be evaluated in the course, the purpose and nature of the discussions in the DFs, and the rules for participation in the DFs in order to keep the discussions organized. The assessment rubric given to students consisted of the following elements: (1) grade weight of participation in the discussion forums, (2) grade weight of the examination, (3) grade weight of individual assignments and (4) grade weight of the final group project.
- The instructor then constructed small groups of three or four students with mixed knowledge levels. Each group received a group name.
- The instructor established a DF for each small group.
- Students were then informed about the objective of establishing small group DFs and encouraged to use these forums to enhance their interaction and collaboration around the learning materials and group learning activities.
- Students were requested to participate actively in two discussion groups. The first was the central DF where students from all small groups participated; the second was the small group DF. The role of the instructor in each group discussion was explained.
- The instructor was actively involved in the central DF to create a learning environment that motivated students to construct knowledge through meaningful interaction with each other as well as with their instructor. The instructor regularly posted questions on different levels of knowledge and provided feedback to students' posts.

- The instructor posted lists of questions and problems to be solved and related each question to a different student. Students then answered the questions directed to them and, as requested, offered comments on other students' answers within a given period of time.
- In the middle of the semester, the instructor organized a group activity that asked each group of students to study a different subject and to prepare a learning unit about it. The subject they received included three questions, each related to a different kind of knowledge.
- Each group was then required to study and discuss a learning unit of a different group, as specified by the instructor. They were asked to post answers to the questions and to comment on the learning unit within a specified deadline. Then, each group was requested to review the feedback they received and to comment on it.
- Aside from continuous feedback and support throughout the course, the instructor also sent monthly personal, positive feedback to students about their level of participation, which motivated students with low participation to be more active in the DFs.
- At the end of the semester, each small group of students was required to complete a final project which was clearly described by the instructor.

Design of the Unstructured Discussion Forum

Students of the control group participated in the unstructured DF. At the beginning of the online course, the instructor explained how students would be evaluated in the course. The instructor emphasized the importance of using the DF for information exchange and feedback among participants. The instructor also encouraged students to use the DF whenever they had questions regarding vague learning materials. The instructor responded to all questions directed to him. In addition, the instructor posted questions about the learned course materials to the DF without directing these questions to individual students. The role of the instructor in the unstructured DF was more "guide on the side," jumping in when necessary, rather than actively designing, organizing, and planning the discussions. Students of the unstructured DF were not requested to work in small groups or to lead any group activity. Students submitted their work/project individually. On the other hand, they had the opportunity to organize and manage the discussions as they liked and to collaborate with each other. Thirty percent of the final grade was given for active participation in the structured as well as in the unstructured DFs.

Limitations of the Study

Effective evaluation of student participation in discussion forums, whether in structured or unstructured forums, would require a more detailed assessment rubric. The use of a grading rubric that includes standards of performance is one factor that affects the quality of the discussion forum (Craig, 2015). In addition, giving students clear information about how participation in discussion forums will be assessed provides extrinsic motivation. The lack of a clear and detailed grading rubric to assess discussion forums in this study was one of its limitations and weaknesses.

Results

The number of respondents who completed the survey was 52; half participated in the structured DFs and the other half participated in the unstructured DFs. In general, students had significantly more positive responses (quantitatively and qualitatively) about participation in the structured DFs compared to those who participated in the unstructured DFs. First, quantitative results will be shown and then qualitative responses to open-ended questions will be described.

Quantitative results suggest that students responded more positively to the structured DF (M=4.20, SD=.55) than to the unstructured DF (M=3.38, SD=.81). The following paragraphs describe the results from both groups (structured and unstructured) according to the statements that were given to students in order to examine the three hypotheses of the study (See Table 1 for quantitative analyses of the statements).

	Statement	Structured DF		Unstructured DF	
		Mean	SD	Mean	SD
Q1	My participation in the DF contributed to the building of knowledge by other classmates	4.04	.60	3.12	.86
Q2	The instructor's role in organizing the discussion within the DF was clear	4.08	.48	3.38	.90
Q3	Getting feedback on the DF from the instructor helped me understand the course materials better	4.19	.49	3.85	.83
Q4	I think that my willingness to share knowledge with others has increased	4.15	.37	3.69	.47
Q5	I liked the way the DF was organized	4.23	.59	2.69	.84
Q6	I think that the forum content was not well organized	1.46	.51	1.96	.72
Q7	I think the participants of the DF shared a lot of knowledge with each other	4.04	.66	2.27	.87
Q8	Getting feedback on the DF from the instructor motivated me to participate more in the DF	4.38	.64	3.38	.85

Table 1. Quantitative Study Questions

Hypothesis 1: Instructor Feedback

Instructor feedback and support in DFs is important for students because it promotes effective interaction and collaboration among group members. Students were asked whether the instructor's feedback motivated them to participate more in the DF (Q8). Students of the structured DF agreed with this statement (M=4.38, SD=.64) more than students of the

unstructured DF (M=3.38, SD=.85). Students of the structured DF also agreed with the statement that "the instructor's feedback helped them understand the course materials better" (M=4.23, SD=.51) more than students using the unstructured DF (M=3.81, SD=.85). See Table 1 for this and all other quantitative analyses. The category of statements (C1) for measuring hypothesis number 1 consisted of the three statements Q2, Q3, and Q8. The Cronbach's Alpha for this category was .746, which shows good reliability. Means and standard deviations for this and other categories are listed in Table 2.

Hypothesis 2: Knowledge Sharing

Hypothesis 2 suggested that students of the structured DF shared more knowledge among themselves than students of the unstructured DF. The category of statements for measuring this hypothesis consisted of the three statements Q1, Q4, and Q7. The Cronbach's Alpha for this category was .673, which is almost good reliability. The results show that students of the structured DF reported sharing significantly more knowledge among themselves (M=4.34, SD=.46) than students using the unstructured DF (M=3.28, SD=.53).

Category	Group	N	Mean	Std. Deviation	T value (Df=50)
C1	structured	26	4.07	.41	8.45***
	Unstructured	26	3.02	.48	
C2	structured	26	4.34	.46	7.63***
	Unstructured	26	3.28	.53	
C3	structured	26	4.23	.41	4.54***
	Unstructured	26	3.52	.67	

*** p<.001

Table 2. Means, Standard Deviations, and T value of Each Category for Testing the Hypotheses in Both Groups

Hypothesis 3: Student Perceptions of Overall Structure and Organization

Hypothesis 3 suggested that there would be differences in how students find the overall structure and organization of the DF (statements Q5 and Q6). Students using the structured DF agreed with the statements Q5 and Q6 (M=4.23, SD=.41) more than students using the unstructured DF (M=3.52, SD=.67). The result of the Pearson correlation was found to be positive (r=.27, P=.058).

In the three categories C1, C2, and C3 that measured hypotheses H1, H2, and H3 respectively, the results showed that students of the structured DF had significantly more positive responses than students of the unstructured DF. Table 2 shows the result of the conducted t-test for independent sample.

Qualitative Comments

The questionnaire also included open-ended questions. Students were asked to describe what they liked or did not like concerning the organization and structure of the DF. They also had the opportunity to share their observations and suggestions. The following is a summary of comments by students concerning the points raised as answers to open-ended questions.

Organization and Management of the DF

Students were asked to describe what they liked and did not like regarding the organization and management of the DF. Almost all of the qualitative comments given by students from both groups to this particular question were positive. This result is in agreement with the quantitative results obtained from the statement Q6. Table 3 shows the qualitative comments given by the students to this question.

Group	Liked	Did not like
Structured	The organization was very good	Sometimes discussion topics were not closed
	The management was very good	
	The comments of the instructor were clear	At first it was stressful because of the tasks
	Precise timing	
Unstructured	The organization and management were good	Little monitoring of instructor
		Sometimes the responses were late
	Things were clearly organized	

Table 3. Qualitative Responses to the Organization and Management of the DF

Participation and Interaction in the DF

Students were also asked to discuss what they liked or did not like concerning the participation and interaction in the DF (Table 4). Qualitative responses from both groups differed. Students of the structured DF found the level of participation and interaction significantly higher than that found by students of the unstructured DF. This difference can be supported by the quantitative results obtained from statement Q7. This lends support to the suggestion that students in the structured DF interacted and shared more together than did students of the unstructured DF.

Group	Liked	Did not like
Structured	I liked the participation and interaction; it encouraged the group members.	Not everyone participated in the same level.
	We cooperate for success.	Not everyone responded to my post.
	Good, but it took a lot of time.	Some students had little participation.
	The communication of the instructor with us was outstanding and helped us in many situations.	The participation in the DF required a lot of time.
Unstructured	Not high. After answering the questions, the debate almost ends.	Participation was not in a significant level.
	There was no high-level interaction, but we benefited from it.	The interaction between the students was weak.
		I did not like it. Everyone was working alone.

Table 4. Qualitative Responses about the Level of Participation and Interaction in the DF

Questions and Tasks Given in the DF

Another questionnaire item dealt with the type of questions and tasks given by the instructor in the DF. Students were requested to comment on what they liked or did not like with regards to the questions and tasks given in the DF. The responses of students participating in the structured DF were clearly more positive than those offered by students of the unstructured DF. Table 5 summarizes the qualitative responses given by students of both groups to this question.

Group	Liked	Did not like
Structured	Questions were stimulating and gave birth to a competition between group members.	There were many questions and tasks.
	Questions on different levels of knowledge were meaningful and helped me to understand the materials of the course.	Many questions. I did not have time to answer all of them.
	I liked the individual questions for each student.	
	Tasks were gradual from easy to difficult.	
	Group tasks were challenging.	
Unstructured	The questions were clear.	Questions did not lead to a big debate.
	The course materials contributed to my understanding of the learned subjects.	You did not need to participate on an ongoing basis, except in solving tasks.

Table 5. Qualitative Responses about the Questions and Tasks Given by the Instructor in the DF

Suggestions and Notes for Next Online Course

In addition to the above-mentioned qualitative responses, students were also asked to give their notes and suggestions. The suggestions and notes provided by students are listed in Table 6.

Structured	I was very pleased to learn this course.
	It is better to integrate f2f meetings in the course, since the materials of the course require that.
	I suggest more individual questions for each student.
Unstructured	I think there is a need for more communication with the instructor in the DF.
	A good and useful experience, but I prefer to learn programming in f2f meetings.
	Members of the DF where not connected together.

Table 6. Suggestions and Notes Written by Students of the Structured and Unstructured DF

Discussion

In the current study, two types of discussion forums were examined: the structured and the unstructured DF. Students' attitudes about, and opinions towards, the two kinds of DF varied widely. Students of the structured DF generally had stronger and more positive attitudes and reactions towards the use of DF than students of the unstructured DF. Students using the structured DF liked the organization and structure of the DF more than the students of the unstructured DF. Specifically, students of the structured DF felt more motivated by the instructor's feedback to participate in the forum than the students of the unstructured DF. This result is also supported by the findings obtained from the statement about the level of interaction between participants in the DF. One possible explanation of this finding is the instructor's role in the structured DF. At the beginning of the online course, students in the structured DF (experimental group) received preparatory instructions and clear directions for online discussions. This information included an assessment rubric, clear explanations about the purpose of the discussion forum, instructions about how to use it, and instructions about group collaboration. Clear and simple directions for online discussion and setting out expectations are important in making student-to-student interactivity more effective (Dalelio, 2013; Mokoena, 2013; Wozniak & Silveira, 2004) and to motivate students to contribute to discussions (Al-Shalchi, 2009; Lall & Lumb, 2010; Roper, 2007). In addition, regular and controlled instructor involvement in the discussion forum through feedback, support, and questioning helped to organize the discourse and create effective and oriented discussion. As a result, students were motivated to contribute to ongoing discussions and to construct meanings through interaction with each other, the content, and the instructor. This explanation is also supported by previous research on online discussions, which showed that instructor participation and support in the DF often encourages student interaction and participation (Bender, 2003; Dalelio, 2013; Kearsley, 2000; Mokoena, 2013) and makes the discussion more effective and successful (Al-Shalchi, 2009; Lall & Lumb, 2010; Prasad, 2009).

Similarly, students using the structured DF agreed with the statement "the instructor's feedback helped me understand the course materials better" more than students using the unstructured DF. In addition, qualitative student responses supported this result. In this study, the instructor regularly posted a variety of questions and authentic problems on different types of knowledge (know-*what*, know-*how*, and know-*why*) in an attempt to make discussions more effective and to promote a deep understanding of the subjects being learned. Several studies have shown that students favored a variety of questions asked in the discussion forum (Andresen, 2009; Akin & Neal, 2007; Gao, 2014; Roper, 2007). "The questions asked by the instructor should not be mundane or ask for recall of memorized facts, but instead should be challenging so that they attempt to deepen enquiry and improve the opportunities to actively acquire knowledge" (Bender, 2003; p. 178). During the course, one activity directed each question to a different student. Students were asked to answer their questions and to comment on other students' answers within a given period of time. This method of activating the discussion forum helped students to better understand the learned materials and to be more involved in discussing, analyzing and constructing knowledge.

Interestingly, students of the structured DF collaborated and shared more knowledge than students of the unstructured DF. Unlike students of the unstructured DF, students of the structured one participated in small group collaborative activities and carried out a final group project. They also received clear instructions about group collaboration and were directed and

encouraged to work collaboratively. Working collaboratively on group activities or projects promoted mutual recognition of each member's importance and contribution to the group's success and thus challenged each other's ideas and facilitated each other's efforts in order to reach the group's goals. In such a situation, students within the collaborative small group were linked together, held accountable for the group's work, received help and assistance from each other, shared resources and materials, and provided each other with feedback in order to successfully perform the group activity. This explanation is also consistent with the results of other studies (Benaya & Zur, 2007; Kalayci & Humiston, 2015; McKinney & Denton, 2006; Teague & Roe, 2007) which showed that the integration of collaborative activities into online computer science courses benefits student learning as well as the development of skill sharing. Another explanation for the above finding may be that the students of the experimental group, unlike students of the control group, participated in two levels of discussions: the small group DF and the central DF. Establishing a DF for each small group of students and asking them to work together on the group activities helped to keep every member involved in the discussion (Felder & Brent, 1994; Rau & Heyl, 1990), enabled group members to create a sense of community of learners with shared goals, and allowed students to manage the discussion according to their needs. This way of organizing the online discussion increased group interaction and interdependence (Hara, Bonk & Angeli, 2000).

Conclusions and Implications

Results indicated that students who participated in the structured DF had significantly more positive responses and attitudes, both quantitatively and qualitatively, than students of the unstructured DF. Gaining more positive attitudes towards the use of DFs in online courses is an important factor that affects students' attitudes towards asynchronous online learning. From the findings of this study emerged a number of suggestions for instructors regarding the structure and management of asynchronous DFs in educational settings. These suggestions may be applicable to other disciplines as well.

In the structured DF, students mainly worked together in small groups. Each small group delivered a final project at the end of the course. It would be of interest to plan a class collaborative project wherein each small group would be responsible for one part of the project which, when assembled, would complete the project. Adding this component to the structured DF might increase inter-group collaboration and contribute to student learning and understanding since students who are actively involved in projects can learn more and develop more positive attitudes than students who are not. Another possible direction could be to compare the effects of different kinds of structured DFs (structured, semi-structured, and unstructured) on students' learning and their attitudes and perceptions towards the use of different kinds of DF.

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The Relationship Between Instructor Servant Leadership Behaviors and Satisfaction with Instructors in an Online Setting

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Abstract

Servant leadership has the potential to improve student satisfaction within online learning. However, the relationship between servant leadership and student satisfaction in an online environment had not yet been understood at the level of the individual instructor. The purpose of this quantitative, correlational study was to evaluate the relationship between online students' perception of their instructor's servant leadership style and the student's satisfaction with the online instructor. We selected 155 online students at a major community college in the south-central United States to complete the Servant Leadership Questionnaire (SLQ) and the Student Evaluation of Teaching (SET) survey online. We examined the relationships between each of the five facets of perceived servant leadership style (altruistic calling, emotional healing, wisdom, persuasive mapping, and organizational stewardship) and student satisfaction. The results of the Spearman's correlations showed a strong positive correlation between all servant leadership behaviors and student satisfaction, $p < .001$. A multiple linear regression analysis showed that the combination of altruistic calling, persuasive mapping, and wisdom strongly predicted student satisfaction with the instructor, $F(3, 151) = 83.8$, $p < .001$, $R^2 = .63$. The results of this study have filled a gap in the literature on the relationship between online student satisfaction and individual servant leadership behaviors. We recommend future research to investigate servant leadership in relationship to online learning at 4-year public, for-profit, and private institutions.

Keywords: servant leadership, student satisfaction, altruistic calling, emotional healing, wisdom, persuasive mapping, organizational stewardship

Sahawneh, F.G. & Benuto, L.T. (2018). The relationship between instructor servant leadership behaviors and satisfaction with instructors in an online setting. *Online Learning, 22*(1), 107-129. doi:10.24059/olj.v22i1.1066

The Relationship Between Instructor Servant Leadership Behaviors and Satisfaction with Instructors in an Online Setting

In 2014, 51% of U.S. students enrolled in institutions of higher education had taken at least one online course (Allen & Seaman, 2016). Despite the many benefits of online learning (Bowen, 2013; Cole, Shelley, & Swartz, 2014; Jones, Everard, & McCoy, 2011; Woodall, Hiller, & Resnick, 2014), student persistence and retention in the online environment remains low (Sorensen & Donovan, 2017; Xu & Jaggars, 2011). Increased student satisfaction is related to increases in student persistence (Hart, 2012; Joo, Joung, & Kim, 2013; Schreiner & Nelson, 2013). When instructors show empathy and caring (Hazel et al., 2014; Ladyshewsky, 2013); express personal consideration; and offer intellectual stimulation, motivation, and inspiration (Bogler, Caspi, & Roccas, 2013), student satisfaction, retention, and success increase (Kranzow, 2013; Gomez, 2013; Joo et al., 2013). Many of these instructor characteristics are consistent with the emergent servant leadership theory (Jacobs, 2011; Noland & Richards, 2015; van de Bunt-Kokhuis & Weir, 2013).

A servant leader is a leader who places other people's needs, goals, and wellbeing above his or her own in order to produce a positive transformation among followers (Blanchard & Miller, 2007; Barnabas et al., 2010; Greenleaf, 1978; Letizia, 2014). The relationship between students and instructors in an online course is similar to the leader-follower relationship observed in organizational settings (Bolkan & Goodboy, 2011; Bogler et al., 2013). What distinguishes online learning from other traditional learning modalities is that the constraints of a set time and a set place affect the online learning milieu weakly or not at all (Nayamboli, 2014). In the online classroom, instructors act as leaders (Garcia, 2015), and their style of leadership may influence their followers, who are the students (Noland & Richards, 2015; Pounder, 2014).

Servant leadership may be a good fit for online learning as online learners face unique challenges such as social isolation, persistence, and high attrition rates (Johnson & Vishwanath, 2011; Huber, 2014; Mariano, 2013; Reed & Swanson, 2014). Servant leadership may benefit online learners by means of emotional healing, wisdom, persuasive mapping, commitment to the growth and empowerment of others, offers of feedback, and commitment to building a community of learners (Barbuto & Wheeler, 2006; Huber, 2014; Steele, 2010). These instructor behaviors may affect student satisfaction (Huber, 2014), thereby increasing student retention and engagement (Lorenzo, 2012; Noland & Richards, 2015; Schreiner & Nelson, 2013; Cole et al., 2014). However, most existing research on servant leadership in higher education has focused on measuring the organizational level of servant leadership rather than on examining servant leadership characteristics within individual instructors (Jacobs, 2011; Nyamboli, 2015; Padron, 2012).

University instructors committed to classroom excellence are critical to the success of any institution of higher education (Leroy, Palanski, & Simons, 2012). Instructors face challenges that stem from the expectations of administrators, students, and accrediting agencies and from the demands of academic research (Jacobs, 2011). Nonetheless, committed servant leadership instructors willingly undertake these challenges to achieve the desired outcome: changed lives and satisfied students (Greenleaf, 1982).

A fundamental element in the learning process is the teacher-student relationship (Noland & Richards, 2015; van de Bunt-Kokhuis & Weir, 2013). This relationship, which is initiated and fostered by the teachers, mirrors the leader-follower relationship found in an organizational setting (Bolkan & Goodboy, 2011; Bogler et al., 2013; Letizia, 2014; Noland & Richards, 2015). Healthy

and trusting relationships between teachers and students in the classroom leads to improvements and progress for the students (Noland & Richards, 2015; Reed & Swanson, 2014; Ren, 2010). Building such relationships begins with the teacher's desire to serve the students. The quality of this service is demonstrated when students grow to be healthier and wiser and when the students themselves become servants of others (Greenleaf, 1977).

Most of the studies of the relationship between servant leadership and student satisfaction have focused on the organizational level of servant leadership (Jacobs, 2011; Nyamboli, 2014; Padron, 2012). No studies to date have involved an examination of servant leadership at the level of the individual leader in relationship to online student satisfaction. However, both the organizational level and the individual level of servant leadership must be considered (Covey, 1998; Irving, 2005). Focusing on servant leadership at the individual level provides an opportunity to examine key individual characteristics of servant leadership (Covey, 1998; Noland & Richards, 2015). Furthermore, to achieve servant leadership at the organizational level, a critical mass of people within the organization must first begin the individual practice of servant leadership (Irving, 2005; Laub, 1999).

The current study provided the opportunity to examine five key individual characteristics of servant leadership and online student satisfaction. These characteristics of servant leadership are (a) altruistic calling, (b) emotional healing, (c) wisdom, (d) persuasive mapping, and (e) organizational stewardship (Barbuto & Wheeler, 2006). These five theoretical dimensions were based on an examination of the seminal works of Greenleaf (1977) and Spears (1998) and then conceptualized in the Servant Leadership Questionnaire (SLQ; Barbuto & Wheeler, 2006). A better understanding of the relationship between individual instructor leadership behaviors and student satisfaction will help university managers, instructors, and other stakeholders design more effective trainings designed to foster leadership qualities in online instructors. These leadership qualities can improve online-student satisfaction (Bogler et al., 2013; Nyamboli, 2014; Huber, 2014) and thereby improve student persistence (Croxton, 2014; Kranzow, 2013).

The purpose of this study was to evaluate the statistical relationship between students' perception of their instructor's servant leadership style and the student's satisfaction with the online instructor. A brief literature review is presented, followed by a discussion of the method used. The results of the study are then presented, followed by a discussion of the findings and a conclusion.

Review of Related Literature

Online classrooms are replacing the traditional on-campus classroom settings at an increasingly rapid rate (Allen & Seaman, 2016). Just as students are making changes to adapt to this virtual learning modality, educational leaders must also make the changes necessary to ensure student satisfaction with the online environment (Cole et al., 2014; Croxton, 2014; Huber, 2014; Nyamboli, 2014). An improved understanding of leadership behaviors of individual instructors will help university managers, instructors, and other stakeholders to design effective trainings to foster leadership qualities in educators teaching in the online environment. Improved leadership behaviors have the potential to improve student satisfaction and achievement in online education (Kranzow, 2013; Joo et al., 2011). Servant leadership behaviors among online instructors may exercise a positive influence on online education (Huber, 2014; Nyamboli, 2014; Reed & Swanson, 2014; van de bunt-Kokhuis & Sultan, 2012).

Based on the writings of Greenleaf (1977, 1978, 1982), Spears (1998) identified 10 behaviors of servant leadership. These components were the first distillation of the ideas of Greenleaf into a model that described servant leadership in precise terms (van Dierendonck, 2011). The 10 characteristics were listening, empathy, healing, awareness, persuasion, conceptualization, foresight, stewardship, commitment to the growth of people, and building a community.

Spears (2005) was able to crystalize Greenleaf's (1977, 1978, 1982) ideas, but did not continue to provide measurement tools to test servant leadership theory empirically. Therefore, researchers were unable to conduct valid, reliable empirical studies based on these qualities (Parris & Peachy, 2013). According to Spears (1998), all these values were needed so that each servant leader would have the tools necessary to build a viable community for a large number of people and thus lead the way by showing a commitment to the well-being and growth of the members of the community. Applying these behaviors, values, and principles of servant leadership is particularly necessary in higher education (Huber, 2014; Nyamboli, 2014; Wheeler, 2012).

Styles of leadership commonly found in higher education, such as transactional and laissez-faire leadership, are limited in their leadership potential. These styles are leader-centered and do not empower others to be involved in working together for the common good (Wheeler, 2012). There is a need to recapture the vision and passion that ignited the early excitement about becoming servants in the field of education (Guillaume, Honeycutt, & Savage-Austin, 2013; Letizia, 2014; Shaw & Newton, 2014). This leadership gap in higher education can be filled by a leadership style that will transform educational institutions and thus restore the public confidence in higher education, foster long-term commitments, and nurture a work environment in which people thrive as they provide service to others (Letizia, 2014; Noland & Richards, 2015; Paul & Fitzpatrick, 2015; Shaw & Newton, 2014; Wheeler, 2012). Servant leadership is that kind of leadership style.

Although servant leadership is practiced in both nonprofit and for-profit organizations, little empirical research exists to examine servant leadership theory in an organizational setting (Pariss & Peachey, 2013). No consensus of the definition of servant leadership exists among scholars (Focht & Ponton, 2015; van Dierendonck, 2011). Greenleaf (1977), who coined the term servant leadership and is considered its grandfather, described servant leadership: "It begins with the natural feeling one wants to serve, to serve first. Then conscious choice brings one to aspire to lead" (p. 27). This lack of a clear definition of servant leadership has resulted in many conceptual frameworks and measurement tools to test servant leadership empirically (van Dierendonck, 2011). Nevertheless, despite this lack of consensus among scholars, servant leadership remains a viable, tenable leadership theory with the potential to transform organizations and individuals in positive directions (Parris & Peachey, 2013).

Views on leadership behavior are changing because of recent demands for a more ethical and people-centered leadership style, particularly after the leadership scandals of Enron, WorldCom, Tyco, University of Illinois, University of Colorado, and UC Santa Cruz. Researchers have therefore suggested that servant leadership theory, with its focus on ethical and authentic leadership, may provide an answer to what organizations need (van Dierendock, 2011).

Many researchers have argued that servant leadership is distinct from other leadership theories. Although many other leadership theories partially or individually address areas such as honesty, integrity, morality, authenticity, people-centered leadership, and spirituality, these traits are combined under servant leadership theory (Dearth & West, 2014; Sendjaya & Cooper, 2010). Servant leadership is also unique among styles of leadership in its focus on the needs and desires

of the followers. Servant leadership emphasizes the empowerment, growth, and personal development of the followers, with the focus on the needs of followers before the needs of the leader (Liden et al., 2015; Stewart, 2012). This emphasis stands in contrast to other leadership theories in which the focus is on the leader and the well-being of the organization rather than on the well-being of the followers (Jacobs, 2011; Rachmawati & Lantu, 2014). This follower-oriented attitude fosters an environment of strong relationships in which the followers are encouraged to become the best they can be for the good of the organization (van Dierendonck, 2011).

According to Greenleaf (1977), the servant leader is above all *primus inter pares*, Latin for first among equals. A servant leader does not exercise his authority to coerce followers to perform but rather uses persuasion. Servant leaders consider their power and authority as an opportunity to serve others, and as such, serving and leading become almost interchangeable (van Dierendonck, 2011). Furthermore, servant leaders find their fulfillment and motivation not in exercising power over their followers but in serving them and seeing them grow as persons (Letizia, 2014; Thompson, 2014). According to Greenleaf (1977), this commitment to service first is a key requirement of good leadership.

The principles, behaviors, and characteristics of servant leaders influence the effectiveness of the leader (Dearth & West, 2014; Parris & Peachey, 2013; Rachmawati & Lantu, 2014; Thompson, 2014; van Dierendonck, 2011). An essential theme of servant leadership is building relationships (Buchen, 1998). Buchan (1998) argued that Greenleaf's (1977) model of servant leadership provided a new framework for institutions of higher education and its faculty. Buchan suggested this model for addressing the essential transformational needs of higher education.

Retaining students in online courses and sustaining a high level of student satisfaction is difficult (Cole et al., 2014; Croxton, 2014). This difficulty is the result of the sense of isolation that students experience when studying online (Rovai & Downey, 2010; van de bunt-Kokhuis & Sultan, 2013). Online students experience an absence of social presence, a sense of isolation, and a lack of interaction with the teacher and other learners (Rovai & Downey, 2010; Reed & Swanson, 2014; van de bunt-Kokhuis & Sultan, 2013). As online education grows, the need for high-quality leadership among instructors grows as well. High-quality leadership that focuses on building relationships between teachers and students is needed (Huber & Carter, 2014; Nyamboli, 2014).

Servant leadership is a style of leadership with the potential to improve student satisfaction and retention for online learning in higher education (Huber, 2014; van de Bunt-Kokhuis & Sultan, 2012). Servant leadership is characterized by the qualities of "listening, forgiveness, empathy, humility, care for people and organization, healing of relationships, awareness, persuasion, courage, giving feedback, conceptualization, foresight, stewardship, authenticity, commitment to growth and empowerment of others, and building community" (van de Bunt-Kokhuis & Sultan, 2012, p. 2). These qualities have made servant leadership one of the five most discussed leadership theories in the current leadership literature (Nyamboli, 2014).

Existing research regarding servant leadership indicates a relationship between servant leadership and student satisfaction in an online educational setting. Many researchers (e.g., Bogler et al., 2013; Huber, 2014; Livingston, 2011; Nyamboli, 2014; Padron, 2012; van de Bunt-Kokhius & Sultan, 2012) have investigated factors related to satisfaction among online students. However, research on the role of online instructors in relationship to student satisfaction, particularly in terms of the leadership style of the instructor, is more limited. Servant leadership style has the potential

to improve student satisfaction with online education (Huber, 2014; van de Bunt-Kokhius & Sultan, 2012). However, most existing research on servant leadership in higher education has focused on measuring the organizational level of servant leadership rather than on examining servant leadership characteristics within individual instructors (Jacobs, 2011; Nyamboli, 2015; Padron, 2012). These researchers used the Organizational Leadership Assessment (OLA) designed by Laub (1999). The OLA instrument used in these research studies was not designed to measure servant leadership on the individual leader level, rather, it was created as a tool to measure the organizational level of servant leadership on six key dimensions of servant-leadership (Laub, 1999). These six dimensions are: (1) Values People, (2) Develops People, (3) Builds Community, (4) Displays Authenticity, (5) Provides Leadership, and Shares Leadership (Laub, 1999).

Not all researchers have established a link between perceived servant leadership behaviors and student satisfaction in an online learning setting (Nayamboli, 2014), student satisfaction in a face-to-face classroom setting (Padron, 2012), or effective teaching (Jacobs, 2011). Padron (2012) researched a face-to-face classroom setting and found a negative correlation between student satisfaction and perceived servant leadership at the organizational level. In an investigation of 68 doctoral level students and 25 faculty and staff members (Nyamboli, 2014), no significant relationship was found between the students' perceptions of the organization level of servant leadership and satisfaction with e-learning (r = .02, p = .88). Participants were assessed by completing the Organization Leadership Assessment and the Distance Education Learning Environment surveys (Nyamboli, 2014). The findings showed that online doctoral students were satisfied with their online learning experience and that the participants perceived a moderate level of servant leadership at the organizational level.

As shown in the above brief literature review, most of the research on servant leadership in higher education has focused on measuring the organizational level of servant leadership rather than on examining servant leadership characteristics of individual instructors (Jacobs, 2011; Padron, 2012). This gap in the literature is problematic because the organizational level and the individual level of servant leadership are inextricably intertwined, and both must be considered (Covey, 1998; Irving, 2005). No empirical studies were located in which the relationship between the individual servant leadership styles of online instructors and online student satisfaction with the instructor was evaluated. However, the evidence from the research on servant leadership at the organizational level suggests that the same positive relationship may be found at the individual level (Huber, 2014; Jacobs, 2011; Steele, 2010).

Methods

To evaluate the extent to which altruistic calling, emotional healing, wisdom, persuasive mapping, and organizational stewardship (Barbuto & Wheeler, 2006) in an online instructor predicted student satisfaction (Tsai & Lin, 2012), we developed the following research questions.

Q1. What is the relationship, if any, between online student perceptions of the instructors' altruistic calling leadership behavior and student satisfaction with the instructor?

Q2. What is the relationship, if any, between online student perceptions of the instructors' emotional healing leadership behavior and student satisfaction with the instructor?

Q3. What is the relationship, if any, between online student perceptions of the instructors' wisdom leadership behavior and student satisfaction with the instructor?

Q4. What is the relationship, if any, between online student perceptions of the instructors' persuasive mapping leadership behavior and student satisfaction with the instructor?

Q5. What is the relationship, if any, between online student perceptions of the instructors' organizational stewardship leadership behavior and student satisfaction with the instructor?

Q6. To what extent do individual components of servant leadership (altruistic calling, emotional healing, wisdom, persuasive mapping, and organizational stewardship) in online instructors, as perceived by students, predict student satisfaction with the instructor?

Sample

To address the research questions, we sampled 155 online adult students enrolled at a community college setting in the south-central United States. All participants were 18 years of age or older. The community college site, which we selected for convenience, was a regionally accredited community college with an enrollment of approximately 6,166 students during the fall 2015 semester. Of these students, 1,028 had enrolled in only one online course during the semester. The participants completed the survey at the end of a 16-week general educational courses offered during the fall 2015 semester. Participants had little or no face-to-face contact with their instructors, and no background on servant leadership was provided to the survey participants.

From the overall sampling frame, 224, or 21.8%, agreed to participate in the study. This percentage was consistent with the anticipated response rate of approximately 20% (Chang & Krosnick, 2010; Messer & Dillman, 2011; Petrovčič, Petrič, & Lozar Manfreda, 2016). Although 224 students attempted the survey, only 155 completed all the questions needed for analysis.

Measures

We used two online survey instruments to collect data for the study: the SLQ and the SET.

SLQ. The SLQ (Barbuto & Wheeler, 2006) is a 23-item inventory that assesses the extent to which leaders display servant-leadership qualities as conceptualized by Greenleaf (1978) and Spears (1998). Two versions of the questionnaire exist: the self-report or leader version, and the rater or follower version. We used the rater version of the SLQ to measure five components of servant leadership: altruistic calling, emotional healing, wisdom, persuasive mapping, and organizational stewardship. We measured all five variables on Likert-type scales, with values ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). We calculated the score for each variable as the mean score for the respective subscale. The SLQ provided a way to conduct empirical research on servant leadership behavior with proven validity and reliability (Barbuto & Wheeler, 2006; Guillaume et al., 2013). We did not include the self-report or leader (faculty) version of the SLQ in this study because the focus of the study was on measuring the students' perception of their online instructors' servant leadership behaviors.

SET. The SET (Tsai & Lin, 2012) is a five-item self-report inventory designed to measure student satisfaction with online instructors. The instrument measured the scores on a Likert-type scale, with values ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). We calculated the student satisfaction score as the mean score for the five items on the scale.

Procedure

After we received Institutional Review Board (IRB) approval, we requested a list of the students' emails from the office of the Dean of Online Learning at the selected college. From this list, we contacted 1,028 participants through e-mail with an invitation to participate in the study. The email stated the reasons for conducting the study and included contact information, an online link to the survey, and the informed consent form? Students were given three weeks to respond to the invitation. To encourage more student participation in the study, students were given an opportunity to win one of five $50 Amazon gift cards.

Among those invited to participate in the study, 155 provided informed consent and completed all survey questions necessary to compute the mean scores for each scale or subscale. When study participants declined to answer one or more survey questions needed to calculate a given variable, we omitted the entire record from the analysis. Thus, all the 68 surveys with missing data were omitted. There were two reasons for this decision. First, the authors of the instruments did not provide instructions for missing value replacement. Therefore, a process of missing value replacement may have invalidated the results. Second, missing value replacement with mean substitution should be used only if 10% or fewer of the components of a given scale are missing (Baraldi & Enders, 2010; Karanja, Zaveri, & Ahmed, 2013). Because all scale scores used in this study included only four or five items, even one missing item would have exceeded the number of permissible items omitted.

We provided a link in the email message to the participants for access to the online survey, which was hosted by SurveyMonkey. We sent two follow-up email reminders to participants to reach students who may have missed the earlier email invitations. Data collection ended after three weeks. We downloaded the data from the SurveyMonkey website directly into SPSS software for analysis.

Results

Among the 224 respondents to the survey, one declined to provide informed consent and was therefore omitted from the study. Among the remaining 223 respondents, 155 (69.5%) answered all survey questions needed to compute the independent and dependent variables. With a sample size of 155, the achieved power of the bivariate correlation was 96.9%, and the achieved power of the multiple linear regressions was 97.2%, showing a strong statistical power for the results.

We performed Fisher's exact tests to determine if the distributions of academic class, course requirements, ethnicity, age, or gender were different between those with and without complete data for the independent and dependent variables. There was no evidence to suggest a difference in academic class, course requirements, ethnicity, age, or gender between those who did and those who did not answer all survey questions required to evaluate the independent and dependent variables.

The majority of the sample consisted of freshmen and sophomores. Two-thirds of the participants were female, and 81.9% were Caucasian. Almost two-thirds of the participants were between the ages of 18 and 29. Table 1 shows the demographic distribution of the participants.

Characteristic	*N*	Percent
Gender		
Male	50	32.3
Female	104	67.1
Missing	1	0.6
Age at time of survey		
18 to 29	100	64.5
30 to 44	37	23.9
45 to 59	17	11
60 or older	1	0.6
Ethnicity		
Caucasian	127	81.9
African-American	12	7.7
Asian	1	0.6
Hispanic	7	4.5
Other	7	4.5
Missing	1	0.6
Class level		
Freshman	45	29
Sophomore	43	27.7
Junior	22	14.2
Senior	18	11.6
Other	27	17.4
Course requirement		
Required for major	86	55.5
Required for minor	16	10.3
Other requirement	26	16.8
Elective	27	17.4

Note. $N = 155$.

Table 1. Demographic Distributions of Participants

We measured all servant leadership variables on a Likert scale, with values ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Mean scores for servant leadership ranged from 2.49 for emotional healing to 3.58 for altruistic calling (see Table 2). Because the student satisfaction score was not normally distributed, as shown by a histogram, we reported the median rather than the mean. The median student satisfaction score was 4.0.

Variable	*M*	*SD*
Altruistic calling	3.58	.90
Emotional healing	2.49	.90
Wisdom	3.50	.83
Persuasive mapping	3.08	.86
Organizational stewardship	3.29	.81

Note. $N = 155$.

Table 2. Servant Leadership Style: Means and Standard Deviations

Assumptions for Spearman's correlation

The only requirement for Spearman's rho is that the relationship between the two variables be monotonic, or linear, rather than curvilinear (Bishara & Hittner, 2012; Hill & Lewicki, 2007). We confirmed this assumption for the current study by inspecting scatterplots of all bivariate relationships being tested. The variables (altruistic calling, emotional healing, wisdom, persuasive mapping, organizational stewardship, and student satisfaction with the instructor) were all measured on an interval scale, which we treated in this study as a continuous measurement. Scatterplots showed no evidence to suggest the linearity assumption was violated. In addition, the scatterplots showed no evidence of outliers.

Assumptions for multiple linear regression

Before conducting the multiple linear regression, the data was examined to ensure that it met the assumptions of linearity, normally distributed errors, homoscedasticity, and the absence of multicollinearity. Scatterplots, histograms, and the variance inflation factor scores indicated that these assumptions were met.

Bivariate Correlations

We computed five bivariate correlations using Spearman's rho correlation statistic. The predictor variables were the mean scores for each of the five subscales of the SLQ: (a) altruistic calling, (b) emotional healing, (c) wisdom, (d) persuasive mapping, and (e) organizational stewardship. For all bivariate correlations, the outcome variable was the mean score for the SET. Table 3 shows the results of the bivariate correlations.

Variable	r_s	p
Altruistic calling	.70	< .001
Emotional healing	.51	< .001
Wisdom	.70	< .001
Persuasive mapping	.69	< .001
Organizational stewardship	.67	< .001

Note. $N = 155$.

Table 3. Servant Leadership Style: Bivariate Relationships with Student Satisfaction

Significant positive relationships between student satisfaction and all servant-leadership scores examined, $p < .001$ were identified. Spearman's rho correlation coefficients ranged from .51 for emotional healing to .70 for altruistic calling and wisdom.

For the stepwise multiple linear regression analysis, the overall model was significant, $F(3, 151) = 83.8$, $p < .001$, $R^2 = .63$ (see Table 4). Three predictor variables (altruistic calling, persuasive mapping, and wisdom) contributed significantly to the model.

	Unstandardized Coefficients		Standardized Coefficients		
Variable [a, b]	*B*	Std. Error	Beta	*t*	*p*
(Constant)	-.10	.25		-0.41	.68
Altruistic calling[c]	.43	.10	.35	4.50	<.001
Persuasive mapping[d]	.40	.10	.31	3.85	<.001
Wisdom[e]	.28	.11	.21	2.52	.01

a. Dependent variable: student satisfaction with the instructor

b. $F(3, 151) = 83.8$, $p < .001$.; R^2 attributed to the total model = .63

c. R^2 attributed to altruistic calling = .52

d. R^2 attributed to persuasive mapping = .09

e. R^2 attributed to wisdom = .02

Table 4. Stepwise Multiple Regression Analysis Predicting Student Satisfaction with Instructor from Servant Leadership Scores

The R^2 values showed that altruistic calling was the most significant predictor of student satisfaction, explaining 52% of the total variance. Additionally, persuasive mapping explained an additional 8.5% of the total variance, and wisdom explained an additional 1.6%. While the other two predictor variables (emotional healing and organizational stewardship) did not contribute significantly to the overall regression model.

Discussion and Conclusions

Researchers have established that servant leadership has the potential to influence student satisfaction in a positive direction (Huber, 2014; Jacobs, 2011; Letizia, 2014; Padron, 2012; Reed & Swanson, 2014; Searle, 2011; van de bunt-Kokhuis & Sultan, 2013). Servant leadership behaviors in traditional, hybrid, or online classroom settings have been associated with higher levels of student satisfaction (Ali & Ahmad, 2011; Jacobs, 2011; Huber, 2014; Johnson, Aragon, & Shaik, 2000; Nyamboli, 2014; Setliff, 2014). Servant leadership behaviors have also been positively correlated with related outcomes such as exemplary instruction (Setliff, 2014); teaching effectiveness (Drury, 2005; Metzcar, 2008), school climate (Black, 2010), and job satisfaction (Cerit, 2010; Irving, 2005; Laub, 1999; Shaw & Newton, 2014; van Dierendock & Nuijten, 2011).

The findings of the current study were congruent with existing research showing a correlation between servant leadership and student satisfaction. What distinguishes online learning from other traditional learning modalities is that the constraints of a set time and a set place affect the online learning milieu weakly or not at all (Nayamboli, 2014). We found a strong positive correlation between student satisfaction and five components of servant leadership in an online setting: altruistic calling, emotional healing, wisdom, persuasive mapping, and organizational stewardship (Barbuto & Wheeler, 2006). These findings were consistent with earlier research showing that instructors who expressed personal consideration; who showed empathy and caring; and who offered intellectual stimulation, motivation, and inspiration tended

to have more satisfied students (Bogler, Caspi, & Roccas, 2013; Hazel et al., 2014; Ladyshewsky, 2013).

In the current study, the combined factors of altruistic calling, persuasive mapping, and wisdom predicted student satisfaction with instructors in an online environment. Similarly, Setliff (2014) indicated that of the five servant leadership behaviors, wisdom was the strongest predictor of exemplary instruction. Altruistic calling and persuasive mapping have also been correlated with exemplary instruction. Altruistic calling, emotional healing, wisdom, persuasive mapping, and organizational stewardship may create a positive environment in which student performance is enhanced (Huber, 2014; Jacobs, 2011; Letizia, 2014; Nyamboli, 2014; Padron, 2012; Reed & Swanson, 2014; Searle, 2011; Setliff, 2014; van de bunt-Kokhuis & Sultan, 2013).

While our results are not causal (we did not assess outcomes related to different pedagogical approaches), our results do imply that online students at a community college perceived the servant leadership behaviors of their online instructors within the virtual learning environment. This implication suggests that institutions of higher learning who wish for an increased level of student satisfaction within the online learning setting may find it beneficial to incorporate faculty trainings that help faculty members integrate servant leadership behaviors into their pedagogical approach to the online classroom. We recommend that these considerations focus on the servant leadership behaviors of altruistic calling, persuasive mapping, and wisdom.

Setliff (2014) suggested using the *Servant Leader Development Model for Faculty by Antecedent*, which was used for data collection and feedback regarding servant leadership behaviors (see Appendix A). In the current study, this model was adapted and modified for an online classroom setting based on the results of the current research. Based on this model, online instructors, administrators, and other stakeholders will be able to have ongoing feedback on servant leader behaviors and their application in an online classroom setting. Following is a discussion of the limitations for each research question.

Limitations

There were several limitations to this study. The study included only adult students who enrolled in a particular online class during the fall 2015 semester at a community college setting in the south-central United States. Expanding the scope of this research to other community colleges, 4-year public colleges, graduate programs, and private colleges would extend the generalizability of the findings. Another limitation was the self-report nature of the study. Students who responded to the follower version of the SLQ may have rated their instructors differently from the way the instructors would have rated themselves on the leader version of the SLQ.

This research was limited by the cross-sectional design. We were unable to observe changes in the relationship between servant leadership behaviors of online instructors and student satisfaction over an extended period (Lu et al., 2013). Finally, 68 (30.5%) of the respondents declined to answer all the survey questions needed to compute the independent and dependent variables, resulting in nonresponse bias. This nonresponse rate may limit the generalizability of the results to the population of interest.

Future directions

Ten years after its development, the SLQ (Barbuto & Wheeler, 2006) has emerged as one of the leading measures of individual servant leadership behaviors (Setliff, 2014). However, most

research on servant leadership theory in higher education has focused on the traditional classroom setting. There is a need to develop new instruments better suited for the online learning milieu.

Greenleaf (1977), who first introduced the construct of servant leadership, stated, "What I have to say comes from experience, my own and that of others, which bears on institutional reconstruction. It is a personal statement, and it is meant to be neither a scholarly treatise nor a how-to-do-it manual" (p. 49). Since 1977, servant leadership has lacked a unified theoretical framework. Little empirical research on servant leadership has been conducted with wide, substantive, and practical applications (Dean, 2014; Fotch & Ponton, 2015; Parris & Peachey, 2013; van Dierendonck, 2011; van Dierendonck et al., 2014). As such, researchers in this young field of servant leadership theory have ample challenges to produce empirical research that will further validate the use of servant leadership across diverse organizational settings (Noland & Richards, 2015). Such research can provide further insights and understanding of this theory for future researchers and practitioners.

The current study has shown that the SLQ can be used in an educational setting, such as a community college. We recommend that this study be replicated in different settings, such as state universities, private colleges, graduate programs, and for-profit educational institutions. Such research may provide additional data on how servant leadership behaviors are related to student satisfaction with online learning and thus fill the existing gap in the literature for this area of study.

Replicating this study with a larger population—using the leader-rated version of the SLQ rather than the follower-rated version used in this study—may provide a different perspective on servant leadership behaviors and their relationship to student satisfaction. Scoring servant leadership behaviors from the perspectives of both instructors and students may provide a better indication of the factors related to online student satisfaction. The current study confirmed earlier findings on servant leadership behaviors in the classroom, but servant leadership theory stands in need of continual development toward a clearer definition and construct measurement (Noland & Richards, 2015). Qualitative research involving interviews with students and faculty members may provide additional insights regarding the experiences of students and faculty members with servant leadership behaviors.

Based on the findings of the current study, we recommend a servant-leadership training model to prepare online instructors. This model, adapted from Setliff (2014), could be used to train online faculty members to develop their servant leadership behavior skills as a way of increasing student satisfaction with online learning.

Conclusions

The current study was the first in which the relationship between individual servant leadership behaviors and online student satisfaction was examined empirically. Additionally, the study was the first in which this relationship was tested at the level of the individual instructors rather than at the organizational level in an online learning setting. The results showed that individual servant leadership behaviors (altruistic calling, emotional healing, wisdom, persuasive mapping, and organizational stewardship) were positively correlated with student satisfaction. Three of these behaviors (altruistic calling, wisdom, and persuasive mapping) strongly predicted student satisfaction in combination. These findings provided evidence consistent with the current servant leadership literature, according to which levels of student satisfaction increased when

instructors exhibited servant leadership behaviors in traditional, hybrid, or online classroom settings (Ali & Ahmad, 2011; Jacobs, 2011; Huber, 2014; Paul & Fitzpatrick, 2015; Setliff, 2014).

This study has empirically demonstrated the correlation of the individual servant leadership behaviors in the online classroom to student satisfaction. We recommend that servant leadership be an option for inclusion in faculty and staff training, curriculum development, and instructional environments, with a focus on the servant leadership behaviors of altruistic calling, persuasive mapping, and wisdom. Such training in servant leadership may be an answer to the quest for a new type of leadership in higher education required to meet the needs and the challenges faced by online learners (Huber, 2014; Nyamboli, 2014; van de Bunt-Kokhius & Sultan, 2012). Servant teachers aim to help students maximize their personal potential by focusing primarily on the students' needs (Noland & Richards, 2015). This new type of compassionate leadership can juxtapose digital technology and human feeling in the online learning classroom (van de Bunt-Kokhius & Sultan, 2012).

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Appendix A:

Integrated Servant Leader Development Model: Antecedent and Demonstrated Behavior

Antecedent	Demonstrated behavior	Source
Altruistic calling	Willing to provide extra time to help students understand the materials	SI
	Encourages students to ask questions without a sense of stress	SI
	Views teaching as a special calling, not a job	SIPG
	Is a source of positive energy	SIPG
	Believes success is measured by the success of students and peers	SIPG
Emotional healing	Willing to provide listening ears and a safe environment for the students when they face personal trauma	SI
	Encourages students to share their feelings regarding the course	SI
	Provides a meaningful input regarding mending the hard feelings students face	SI
Wisdom	Develops and creates "teachable moments"	SI
	Creates a conducive learning environment	SI
	Surveys the students' understanding of prior information	SI
	Clearly describes the objectives of the day's material and how it builds upon prior learning	SI
	Uses various media to add depth, contrast, and context effectively to illuminate and amplify salient points	SI
	Uses multimedia to bring outside experts into the online classroom.	SI
Organizational stewardship	Develops and communicates positive regard for the organization	SIPG
	Describes connections with other organizations and the community at large	PG
	Emphasizes the social importance of group involvement	SIPG
	Describes and communicates the importance of service to others	SIPG
	Describes and demonstrates wise stewardship	SIPG
	Emphasizes that each person must take responsibility	SIPG
Persuasive mapping	Seen as actively involved in student issues	SIPG
	Has the ability to discuss the importance of direction with students	SI
	Has the ability to motivate students to perform at their highest level	SI
	Has the ability to communicate in a fashion that inspires others to follow	SIPG
	Has the ability to follow a rational moral compass	SIPG
	Has the ability to obtain consensus through a highly developed interpersonal skill set	PG
	Is seen as one who can reduce confrontation	PG

Note. SI = student instructor review. PG = peer group review. SIPG = student instructor review and peer group review. Adapted from "A study of student perceptions of exemplary instruction and servant leader behavioral qualities," (pp. 62-63) by Richard C. Setliff, Jr., 2014, Ph.D. dissertation, Indiana State University, Terre Haute, Indiana. Retrieved from Dissertations & Thesis: Full Text. (1526012795). Used with permission.

Comparing Student Performance on Proctored and Non-Proctored Exams in Online Psychology Courses

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Abstract
As online education becomes a more popular and permanent option for obtaining an education after high school, it also raises questions as to the academic rigor of such classes and the academic integrity of the students taking the classes. The purpose of the current study is to explore the integrity issue and to investigate student performance on online examinations. Utilizing a sample of about 1,700 students who took online psychology classes of varying difficulty at Washington State University from spring 2015 to spring 2016, we found that students performed 10–20% better and took about twice as long on non-proctored versus proctored exams. The effect held when we compared our in-house proctoring service used during this time against ProctorU, used for one semester in fall 2012. To ensure the most robust design possible, we also rotated the proctored exam in each class at least once and then compared performance on an exam when it was proctored versus when the same exam was non-proctored. Results showed better performance when the exam was non-proctored than when it was proctored. Finally, since instructors changed over the four semesters our study ran, we wanted to ensure that the results were not due to differences in teaching style. This potential confounding variable was eliminated. We discuss possible reasons for the difference in performance, to include student academic misconduct, and offer suggestions for ensuring we have both academic rigor and integrity in online courses.

Keywords: cheating, online education, proctored exams, time measure

Daffin, Jr., L.W., & Jones, A.A. (2018). Comparing student performance on proctored and non-proctored exams in online psychology courses. *Online Learning, 22*(1), 131-145. doi:10.24059/olj.v22i1.1079

Comparing Student Performance on Proctored and Non-Proctored Exams in Online Psychology Courses

Online/distance learning has become an increasingly popular method of receiving a higher education, often serving an off-campus population who cannot attend class on campus. The platform allows for flexibility for the student (Stack, 2015), and as Hannay and Newvine (2006) found in a 22-question survey of 217 students taking undergraduate criminal justice courses, 88% of students said they take online classes because classroom course schedules do not always fit into their busy lives, while 20% said the choices of traditional classes are at times

limited. Furthermore, 90% of online students were found to read the required text compared to just 60% of their classroom counterparts, who apparently were waiting on their instructors to "feed" the information to them. Overall, the authors found that students in their sample earned higher grades, believed they learned more, thought exams were easier, spent more time on classes, found the text more useful, and perceived classes to be of higher quality, but overall they saw classes as harder in the online learning environment (Hannay & Newvine, 2006).

Despite the results presented above, a criticism of online learning is that academic rigor may not be up to par with classroom courses. With more and more universities developing online courses and degree programs, this criticism should in time disappear. There is also research dedicated to addressing this issue and to finding ways to effectively engage online students so that their experience is nearly identical to that of classroom students. A second criticism, and one that is currently being addressed, is that there is a lack of academic integrity in the online environment. We live in the age of the information superhighway and students can find whatever they want to on the Internet with just a click or two of a mouse. This makes researching for classes very easy and should enhance learning. Of course, the downside is that papers can be easily bought online from sites such as Course Hero, and when students take exams they can find the answers to questions, despite admonitions against using outside resources, such as the textbook, websites, or other students. Some websites even post publisher test-bank questions and answers. Possibly the most flagrant offense is the existence of companies willing to take the class for the student, because "Life is too short to spend on classes you have no interest in. Focus on whats really important in your life" (We Take Your Class, 2012). They guarantee an A or B or your money back. As a consequence, the student you think you are interacting with on a weekly basis may not actually be the student at all. This is a serious issue for academic integrity in the online environment.

So why do students cheat? Cizek (1999) identified common justifications students use: it's easy to do, they need to pass the class, the course is too hard, the instructor is unfair, no one cares about cheating, everyone else is cheating, and there's no time to study. Cheating can be classified in one of two ways (Bunn, Caudill, & Gropper, 1992). *Planned cheating* is premeditated and involves developing cheat sheets, plagiarizing a paper, or copying homework. *Panic cheating* occurs during a test when the student realizes he or she does not know the answers to the questions, which leads to wandering eyes and the copying of answers. Planned and panic cheating are both issues in the classroom environment, but planned cheating is more likely the only issue online since students complete exams in isolation. In terms of cheating online, Rowe (2004) said students may wait to take their exam so that they can get answers from other students, obtain unauthorized help during the exam, or make false claims so they can retake the exam. Other methods include setting up two computers (one for taking the exam and one for looking up answers), stating that computer problems prevented completion of the exam, and purchasing answers from the Internet (Moten et al., 2013).

This leads us to wonder how prevalent instances of cheating are in the online learning environment. Grijalva, Nowell, and Kerkvliet (2006) estimated that 3% of students cheated in a single online class and that this rate is not quantitatively different than instances of cheating in a traditional classroom. They conclude that as online education grows there is no reason to assume that academic dishonesty will grow as well. Likewise, Stuber-McEwen, Wiseley, and Hoggatt (2009) administered the Academic Dishonesty Survey to 225 students to determine the frequency and type of dishonest academic behaviors they engaged in. Students reported higher cheating

behavior in the traditional classroom than in the online setting, leading the authors to conclude, much like Grijalva, Nowell, and Kerkvliet (2006), that instances of academic misconduct among online students may not be as high as thought. In line with these studies, students' perception of the frequency of cheating in online classrooms versus face-to-face classrooms showed no significant difference (Spaulding, 2009).

It may be that the rate of cheating online is as low as these studies suggest or that most cheating online goes undetected—and so unpunished—leading to repeated performance of the act, and that the academic community grossly underestimates it (Haney & Clarke, 2007). In a hybrid information systems class consisting of 300 students, and in which online quizzes were used to reinforce text material and made up just 10% of the final grade, or 1% for each quiz, Milliron and Sandoe (2008) convicted 15% of the students for quiz cheating. The quizzes were low stakes, easy, and information was covered in a very fundamental way. Students were told explicitly that were not allowed to consult with others. Results showed that students still congregated both on and off campus to take the quizzes together.

Several studies have shown that students perform better on non-proctored exams than proctored exams. Using a sample of 120 students in a doctor of pharmacy program and randomly assigned into either an online self-study group with online proctored quizzes, online self-study group with non-proctored quizzes, or textbook-based self-study group with proctored quizzes, Wellman and Marcinkiewicz (2004) found that the online, non-proctored students had the highest average scores of the three groups. They were also found to have the lowest performance on learning based on their pre- versus posttest change score. Similar results were found in a study of 300 undergraduate students taking a cognitive achievement test. Students in the non-proctored group performed better than those in the proctored group, but also of interest was of the fact that there was no difference whether the exam was non-proctored online or administered via pencil-and-paper. The authors suggest that the mode of administration is not as important as a lack of proctoring (Carstairs & Myors, 2009). Furthermore, Richardson and North (2013) found the same pattern of higher non-proctored exam scores in a sample of 65 students scattered across four online business administration courses at both the undergraduate and graduate level, though the difference in exam performance was smaller for the graduate students.

Harmon and Lambrinos (2008) drew data from two online classes in a principles of macroeconomics course taught during summer 2004 and the same class taught again in summer 2005. Each course consisted of four exams: three non-proctored exams and one comprehensive final. The classes were identical in structure and content, with the exception that the 2004 class had a non-proctored final exam, and the 2005 class had a proctored final exam. Results indicated significantly higher scores in the non-proctored test group versus the proctored test group, and the researchers took this as a case of cheating, since human capital variables, such as age, class rank, and GPA, explained test score variation less effectively in the non-proctored format than the proctored format. In contrast, Hollister and Berenson (2009) found a greater variability in test scores among a non-proctored group versus a proctored group, though upon further analysis the researchers found no evidence of cheating.

Stack (2015) found no significant difference between tests administered in a proctored setting at a university and tests administered via a lockdown browser without a proctor. Students in the lockdown browser group were given randomized test questions and were unable to backtrack to previous questions. This finding is important, as it could help solve the problem of needing to have all tests be proctored in order to ensure academic integrity. Perhaps a lockdown

browser, randomized test questions, and the inability to backtrack could be sufficient to reduce academic dishonesty.

Time is another important factor related to exam scores for proctored versus non-proctored tests online. Students who take longer to complete exams may be engaging in forms of academic dishonesty, such as looking up answers or consulting with a peer. A study by Hylton, Levy, and Dringus (2016) randomly assigned students to either a treatment or control group. Both groups were enrolled in the same course at a private university in Jamaica and took their exams online from the same pool of questions. The treatment group was monitored via webcam by a Web-based proctor, while the control group was not monitored at all. The results showed that students who took the non-proctored exam scored significantly higher than those taking the proctored exam and that the non-proctored students took significantly longer to complete the exam. The researchers also learned that students who were not monitored perceived that they had a greater chance to collaborate, and those who were monitored felt a greater level of deterrence from cheating.

So the studies above produce mixed findings about whether students are more likely to cheat online or not. Some indicate that the rate of cheating is no higher online than in the classroom, with classroom being higher at times (Grijalva et al., 2006; Stuber-McEwen et al., 2009; Spaulding, 2009). Other studies show that students perform better when taking an online non-proctored exam than when taking an online proctored exam (Milliron & Sandoe, 2008; Wellman & Marcinkiewicz, 2004; Richardson & North, 2013; Harmon & Lambrinos, 2008; Stack, 2015; Hylton et al., 2016).

The studies mentioned have several common limitations. First, generalizability is an issue, as many studies had very small sample sizes or samples from specific demographics of the population. Most studies have included no more than a few hundred students from one or two sections of a class. Second, cheating was assessed via self-report, making social desirability bias a real issue. Third, in most studies, only one class from that field was utilized. Classes within a major vary in difficulty level, so more difficult classes may, by their nature, lead to a greater level of student cheating than easier classes. Fourth, the content tested in each exam will likely vary, with some exams being more difficult than others, such as in an introductory psychology course. The biological basis of behavior chapter is usually more challenging for students than the chapter on human development. As such, students may be led to cheat more on the former exam than the latter. This limitation can be eliminated by simply rotating which exam is proctored across semesters.

The purpose of this study is to add to the body of literature investigating performance differences between proctored and non-proctored exams, and to expand on this research, much like Hylton et al. (2016), by offering an objective measure of why such differences exist. We hypothesize that students will perform better on non-proctored exams than on proctored exams, and that students will take more time to complete non-proctored exams than proctored exams.

Methods

Participants

Our study included data from 1,694 students taking online classes at Washington State University (WSU) in Pullman, WA. Data were collected from the spring 2015 semester to the spring 2016 semester and included students taking classes over the compressed, 12-week

summer 2015 session. During the fall and spring semesters, which last 15 weeks, online classes are restricted to Global Campus students unless a course does not fill to capacity, but during the summer, students from the Pullman, Tri-Cities, Vancouver, and/or Spokane campuses take online courses too.

Typically, our online students are working adults with families, are in their 30s or 40s, have been out of school for a period of time, and attend half- to full-time, all while juggling their many life responsibilities. This is contrasted with campus students, who are generally coming straight out of high school; attending school full-time; juggling extra-curricular activities, campus life, and work; and are away from home for the first time in their life.

Materials

The only materials used in this study were course exams, most of which were in multiple-choice format. In a few classes, short answer and matching questions were used too. Our online program includes a diverse range of courses at all academic levels, from freshman to senior, and all difficulty levels, from foundational courses (such as PSYCH 105) to more advanced courses (such as PSYCH 491). The list of courses included in this study are described in Table 1.

#	Catalog Title	Study *n*	Catalog Description
105	Introductory Psychology	135	Survey of the basic terms, processes, principles, and theories related to the scientific study of human behavior. Offered: Fall, Spring, Summer
230	Human Sexuality	132	Sexuality in personal development; personal, cultural, biological influences on sexual identification and behavior; fertility, reproduction, sexual functioning, sexuality and personality. (Crosslisted course offered as PSYCH 230, WOMEN ST 230) Offered: Fall, Spring, Summer
265	Biopsychological Effects of Alcohol and Other Drugs	85	Biopsychological effects of the major classes of abused and psychotherapeutic drugs, including alcohol, stimulants, sedatives and hallucinogens. Offered: Fall and Spring
321	Introduction to Personality	225	Theories, concepts, methods, discoveries in psychology of personality. Offered: Fall, Spring, Summer
324	Psychology of Gender	223	Contemporary overview of the psychological theory and research on sex and gender. (Crosslisted course offered as PSYCH 324, WOMEN ST 324) Offered: Fall, Spring, Summer
333	Abnormal Psychology	225	Problems of abnormality from traditional and evolving points of view; types, therapies, outcomes, preventive techniques. Offered: Fall, Spring, Summer

350	Social Psychology	263	Attitude changes, conformity, interpersonal relations, groups and social influences explored to give a coherent view of social psychology. (Crosslisted course offered as PSYCH 350, SOC 350). Offered: Fall, Spring, Summer
361	Principles of Developmental Psychology	140	Psychological processes of aging; changes in sensory, motor, cognitive, motivational and personality characteristics; research methodologies for the study of aging Offered: Fall, Spring, Summer
363	Psychology of Aging	17	Psychological processes of aging; changes in sensory, motor, cognitive, motivational and personality characteristics; research methodologies for the study of aging. Offered: Summer
372	Biological Basis of Behavior	35	Functional relationship between nervous system and behavior; integrated organ systems, sensory processes, and investigative procedures. Offered: Spring
401-Pre	Historical Development of Psychology	31	Concepts, methods, theories, trends, and systems.
401-Post		55	Offered: Fall, Spring, Summer
464	Behavior Disorders of Children and Adolescents	12	Theoretical and empirical approaches to the description, etiology, and treatment of behavior disorders in children and adolescents. Offered: Summer
490	Cognition and Memory	91	Human information processing, memory, and cognition. Offered: Fall, Summer
491	Principles of Learning	25	Principles of learning from a behavioral perspective using the experimental analysis of behavior. Offered: Spring

Table 1. Descriptions of Courses Offered Online in the Psychology Department at Washington State University

The course designs held constant during the 2015–2016 year (with the exception of PSYCH 401, and we separated the data for this class into pre- and post-design change), while the instructor of record for each course changed at least once. In general, the same exam was proctored during the three semesters making up 2015, and then in the spring 2016 we switched which exam was proctored.

Procedure

All online courses were taught in Blackboard Learn with the exception of one semester of data. Course instructors were graduate students in at least their second year of study at WSU. They were drawn from both our clinical and experimental PhD programs. A few courses were taught by department faculty, to include the first author of this study. Instructors were not

informed of the details of this study so that they could not influence their students' performance on exams.

In each online class, one exam is proctored and the remaining exams are non-proctored. Proctored exams are administered by WSU's in-house proctoring service, Global Campus Proctoring Service (GCPS). Students sign up for a time during the exam period, which runs Monday to Sunday in all classes. This gives students the opportunity to find a day and time that fits their busy schedule and which fits the hours during which GCPS is open. When their exam day and time arrives, students contact GCPS, provide proof of identity, and then use their webcam to show their testing space. The student takes the exam free of interference from the proctor unless an issue arises. When finished, the student informs the proctor, and the session ends. All proctored exams are password protected, and only GCPS and the instructor have this password. Hence, a student cannot preview an exam on his or her own time. Proctored exams include the following instructions: "The exam is closed book, with no aids/notes. A dry erase white board is allowed for making notes. The proctor will verify that the student has wiped the board clean upon exam completion." In terms of non-proctored exams, students can take the exam again anytime during the exam period. The same guidelines prohibiting the use of outside materials, people, or books apply, as stated in the course syllabus.

Data were collected at the end of each semester after all final grades were submitted by downloading the gradebook in each class. The names of the individual students were omitted from the data file analyzed via SPSS and were replaced by a participant number. Also, any work unrelated to exams was deleted from the final data file.

Analysis

We utilized a series of paired-samples *t*-tests to investigate several hypotheses. First, we examined differences in student performance on proctored and non-proctored exams based on percentage earned and the time it took to take the exam. We hypothesized that students would earn a higher score on non-proctored exams than on proctored exams and that students would take more time to complete non-proctored exams than proctored exams.

To rule out the possibility that poor performance is somehow due to the in-house proctoring service currently in use, we examined student exam performance from the fall 2012 semester, when ProctorU was utilized. We hypothesized that students would earn a higher grade on non-proctored exams than proctored exams and analyzed exam scores from four psychology courses offered at the time: 105, 321, 324, and 350.

We next wondered how students performed on an individual exam when it was non-proctored one semester and then became proctored another semester. To this end, we looked at the specific exams in each class that underwent a switch. We hypothesized that when an exam switched from proctored to non-proctored, student performance would increase significantly. Similarly, we hypothesized that if an exam was initially non-proctored, student performance would decrease significantly when it became proctored.

Lastly, we wanted to ensure that the performance was not linked to the instructor of record for each class. It is possible that some online instructors do a better job of explaining concepts in the discussion board, which then leads students to a clearer understanding of the material and higher exam grades. By examining performance for each exam in the class across semesters, we could see where differences might lie and then explain whether this is attributable

to the instructor and not potential cheating. To accomplish this, we used one-way ANOVAs with Tukey's post hoc test and had two hypotheses in relation to exams, semesters, and percentages. First, we hypothesized that exam differences would exist only—or mostly—with exams that had a shift from non-proctored to proctored. Those without a shift would not be significantly different from one another. Second, for semesters, most differences would lie with spring 2016 and all or most of the 2015 semesters, as the greatest number of shifts in the most classes occurred during spring 2016.

Results

Analysis Level 1: Testing Exam Score and Time

We wanted to first see how students performed on proctored and non-proctored exams in online psychology classes at WSU during the four semesters from spring 2015 to spring 2016. A paired samples *t*-test revealed that the mean percentage earned on proctored exams (M = 64.37, SD = 15.47) was significantly lower than the percentage earned on non-proctored exams (M = 77.12, SD = 11.45), $t(1693) = -37.19$, $p = .000$, d = 0.90, 95% CI [–13.42, –12.08], thereby supporting our hypothesis. This result held not only across all online psychology courses pooled together in one analysis but also across individual courses analyzed alone. It would be expected, and was found, that in some classes the difference between proctored and non-proctored exam was greater than in other classes and that this is a function of class difficulty. Please see Table 2.

		Proctored Exams		Non-Proctored Exams						
Class	*n*	*M*	*SD*	*M*	*SD*	M_D	*t*	*df*	*d*	95% CI
All Classes	1694	64.37	15.47	77.12	11.45	-12.75	-37.19	1693	0.90	[13.42, -12.08]
105	135	67.11	14.52	73.17	13.16	-6.06	-6.89	134	0.59	[-7.80, -4.32]
230	132	63.77	15.36	77.80	10.94	-14.03	-10.58	131	0.92	[-16.65, -11.40]
265	85	61.67	11.82	73.63	9.69	-11.96	-12.35	84	1.34	[-13.88, -10.03]
321	225	73.03	12.97	80.66	9.68	-7.63	-9.50	224	0.63	[-9.21, -6.05]
324	223	68.47	16.21	75.88	11.74	-7.41	-7.89	222	0.53	[-9.26, -5.56]
333	225	59.96	11.33	77.79	11.95	-17.83	-19.49	224	1.30	[-19.64, -16.03]
350	263	58.68	13.98	73.95	10.99	-15.27	-20.21	262	1.25	[-16.76, -13.79]
361	140	72.15	12.50	82.19	9.23	-10.04	-12.11	139	1.02	[-11.68, -8.40]
363	17	58.35	14.62	77.76	6.19	-19.41	-7.62	16	1.85	[-24.81, -14.01]
372	35	58.17	16.08	75.56	11.72	-17.39	-8.41	34	1.42	[-21.60, -13.19]
401-Pre	31	53.16	19.94	80.31	12.19	-27.15	-7.91	30	1.42	[-34.16, -20.15]
401-Post	55	60.52	18.65	76.18	10.52	-15.66	-7.39	54	1.00	[-19.91, -11.41]
464	12	63.00	11.58	79.17	11.12	-16.17	-4.15	11	1.20	[-24.74, -7.59]
490	91	59.78	18.22	79.46	12.85	-19.68	-9.87	90	1.04	[-23.64, -15.72]
491	25	56.25	18.69	75.57	10.32	-19.32	-5.28	24	1.06	[-26.87, -11.76]

Note. All p values are < .01.

Table 2. Differences in Student Performance on Proctored vs. Non-Proctored Exams in Online Psychology Course

Secondly, we wanted to know if there was a difference in the amount of time it took students to complete their exams, whether it was proctored or non-proctored, and so obtained the average time of completion for the class from Blackboard under Item Analysis. In most online courses, students were given 60 minutes to complete exams. A paired samples *t*-test revealed that the mean time taken on proctored exams (M = 27.69, SD = 5.17) was significantly lower than the time taken on non-proctored exams (M = 48.18, SD = 5.13), $t(38) = -17.55$, $p = .000$, d = 2.81, 95% CI [–22.85, –18.13]. This supported our hypothesis and showed that even though students were given 60 minutes to take all exams, they averaged 20 minutes more time on non-proctored than proctored exams. Please see Table 3.

Class	*n*	Proctored Time (minutes)	Non-Proctored Time (minutes)	M_D
All Classes	1694	27.69	48.18	-20.49
105	135	25.75	46.50	-20.75
230	132	21.67	45.75	-24.08
265	85	21.00	52.44	-31.44
321	225	24.00	43.75	-19.75
324	223	28.25	48.08	-19.83
333	225	29.00	56.13	-27.13
350	263	28.80	46.27	-17.47
361	140	28.00	49.50	-21.50
363	17	24.00	40.33	-16.33
372	35	23.00	50.67	-27.67
401-Pre	31	30.00	51.00	-21.00
401-Post	55	35.33	56.42	-21.08
464	12	43.00	37.50	-5.50
490	91	30.33	47.17	-16.83
491	25	35.00	48.67	-13.67

Table 3. Mean Time Taken on Proctored vs. Non-Proctored Exams in Online Psychology Courses

Analysis Level 2: Proctoring Service

A paired samples *t*-test revealed that the mean percentage earned on proctored exams (M = 65.37, SD = 14.73) was significantly lower than the percentage earned on non-proctored exams (M = 81.91, SD = 10.17), $t(258) = -19.25$, $p = .000$, d = 1.20, 95% CI [–18.22, –14.84], thereby confirming our hypothesis. Please see Table 4.

		Proctored Exams		Non-Proctored Exams					
Class	*n*	*M*	*SD*	*M*	*SD*	*t*	*df*	*d*	95% CI
All Classes	259	65.37	14.73	81.91	10.17	-19.25	258	1.20	[-18.22, -14.84]
105	46	57.48	12.25	73.43	12.40	-11.22	45	1.65	[-18.82, -13.09]
321	70	57.54	14.92	85.75	6.87	-16.69	69	1.99	[-31.58, -24.83]
324	77	69.04	10.54	82.62	9.67	-12.35	76	1.41	[-15.77, -11.39]
350	66	74.91	13.14	82.90	8.73	-5.46	65	0.64	[-10.91, -5.07]

Note. All p values are < .01.

Table 4. Differences in Student Performance on Proctored vs. Non-Proctored Exams in Select Online Psychology Courses Taken During Fall 2012

The results for exam percentage were identical to the 2015–2016 data, suggesting that the proctoring service used was not a factor in student performance.

Analysis Level 2: Exam Difficulty Affecting Student Performance

Table 5 shows that when an exam was proctored, students performed worse than when it was non-proctored, as predicted. This was the case in all psychology classes for the four semesters under study. We did not include PSYCH 361, 372, 401 Pre, 464, and 491 since we had only one semester of data to examine.

			When Proctored		When Non-Proctored							
Class	*n*	Exam	*M*	*SD*	*M*	*SD*	M_D	$S_{(M1-M2)}$	*t*	*p*	*df*	95% CI
105	135	2	67.96	15.21	77.98	10.50	-10.02	2.72	-3.69	.000	133	[-15.40, -4.65]
		4	64.85	12.41	72.45	15.80	-7.61	2.90	-2.62	.010	128	[-13.35, -1.87]
230	132	5	63.50	16.25	69.95	13.90	-6.45	2.86	-2.25	.026	130	[-12.12, -0.79]
		2	64.31	13.57	85.18	12.34	-20.87	2.36	-8.86	.000	130	[-25.54, -16.21]
265	85	2	64.92	11.74	72.43	11.31	-7.51	2.51	-3.00	.004	83	[-12.50, -2.53]
		3	58.91	11.29	76.31	12.50	-17.39	2.58	-6.74	.000	83	[-22.53, -12.26]
321	225	3	73.88	13.29	87.25	10.48	-13.37	1.86	-7.21	.000	223	[-17.03, -9.72]
		4	70.91	11.97	83.89	12.27	-12.98	1.80	-7.21	.000	223	[-16.53, -9.43]
324	223	4	70.58	15.55	78.41	13.83	-7.83	2.37	-3.30	.001	221	[-12.50, -3.16]
		2	61.85	16.60	72.66	16.30	-10.81	2.56	-4.22	.000	221	[-15.86, -5.77]
333	225	3	59.29	10.74	83.36	12.69	-24.07	1.71	-14.08	.000	223	[-27.44, -20.70]
		2	61.85	12.76	78.19	12.68	-16.34	1.92	-8.49	.000	223	[-20.14, -12.55]
350	263	2	57.37	13.99	69.90	12.93	-12.53	2.05	-6.12	.000	261	[-16.56, -8.50]
		4	63.31	13.03	74.88	12.97	-11.57	1.93	-5.98	.000	258	[-15.38, -7.76]
361	140	3	72.51	12.38	82.59	8.39	-10.08	2.56	-3.94	.000	138	[-15.13, -5.03]
		4	70.56	13.14	81.43	10.79	-10.87	2.45	-4.44	.000	137	[-15.72, -6.03]
401-Post	55	3	59.76	18.44	77.21	11.27	-17.45	4.04	-4.32	.000	53	[-25.54, -9.35]
		4	60.86	18.98	82.67	16.86	-21.82	5.36	-4.07	.000	53	[-32.56, -11.07]
490	91	3	59.02	19.03	74.69	17.49	-15.67	3.93	-3.99	.000	89	[-23.48, -7.86]
		1	60.88	17.16	76.23	13.09	-15.34	3.17	-4.83	.000	89	[-21.65, -9.04]

Note: All p values are < .01.

Table 5. Examining Differences in Student Performance on the Proctored and Non-Proctored Versions of Class Exams

Analysis Level 2: Instructor of Record Affecting Student Performance

The results of one-way ANOVAs with Tukey's post hoc test showed that differences only occurred with the exams for which a switch from non-proctored to proctored occurred. This confirmed our hypothesis. Also, in all but two online courses, only the exams which had a switch showed significant differences across semesters. The two classes in which more than the two exams were significant included PSYCH 265 and PSYCH 361. The result from PSYCH 265 is not surprising. The same instructor taught the class each semester and routinely modified his exams by adding new questions. He made the decision as to which questions to keep and which

to discard based on item analysis of each exam. Each exam changed slightly from semester to semester; hence, three of the four exams were significantly different across this period. As for PSYCH 361, four of the five exams came up significantly different. Exams 3 and 4 experienced the switch, and so significance was to be expected. Exams 1 and 2 did not switch; therefore, significance was unexpected.

Interestingly, when the post hoc tests revealed differences between semesters other than spring 2016 and another, it was always between summer 2015 and another 2015 semester. This was the case for Exam 2 in PSYCH 361 and can be easily explained: WSU students taking online classes in the summer semester of any year tend to be of a different demographic. Many online students take the summer off, while on-campus students, in turn, take online classes. This affords on-campus students the opportunity to go home but still make progress toward completing their degree.

Discussion

Main Findings and Previous Research

Consistent with previous research and in support of our hypotheses, we found that students performed significantly worse on proctored exams than non-proctored exams (Wellman & Marcinkiewicz, 2004; Harmon & Lambrinos, 2008; Hollister & Berenson, 2009; Richardson & North, 2013; Stack, 2015). In spring 2016, the proctored exam in each PSYCH class was switched, meaning the results held across 14 classes, four semesters, and at least one proctored exam switch. Switching proctored exams was an important manipulation in this study. It could be that we unintentionally selected an exam to be proctored that was generally more difficult for students, resulting in poor performance and making it appear that students did better on non-proctored exams. The main take-home point is this: an exam students did poorly on when proctored transformed into a greatly improved performance when non-proctored. Likewise, an exam that students did well on when non-proctored became a blemish on their overall class performance when it was proctored.

This leads to the question of why this difference exists. It could be due to students' general anxiety about taking an exam, which is further exacerbated by being watched while they do so. Or it could be due to the fact that while students are taking their exam under the vigilant eye of a proctor, they cannot use notes, Internet sources, other classmates, and/or their textbook, which they may use in a non-proctored exam despite instructions not to do so. We also found that students took almost twice as long to complete non-proctored exams, much like the findings of Hylton et al. (2016). Students might be taking advantage of not being monitored during all but one exam in their class, but this cannot be confirmed.

Strengths and Limitations

This study stands apart from past research for several reasons. First, our data set included a sample of approximately 1,700 students taking online psychology courses over four semesters, representing the largest sample size and spanning the longest period to date. Second, a wide array of classes of varying difficulty levels were used. Third, a comparison of two proctoring services was undertaken to ensure the effect was not just an artifact of our in-house proctoring service. Fourth, we manipulated which exam was proctored to see if the effect held. Fifth, we explored whether shifts in course instructor could be the cause of our differences in exam

performance and were able to account for and offer explanations when differences emerged. We believe these five strengths compensated for the limitations of past research, such as small sample sizes, using only one class, restricted class types, and varying exam difficulty due to content tested.

Of course, our study is not without limitations. First, our focus was only on students taking online psychology classes and offers no comparison with classroom psychology courses or courses in other fields. Second, our sample consisted of online students, who mostly represent a different demographic than classroom students. Third, though we did compare two proctoring services, our study with ProctorU utilized data from almost three years before the main study and included just four classes. We need to better generalize the effect across proctoring services. Finally, we did randomize which exam was proctored in all classes, but we need to do so in more than just one semester.

Implications and Future Directions

Hylton et al. (2016) reported that students who were not monitored felt that they had more of a chance to collaborate with others and use unauthorized resources, while those who were monitored by a Web-based proctor felt that they could not engage in misconduct while taking their exam. Though we did not ask students for their impressions of proctored and non-proctored testing conditions, our results showed that students did earn higher scores on non-proctored exams and took almost twice as long as they did on proctored exams. Importantly, this effect held when an individual exam switched from proctored to non-proctored, or vice versa.

We need to realize that students have the potential to use their textbooks and notes when taking online exams, so we need to design courses with the risk of academic dishonesty in mind (Trenholm, 2007). How so? We have to establish clear course learning and behavioral objectives, show students what a class can offer them, explain tracking tools used to monitor activity in the course, create policies for Internet service provider (ISP) crashes, and create a large test bank to draw questions from (Christe, 2003). Additionally, we need to include essay or short answer questions and not just multiple-choice style questions, make sure students are aware of the policy on and penalties for cheating, give shorter time frames for completing exams, and randomize questions and answer choices (Moten et al., 2013). Milliron and Sandoe (2008) suggest verifying the test taker's identity and reshaping the attitudes and perceptions of students as they relate to cheating and assessment. Stiff penalties for cheating could be implemented at the university level in terms of permanent notations on the student's record (Kitahara, Westfall, & Mankelwicz, 2001) and at the course level in terms of an F for the assignment/exam or an F in the course. It is important to note that the perceived *severity* of sanctions can be just as effective at reducing dishonest behavior as the *certainty* of sanctions (D'Arcy, Hovav, & Galletta, 2008), further supporting the need to be clear on such policies and to educate students on them.

There is a justifiable need to proctor a minimum of one online exam each semester, and at best, all online exams in a class, just as would be the case in a classroom course. The issue with this is that there is a cost for each exam that is proctored, with the average being about $20 per exam. With the growing cost of textbooks, it is prudent for universities not to further burden students financially by charging what may seem (to the university) like a modest fee for proctoring exams. Of course, in light of research such as ours, universities could justify it as a cost of doing business, but at the same time, we do not want to make education inaccessible for those who are already financially challenged.

Another possibility suggested in the literature is the use of code-of-conduct or honor statements (Christe, 2003; Milliron & Sandoe, 2008). Most universities have already developed such statements, and course instructors and designers could add them to the beginning of each exam as a reminder to students to behave ethically. Inclusion of such statements does not cost the student or instructor anything in terms of money and may be just as effective as proctoring an exam. This is supported in the research of Ariely and colleagues, who showed that asking participants to recall the Ten Commandments prior to doing a task or being reminded of an honor pledge (Mazar et al., 2008), signing an honesty pledge at the top rather than the bottom of a page (Shu et al., 2012), and presenting participants with an out-group cheater (Gino et al., 2009), all significantly reduced cheating and can be used to revise current intervention and policy (Ayal et al., 2015). Hence, a viable future direction, and one that our research team is currently pursuing, is to investigate the utility of conduct statements for reducing cheating during online proctored exams.

A final possibility is to make online exams open notes/book from the start but increase the difficulty of such exams so that they are not simply testing the recollection of facts (Feller, 1994; Williams & Wong, 2009; Stowell, 2015). Though students would be permitted to utilize outside sources, eliminating student misconduct issues, they would still need a good understanding of the material to be able to accurately apply it and could not simply look up answers as they took the exam.

Conclusion

In sum, the current study adds to the growing body of literature showing that students perform better when an online exam is not proctored. Cheating is one explanation for this behavior, but so is student-reported anxiety about test taking, whether the exam is proctored or not. Many strategies can be undertaken to ensure academic integrity in the growing area of online education if we, as educators, are willing to put the time into course development.

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Examining the Reliability and Validity of a Turkish Version of the Community of Inquiry Survey

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Abstract
The aim of this study was to describe the validity and reliability of a Turkish language version of the CoI survey developed by Arbaugh et al. (2008). Data were obtained from 1150 students enrolled in online courses in various departments in three Turkish state universities. The data were randomly divided into two parts: the first part was subjected to exploratory factor analysis; the second part underwent confirmatory factor analysis. A three-factor structure of the CoI framework explained 75.28% of the variance in the pattern of relationships among the items using the first split-half sample. All three presences had high reliabilities (teaching presence=.965, social presence=.953, and cognitive presence=.972). The three-factor structure of the CoI framework with teaching, social, and cognitive presences confirmed the validity of the Turkish version of the CoI survey.

Keywords: community of inquiry; teaching presence; social presence; cognitive presence; online learning; factor analysis

Olpak, Y.Z., & Kiliç Çakmak, E. (2018). Examining the reliability and validity of a Turkish version of the community of inquiry survey. *Online Learning, 22*(1), 147-161. doi:10.24059/olj.v22i1.990

Examining the Reliability and Validity of a Turkish Version of the Community of Inquiry Survey

The number of distance education programs established in Turkish universities is increasing day by day. Currently, there are 183 higher education institutions (112 state universities, 65 foundation universities, and 6 foundation vocational schools) in Turkey. According to statistical data of the Council of Higher Education, 98 of them (67 state universities and 31 foundation universities) had distance education centers servicing 59,282 online learning students during the 2014-2015 academic year (Yavuzalp, Demirel, Taş, & Canbolat, 2017). To promote in-depth and significant learning in the online environment, the Community of Inquiry (CoI) framework proposed by Garrison, Anderson, & Archer (2000), identifies the critical conceptual elements required for success, and many studies on distance learning have thus employed the framework. Additionally, the CoI framework has been confirmed by various studies (e.g., Akyol & Garrison, 2008; Arbaugh, 2007; Arbaugh, et al., 2008; Garrison, Cleveland-Innes, & Fung, 2004, 2010; Kozan & Richardson, 2014; Yu & Richardson, 2015). The framework suggests that learning may occur as the result of the interaction among three main elements: cognitive, social, and teaching presences (Garrison et al., 2000). The elements, categories, and indicators of the CoI framework are shown in Table 1 (Garrison & Anderson, 2003).

Elements	Categories	Indicators
Cognitive Presence	Triggering Event	Recognize problem Sense of puzzlement
	Exploration	Divergence Information exchange Suggestions Brainstorming Intuitive leaps
	Integration	Convergence Synthesis Solutions
	Resolution	Apply Test Defend
Social Presence	Affective	Expression of emotions Use of humor Self-disclosure
	Open Communication	Continue a thread Quote from others' messages Refer explicitly to others' messages Ask questions Compliment, express appreciation Express agreement
	Cohesive	Vocatives Addresses or refers to the group using inclusive pronouns Phatics, salutations
Teaching Presence	Instructional Design and Organization	Set curriculum Design methods Establish time parameters Utilize medium effectively Establish netiquette Make macro-level comments about course content
	Facilitating Discourse	Identify areas of agreement/disagreement Seek to reach consensus/understanding Encourage, acknowledge, or reinforce student contributions Set climate for learning Draw in participants, prompting discussion Assess the efficacy of the process
	Direct Instruction	Present content/questions Focus the discussion on specific issues Summarize the discussion Confirm understanding through assessment and explanatory feedback Diagnose misconceptions Inject knowledge from diverse sources, e.g., textbook, articles, Internet, personal experiences (includes pointers to resources) Respond to technical concerns

Table 1. The Elements, Categories, and Indicators of CoI Framework

Cognitive presence—the most challenging type of presence in the CoI framework to study and develop in online courses (Garrison & Arbaugh, 2007)—was defined as "the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse in a critical community of inquiry" (Garrison, Anderson, & Archer, 2001, p. 11). Cognitive presence is expressed as critical thinking and is operationalized via the practical inquiry model (Garrison et al., 2001). The practical inquiry model, shown in Figure 1, consists of four phases: triggering event, exploration, integration, and resolution. These elements reflect the critical thinking process thought to contribute to cognitive presence (Garrison et al., 2001). In this context, cognitive presence is defined as the inquiry process with problem definition, exploration of relevant content and ideas, integration of those ideas in a meaningful structure, and testing the usefulness of outcomes directly or indirectly (Garrison, 2006).

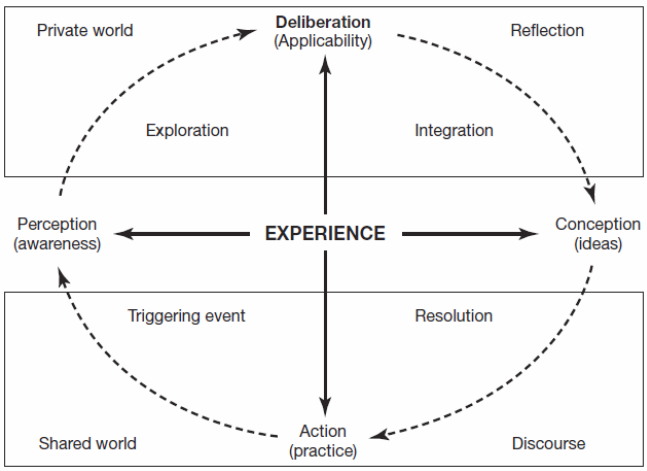

Figure 1. Practical inquiry model

Social presence—the most extensively studied theme among core elements in the CoI framework (Arbaugh, 2007)—is defined as "the ability of learners to project themselves socially and emotionally in a community of inquiry" (Rourke, Anderson, Garrison, & Archer, 2001, p. 51). According to Garrison (2009), however, the concept of social presence has, over time, changed from its original conceptualization. Therefore, Garrison (2009) has updated social presence to mean "the ability of participants to identify with the community (e.g., course of study), communicate purposefully in a trusting environment, and develop interpersonal relationships by way of projecting their individual personalities" (Garrison, 2009, p. 352).

Teaching presence occurs both before and during the course. It is defined as "the design, facilitation, and direction of cognitive and social processes for the purpose of realizing personally meaningful and educationally worthwhile learning outcomes" (Anderson, et al., 2001, p. 5). Anderson et al. (2001) stated that all the participants can contribute to teaching presence in online courses and, therefore, they preferred to use "teaching presence" rather than "teacher presence."

According to Garrison et al. (2000), the elements of CoI can enhance or inhibit the quality of educational experience and learning outcomes. Hence, one of the challenges educators face is to implement CoI in the online learning environment. Determining students' CoI perceptions is important for evaluating educational activities presented by some stakeholders such as course designers, program administrators, and instructors.

When studies related to the CoI framework were analyzed, it was initially understood that while CoI was examined in qualitative studies (e.g., Anagnostopoulos, Basmadjian, & McCrory, 2005; Garrison & Cleveland-Innes, 2005; Oriogun, Ravenscroft, & Cook, 2005; Schrire, 2004), the number of studies in which the three main elements (cognitive, social, and teaching presence) in the model were analyzed together increased with the development of surveys which provided opportunity for determining perceptions of CoI. Thus, it has become possible to work relatively efficiently in larger and wider samples and to increase the generalizability of the findings. In this respect, a variety of data collection tools were developed by researchers (Arbaugh, 2007; Arbaugh et al., 2008; Garrison et al., 2004). However, a review of the literature suggests that the CoI survey developed by Arbaugh et al. (2008) is widely accepted. The study conducted by Arbaugh et al. (2008) aimed to develop a valid and reliable CoI survey. The generalizability of the studies carried out through a single institution was limited. In this context in the summer of 2007, 287 graduate students in education and business were reached in four different institutions in the USA and Canada. In scoring the 34-item survey, a rating between 0 (Strongly Disagree) and 4 (Strongly Agree) was used. Analyses confirmed the reliability and validity of CoI conceptual framework consisting of cognitive, social, and teaching presences.

While the Arbaugh et al. (2008) study was conducted solely with online students, the reliability and the validity of this research were also tested with students in blended or online learning environments (e.g., Arbaugh, Bangert, & Cleveland-Innes, 2010; Bangert, 2009). In the evaluation of the survey developed in the original study, a rating between 0 (Strongly Disagree) and 4 (Strongly Agree) was utilized. In other studies, different rating options such as 1-4, 1-5, and 1-6 were used (e.g., Arbaugh et al., 2010; Bangert, 2009; Díaz, Swan, Ice, & Kupczynski, 2010; Shea & Bidjerano, 2009). In addition, some changes were made to the original survey items by different researchers (e.g., Díaz et al., 2010; Shea & Bidjerano, 2009). In one of these CoI survey studies conducted by Shea & Bidjerano (2009), Arbaugh et al.'s (2008) CoI survey was carried out. However, the 12th item ("The instructor provided feedback that helped me understand my strengths and weaknesses") was a modified restatement of the same item in the original survey ("The instructor provided feedback that helped me understand my strengths and weaknesses regarding the course goals and objectives"). When the items in the CoI survey were examined and shared at https://coi.athabascau.ca/, the interactive web site designed for sharing and discussing the research related to the CoI framework ("CoI Survey," 2015), the items reflected those used in the Shea and Bidjerano (2009) research.

In another study conducted by Díaz et al. (2010), a CoI survey developed by Arbaugh et al. (2008) was used; however, the 12th item ("The instructor provided feedback that helped me understand my strengths and weaknesses") and the 28th item ("Discussing course content with my classmates was valuable in helping me appreciate different perspectives") were changed from the original survey. The results of the study also confirmed the factor structure of the CoI framework. Kozan and Richardson (2014) examined the factor structure of the adapted form of the survey developed by Arbaugh et al. (2008). In this context, in a study conducted by Díaz et al. (2010), the CoI survey was used to determine students' perceptions of cognitive, social, and teaching presences. With a high degree of reliability, the result confirmed a three-factor structure of the CoI framework.

In a study on the determination of student perceptions of CoI by Olpak, Yagci, & Basarmak (2016), it was mentioned that the survey developed by Arbaugh et al. (2008) had been adapted into different languages such as Korean and Arabic (Alaulamie, 2014; Yu & Richardson, 2015) and was used in different disciplines such as education, business, and health care. In addition, Olpak et al. (2016) stated that the final draft used in the study conducted by Díaz et al. (2010) could be adapted into different languages. Therefore, in the scope of the present research, we aimed to adapt the final draft of the CoI survey used in the Diaz et al. study into Turkish.

Methods

Sample

The study was carried out with 1150 students enrolled in online courses in different departments and disciplines (education, nursing, business, engineering, science and math, tourism, etc.) at three state universities in Turkey during the 2015-2016 spring term. Females comprised 60.78% of the participant sample and 39.22% of the sample was male. The average age of a survey respondent was 19.71; ages of participants across the sample ranged from 17 to 41.

Data Collection Tools

Data was collected using the CoI survey which was developed by Arbaugh et al. (2008) and used in the study conducted by Díaz et al. (2010). An individual information form (gender, age, and department etc.) was also used. First, the authors translated the survey into Turkish. Then, two experts in Turkish provided feedback about the accuracy of the Turkish translation. In response to the feedback, edits were made, and an expert evaluation form was prepared. This evaluation form was used to gather expert opinion related to the appropriateness of the items in the Turkish form of the CoI survey. The experts' evaluations dealt with the appropriateness of the items in terms of scope and Turkish culture; it utilized a 3-point Likert scale (1=Not appropriate, 2=Moderate, 3=Completely appropriate). An explanation column was added to each item to encourage the experts to provide additional comments if necessary. When the data obtained from the seven expert evaluation forms were considered, it was decided that the items with an item average score of 2.50 or higher would be appropriate to be included under the relevant factor; the items with an item average score lower than 1.50 would be excluded from the related factor, and the other items would be corrected according to the recommendations of the experts. Per the feedback of the experts, the Turkish survey consisting of 34 items was finalized. The items in the finalized Turkish survey were given to the three English language experts who "back translated" (a procedure according to which a translator or team of professional translators interpret a document previously translated into another language back to the original language) the survey items into English again. After the consistency between Turkish and English forms was confirmed, the study was conducted.

Data Analysis

The total sample (n=1150) was randomly divided into two equal halves by using the Statistical Package for the Social Sciences (SPSS, version 20). Exploratory factor analysis (EFA) was performed on the first sample (n=575) and confirmatory factor analysis (CFA) was performed on the second sample (n=575). Also, the internal consistency reliability was tested by using Cronbach's α for each competency. In such studies, the sample size significantly influences the number of factors that will arise from the analysis. Various opinions exist about sample size. Kass and Tinsley (1979) recommended 5 to 10 participants per item; Nunnally (1978) recommended at least 10 or more respondents per item, and Comrey and Lee (1992) claimed that a sample size of 200 was fair and a sample size of 300 was good. Based on these figures, it was concluded that the number of participants in each sample in this study was sufficient.

Results

Exploratory Factor Analysis (EFA)

EFA is a statistical method which is used to increase the reliability of a survey by removing inappropriate items. The method also identifies the dimensionality of constructs by examining relations between items and factors when the information of the dimensionality is limited (Netemeyer, Bearden, & Sharma, 2003). To describe the factor pattern of the CoI survey, an EFA was conducted on the 34

items with varimax rotation using SPSS 20. The Kaiser–Meyer–Olkin measure confirmed the sampling adequacy for the analysis, KMO = .983. Bartlett's Test of Sphericity, $\chi 2$ (561) = 22928.265, $p < .000$ indicated that correlations between items were sufficiently large for the EFA. Two factors emerged with an eigenvalue of 1 over 34 items. The contribution of these factors to the total variance is 72.441%. However, it was decided that the analysis should be repeated with three factors to be consistent with the number of factors expected in the theoretical structure determined during the development of the survey.

In the repeated analysis for the three factors, the total contribution of the factors to the total variance was 27.187% for the first factor, 25.424% for the second factor, and 22.665% for the third factor. The total contribution of these factors to the variance is 75.277%. The three factors above the 1 eigenvalue are shown in the Scree Plot in Figure 2. The factor pattern and the factor loadings of the items obtained as the result of the repeated analysis as three factors are given in Table 2. The bold numbers shown in Table 2 represent the specific CoI survey items that comprise each of the three factors emerging from the exploratory analysis.

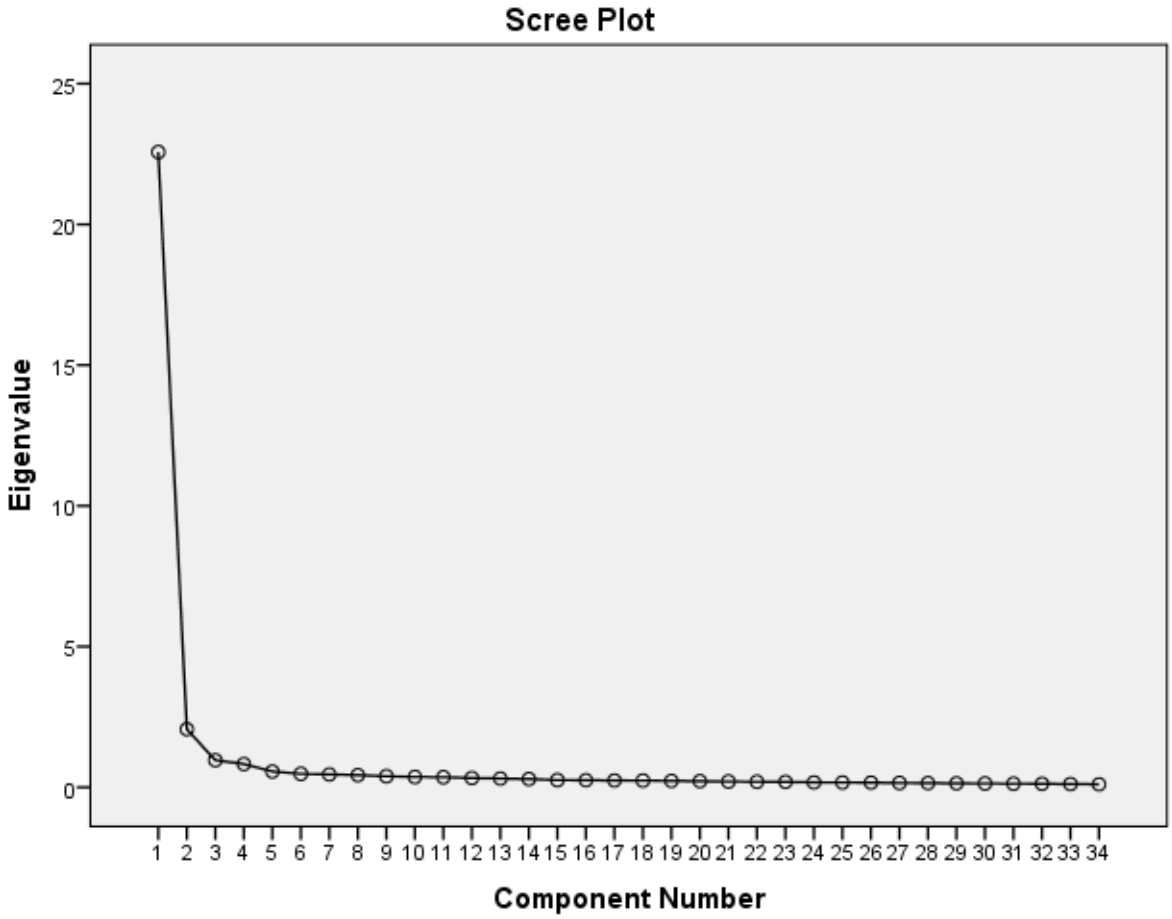

Figure 2. Scree plot for the Turkish version of the CoI survey

	Component		
	1	2	3
Teaching Presence			
1. The instructor clearly communicated important course topics.	**.772**	.300	.168
2. The instructor clearly communicated important course goals.	**.798**	.303	.173
3. The instructor provided clear instructions on how to participate in course learning activities.	**.800**	.244	.230
4. The instructor clearly communicated important due dates/time frames for learning activities.	**.741**	.204	.211
5. The instructor was helpful in identifying areas of agreement and disagreement on course topics that helped me to learn.	**.806**	.276	.274
6. The instructor was helpful in guiding the class towards understanding course topics in a way that helped me clarify my thinking.	**.710**	.349	.342
7. The instructor helped to keep course participants engaged and participating in productive dialogue.	**.746**	325	.297
8. The instructor helped keep the course participants on task in a way that helped me to learn.	**.728**	.332	.357
9. The instructor encouraged course participants to explore new concepts in this course.	**.631**	.363	.461
10. Instructor actions reinforced the development of a sense of community among course participants.	**.609**	.338	.486
11. The instructor helped to focus discussion on relevant issues in a way that helped me to learn.	**.642**	.317	.493
12. The instructor provided feedback that helped me understand my strengths and weaknesses.	**.608**	.392	.456
13. The instructor provided feedback in a timely fashion.	**.597**	.382	.306
Social Presence			
14. Getting to know other course participants gave me a sense of belonging in the course.	.447	.411	**.546**
15. I was able to form distinct impressions of some course participants.	.349	.388	**.638**
16. Online or web-based communication is an excellent medium for social interaction.	.252	.423	**.667**
17. I felt comfortable conversing through the online medium.	.285	.370	**.721**
18. I felt comfortable participating in the course discussions.	.335	.367	**.748**
19. I felt comfortable interacting with other course participants.	.326	.352	**.765**
20. I felt comfortable disagreeing with other course participants while still maintaining a sense of trust.	.312	.402	**.720**
21. I felt that my point of view was acknowledged by other course participants.	.346	.456	**.671**
22. Online discussions help me to develop a sense of collaboration.	.288	.517	**.656**

Table 2. CoI Survey Items and Factor Loadings

	Component		
	1	2	3
Cognitive Presence			
23. Problems posed increased my interest in course issues.	.348	**.636**	.502
24. Course activities piqued my curiosity.	.337	**.685**	.431
25. I felt motivated to explore content related questions.	.304	**.760**	.388
26. I utilized a variety of information sources to explore problems posed in this course.	.315	**.738**	.342
27. Brainstorming and finding relevant information helped me resolve content related questions.	.331	**.735**	.396
28. Discussing course content with my classmates was valuable in helping me appreciate different perspectives.	.296	**.651**	.479
29. Combining new information helped me answer questions raised in course activities.	.448	**.708**	.355
30. Learning activities helped me construct explanations/solutions.	.442	**.694**	.378
31. Reflection on course content and discussions helped me understand fundamental concepts in this class.	.423	**.708**	.390
32. I can describe ways to test and apply the knowledge created in this course.	.437	**.658**	.385
33. I have developed solutions to course problems that can be applied in practice.	.388	**.672**	.410
34. I can apply the knowledge created in this course to my work or other non-class related activities.	.390	**.664**	.324

Table 2 (cont). CoI Survey Items and Factor Loadings

Reliability Analysis

An item analysis was conducted to test the reliability of each presence as well as the overall CoI survey. Cronbach's α yielded internal consistencies equal to .965 for teaching presence, .953 for social presence, and .972 for cognitive presence. In addition, Cronbach's α for the instrument overall was .984. According to Blunch (2008), if the α value is over .70, it shows the internal consistency is acceptable and if the α value is over .90, the internal consistency is excellent. In this context, the α values of the Turkish CoI survey are excellent.

Confirmatory Factor Analysis (CFA)

Following the EFA, a CFA was conducted. The CFA tests whether a previously defined and constrained structure is confirmed as a model. The CFA is also used to confirm a conceptual structure or model (Maruyama, 1998). In this context, the CFA is used for predictive validity (Floyd & Widaman, 1995; Kline, 2005) and is useful for the development, regulation, and re-examination of measurement tools (Floyd & Widaman, 1995).

The CFA was conducted on the second subsample (n=575) using Lisrel 8.80 to test the stability and reproducibility of the three-factor CoI model produced by the EFA. Fit indices were calculated for the three-factor model. However, since the appropriateness and effectiveness of indices depend on sample size, estimation procedure, model complexity, and/or violation of the underlying assumptions of multivariate normality and variable independence, no clear consensus emerged regarding model fit (Byrne, 2010). However, Root Mean Square Error of Approximation

(RMSEA), the Comparative Fit Index (CFI) and the Non-Normed Fit Index (NNFI) values provide optimal information by benefitting from the studies made by the different researchers in the study conducted by Bangert (2009). When fit indices are calculated as the result of CFA with the limit values, CFI and NNFI values have excellent conformity, RMSEA values have weak conformity, and $\chi 2$/df values do not have good conformity ($\chi 2 = 2968.10$, df = 524, p = .00, RMSEA = .090, CFI = .98, NNFI = .98).

When we consider the modification indices related to the analysis results, a considerable relationship can be determined between the error covariance of item 17 and item 16 in the social presence factor and between item 1 and item 2 in the teaching presence factor. Considering roughly the same measurement of properties, one might consider subtracting an item from the item pairs. However, in accordance with the experts' opinions, it was decided that it would be more appropriate to examine the structure examined with EFA for validity by adding the high error correlations observed between the items into the model.

When the fit indices calculated in the second CFA result are compared with the limit values, CFI and NNFI values demonstrate excellent conformity; RMSEA values have weak conformity, and $\chi 2$/df values have conformity at an intermediate level ($\chi 2 = 2539.14$, df = 522, p = .00, RMSEA = .082, CFI = .99, NNFI = .99). When the other fit indices are compared with the limit values, Root Mean Square Residual (RMR) values indicate a good fit while Standardized RMR and Incremental Fit Index (IFI) values indicate a perfect fit (RMR = .063, SRMR = .039, IFI = .99). The obtained t values for the factor loadings ranged from 19.74 to 26.86, which indicate that all items were significant at $p < .001$. When the results related to the CFA given in Figure 3 were examined, the factor loadings of the items ranged from 0.72 to 0.88. Finally, the results of the CFA confirmed that the model fit between the proposed model and the observed data is excellent.

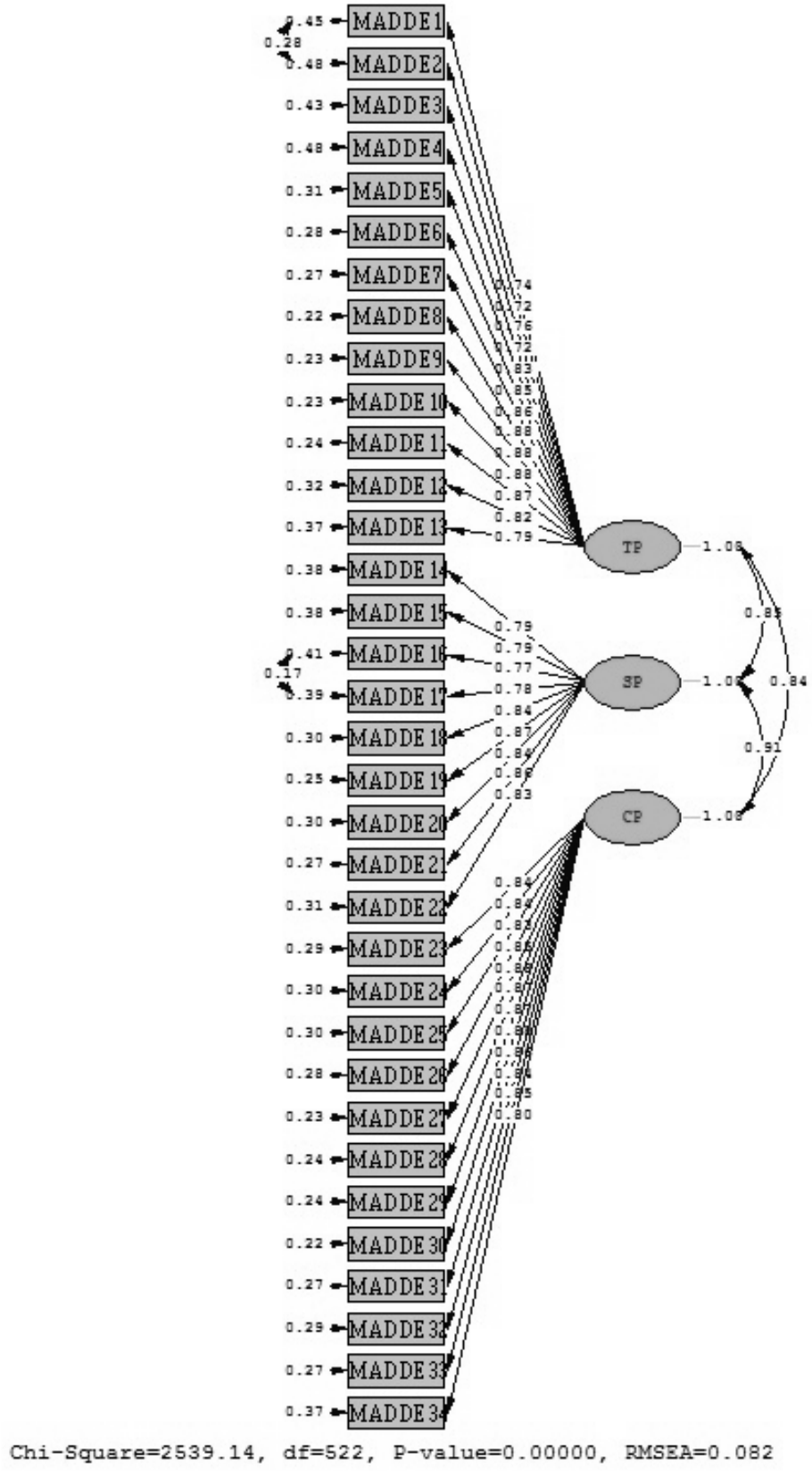

Figure 3. CoI survey instrument CFA results

Discussion

The purpose of this research was to test the validity and reliability of a Turkish version of the CoI survey. Participants' responses were analyzed using EFA to identify the underlying dimensions assessed by the CoI survey; CFA was used to test the fit of the hypothesized model against the model predicted to exist in the population. Results from the EFA identified two—rather than three—factors for the CoI survey. When EFA is repeated with three factors to be convenient with the CoI model, all items were loaded significantly. The three factor model identified by the EFA was then subjected to a CFA with a second subsample of participants. When the modification indices related to the analysis results are examined, there is a strong relationship between the error covariance of two each items involved in teaching presence and social presence factors. It was decided that it would be appropriate to test the high error correlations observed between the pair of items by adding them to the model; the results of the second CFA confirm that the model is a good fit. Cronbach's α values calculated for the Turkish form change between .95 and .97. Cronbach's α value calculated for the whole survey is .98. As in the original and Turkish versions of the CoI survey, there are 34 items in total: 13 of them related to teaching presence, 9 items related to social presence and 12 items related to cognitive presence. Regarding many analyses of the CoI survey, the Cronbach's α values calculated for internal consistency in Arbaugh et al. (2008), Díaz et al. (2010), Kozan & Richardson (2014) and the Turkish version of the CoI survey are given in Table 3.

	Arbaugh et al. (2008)	Díaz et al. (2010)	Kozan & Richardson (2014)	Turkish Form
Teaching Presence	.94	.96	.96	.96
Social Presence	.91	.92	.91	.95
Cognitive Presence	.95	.95	.94	.97

Table 3. Cronbach's α Values of the CoI Survey Factors

When the results of the current study are compared to other studies in which the CoI survey was translated into other languages, the CoI survey developed by Arbaugh et al. (2008) emerges as the most suitable for a Turkish language translation. The results of factor analysis in an Arabic adaptation study conducted by Alaulamie (2014) showed that items were loaded appropriately in the expected factors. Only the 24th item in the instrument had a cross-loading issue. Therefore, it was suggested that this item could be dropped in future studies or new validity and reliabilty studies could be conducted. In another study conducted by Yu & Richardson (2015), the adaptation of a Korean language survey showed that two items were omitted from the survey: the 4th item in the teaching presence category ("The instructor clearly communicated important due dates/time frames for learning activities") and the 14th item in the social presence category ("Getting to know other course participants gave me a sense of belonging in the course"). Additionally, the internal consistency coefficients (teaching presence=.95, social presence=.91, cognitive presence=.96 and total=.97) in 32 items of the Korean version of the CoI survey confirmed the structure of the CoI framework with three factors.

Conclusions

EFA and CFA results conducted during the adaptation of the CoI survey consisting of three factors showed that the conformity of the model with the actual data is at an acceptable level, and the analyses performed related to reliability show that the survey is reliable. A review of the literature revealed that the CoI survey, developed as a result of a pioneering work by Arbaugh et al. (2008), was translated/adapted into different languages such as Korean and Arabic (e.g., Alaulamie, 2014; Yu & Richardson, 2015) and it was used in other disciplines, such as education, management and health care (e.g., Arbaugh, 2013; Arbaugh et al., 2010; Bangert, 2009; Carlon et al., 2012). When studies of the use of the CoI survey are examined in detail, various variables (e.g., student educational level, number of online courses taken by students, characterization of the course as fully online or blended, discipline, gender, and age) are considered. Therefore, new studies can be conducted by considering these variables. In addition, new studies related to the adaptation of the CoI survey into different languages can be planned by considering the changes in survey items and the ratings of the items. Utilization of the Turkish adaptation of the CoI survey by various stakeholders (such as course designers, program administors, and instructors) may provide insights regarding the evaluation of applications in distance education in Turkey. Since the survey is internationally accepted, it can be used as a bridge to compare international studies with national studies and suggestions can be developed for future improvement. Finally, this study only concerned itself with students in online courses. In future studies, administering the CoI survey in blended learning environments and engaging students at different educational levels and in different institutions may contribute to a better understanding of the structure related to the CoI survey.

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The (Lack of) Influence of Age and Class Standing on Preferred Teaching Behaviors for Online Students

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Abstract
This study contributes to the growing body of literature about what makes a successful online learning environment. Specifically, it addresses assumptions made about online learning environments—regarding self-determination and adult learners—by measuring students' perceptions and preferences for teaching behaviors that they believe help them succeed in online classrooms. Using two waves of survey data, only seven teaching behaviors were consistently related to online learners' preferences based on differences in age and class standing among students, and those behaviors do not fit neatly within the assumptions typically made about adult learners. These findings should begin to raise questions about whether the assumptions made about adult learners actually manifest in online learning environments. This study reveals evidence of a more pragmatically minded group of adult learners, particularly when considering the impact of age and class standing for online students, and provides insight as we look for ways to help online learners be more successful.

Keywords: adult learners, self-directed learning, online teaching and learning

Kennan, S., Stockdale, S., Hoewe, J., & Bigatel, P. (2018). The (lack of) influence of age and class standing on preferred teaching behaviors for online students. *Online Learning, 22*(1), 163-181. doi:10.24059/olj.v22i1.1086

The (Lack of) Influence of Age and Class Standing on Preferred Teaching Behaviors for Online Students

Adults—defined as those over the age of 25—are often credited with different learning and learner characteristics than their younger counterparts (Merriam & Caffarella, 1999). Interestingly, many of the characteristics of adult learners are also cited as positive prerequisites for online learning. It is reasonable to assume this link between effective online learning strategies and adult-learning concepts will continue to grow stronger as more nontraditional adult learners enroll in online coursework. In a previous study (Bigatel et al., 2012), research-based successful online

teaching behaviors were identified from current best practices in online teaching. Teaching behaviors were defined as the tasks performed during course delivery. Sixty-four unique teaching behaviors were identified, and experienced online faculty and staff were asked to rate their level of importance. Of interest was the fact that over half of the teaching behaviors had a rating of 6.0 or higher on the 7-point scale. Given this, we have proposed that age and class standing (i.e., freshman, sophomore, junior, senior) are positively correlated with those teaching behaviors closely aligned with adult learning theories for online learning. If these hypotheses are substantiated, it would follow that to maximize learning online, instructors and designers need to be cognizant of the age and class standing of online students.

Initially, this study presents an overview of the literature on adult learning and closely aligned theories of motivation, with particular attention paid to online learning and motivation. It then examines specific research findings for success in online learning when age or class standing were used as variables, regardless of the purpose of the investigation. In this study, respondents' age and then class standing were used as independent variables to test their relationships with online students' preferences for particular online teaching behaviors. Several one-way regression models were run to test age and class standing's abilities to predict the importance of each preferred teaching behavior. In this way, the present study will advance knowledge about the ideal teaching practices for online learners, considered through the lens of adult learning theory and self-determination theory.

Review of Related Literature

Adults and Learning

Andragogy is a formative concept in adult learning and is also referred to as adult education. Malcolm Knowles (1968) is credited with introducing this term into the scholarly literature. Malcolm Knowles (1989) and later Merriam and Brockett (1999) described five relevant assumptions that underlie andragogy: Adults need to know the "why" of what they are asked to learn; adults wish to be treated as capable of directing their own learning (self-direction); adults bring greater life experiences to their learning; adults view learning as a means to inform their immediate real-life situations; and potent motivators for adults are intrinsic (although some extrinsic motivators are important, too). The learning environment also is important. Merriam and Brockett (1997) suggested successful learning takes place when the physical, social, and psychological environment is structured to recognize and support the unique needs of adult learners. Knowles (as cited in Merriam and Caffarella, 1999) suggested the classroom environment "should cause adults to feel accepted, respected, and supported" (p. 273).

Knowles assumed a different pedagogy for children and young adults, as did the work of Perry (1981) and others (e.g., Kasworm, 1983). Perry's work with college students (1981) proposed a nine-stage (with transitions) hierarchical model of understanding or interpreting learning experiences from both a student's and an instructor's view. For example, in Position 1: dualism, the instructor is the authority with the correct answer; if the student does all the work, the faculty member suggests, success will follow. A middle position (Position 5: relativism) is when the student sees all information as relative, and absolutes are few and far between. Perry suggested that this is a powerful stage that allows the learner to think objectively. The student sees that the instructor has expertise but not all the answers; the instructor helps the student by providing resources from which to make reasonable inferences. As the student reaches higher levels, the student reaches "levels of commitment," and he or she is willing to take personal responsibility for

some areas of his or her life. Within these later stages, personal beliefs and values merge with objective thought. At this point, the faculty member provides choices to allow students to learn what they deem important to learn.

Faculty members can benefit from knowledge about cognitive development theories such as Perry's because cognitive development continues throughout adulthood. They provide an understanding of different stages of cognitive development that inform instructional practices that might more appropriately fit different development stages. Furthermore, the implication for adult learning is that "motivation and readiness to learn will vary according to stage of life-span development" (Knowles, Holton, & Swanson, 2011, p. 226).

Characteristics of Younger Versus Older Adults and Learning Technology

More recent literature suggests that young adults (ages 18–24) are often assumed to be more tech savvy. In their review of literature, Bennett, Maton, and Kervin (2008) noted that this group of learners is often described as *experiential learners*, capable of multitasking, and skilled in communication technologies for retrieving information and having interactions with each other. However, Bennett et al. (2008) noted the lack of research supporting this claim. The authors noted that the research is not as clear as one might expect. These young adults might better be viewed as a heterogeneous group with varying skills and abilities.

A study conducted by Ladyshewsky and Pettapiece (2014) found that adult learners (25 years and older) required additional guidance in the use of technologies such as email, video conferencing, and more media-rich tools, such as Skype and Blackboard Collaborate. This study cautioned instructors that they cannot assume adult learners will use technology appropriately. Furthermore, technology competencies in U.S. adults were found to be below the international average, according to "The Programme for the International Assessment of Adult Competencies" (PIAAC) survey results (Patterson & Paulson, 2016). Limited technology-related skills can put adult learners at risk when they pursue postsecondary education. Moreover, the NMC Horizon Report states that although millennial students today may be more digitally literate than previous generations because they have been immersed in technology-rich environments, that does not mean they are confident in using technology, especially in an educational context (Johnson et al., p. 24).

Motivation, Adult Learning, and Online Learning

As inferred earlier when calling attention to the similarities between adult learning characteristics and online learning, motivation (especially intrinsic or self-directed) is often cited as a key to successful online learning. Hartnett, St. George, and Dron (2011) described motivation for online learning as "complex, multifaceted, and situation dependent" (p. 20). However, for purposes of this study, the theory of motivation most closely aligned with adult learning and online learning concepts is Deci and Ryan's (1985) self-determination theory (SDL). Deci and Ryan (2000) suggested that framing motivation within self-determination theory may be a more "psychological meaningful way of defining self-directed learning for purposes of predicting academic achievement, classwork adjustment, and well-being" (p. 75). Within this theory, motivation is situational, and all learners have an intrinsic need for autonomy, competence, and relatedness.

Deci and Ryan (2000) suggested a continuum of levels of motivation defined by perceived levels of learner self-direction and control. They described five stages, ranging from *intrinsic motivation* (personal enjoyment in the activity and, therefore, self-directedness) at one end of the

spectrum to *amotivational* (the learner does not understand the "why" and is nondirected) at the other end. Between these two ends of the continuum are three stages of extrinsic motivation: (1) *identified*, where the activity is relevant—although perhaps not enjoyable—to the needs of the learner to meet a distal goal and is, therefore, self-controlled; (2) *introjected*, where activities are completed to meet others' goals and are, therefore, other-directed; and (3) *extrinsic*, where behaviors are performed for a reward and are other-directed. As students move along the continuum, they become more self-determined and willing to direct their own learning. A study conducted by Rothes, Lemos, and Gonçalves (2017) added that learning strategies that facilitate the "progressive internalization of learners' controlled motivation" also support the continuum idea of self-determination suggested by Deci and Ryan (2000). The authors recommended creating a learning environment that is *autonomy-supported*, where learners are given choices progressively (Rothes et al., 2017, p. 20). It is understandable that too much autonomy (control) at first may not be a motivating factor given various contextual factors, such as a newness to an online learning environment, length of time away from academic studies, lack of familiarity with course content, and so on. But various research (e.g., Liu, Wang, & Ryan, 2016; Taylor et al., 2014) has suggested that learning improves as learners move toward more self-determined behaviors.

Online Learning and the SDL Model

Chen and Jang (2010) investigated a model of motivation in online teaching based on self-determination theory (Reeve, 2002). Again, this theory posits autonomy, relatedness, and competency as determinants of self-determination. Motivation itself is viewed on a continuum from amotivation to intrinsic motivation. These authors found support for online learners' needs for autonomy, relatedness, and competency (including fostering peer interactions). Previous studies cited by Chen and Jang (e.g., Reeve, 2002; Reeve & Jang, 2006) suggested strategies such as allowing choice, providing a rationale for the activities, and offering feedback that supports autonomy and increased self-determination. And as noted, self-determination theory also allows for the consideration of contextual factors that may be important in online learning.

Reeve (as cited in Chen & Jang, 2010) suggested that instructors need to acknowledge and accept negative responses to the course requirements. Finally, Chen and Jang (2010) called attention to the findings of their course-satisfaction modeling structure that noted "aimless supports without addressing student needs" lead to negative outcomes. Along these lines, Kaul and Lakeym (2003) as well as Reinhardt, Boerner, and Horowitz (2006) presented evidence that there is a real difference in *perceived* support (perceived valuable by the learner and, therefore, self-determined) versus *received* support (perceived valuable by the other/instructor and, therefore, other controlled and not self-determined). There is a fair amount of literature concerning perceived social support (e.g., in the medical and social work fields) that discusses the impact of perceived versus received support that may also play out in online learning. For example, Helgeson (2006) interviewed 64 patients and their spouses after a cardiac event with the goal of determining which forms of support lead to the best patient adjustments. Results indicated perceived support led to better adjustment than received support. Simply put, received support did not necessarily meet the needs of the individual.

In a related vein, Horzum, Kaymak, and Gungoren (2015) investigated a model that examines the relationships between online readiness, academic motivators, and perceived learning, with more than 400 students. Their hypotheses predicted that increasing learning readiness would increase academic motivation and that increasing academic motivation would directly increase perceived learning. Both hypotheses were supported. For the purposes of this review, it is

important to note that self-directed learning (SDL) and learner control are the important contributors to higher online-learning readiness levels. When the authors examined academic motivation (citing SDT as the model), intrinsic motivation stood out, accounting for 47% of the latent variable variance. The authors concluded that "the fact that students encounter interesting or satisfying learning materials seems to be an important component" (Horzum et al., 2015, p. 766).

Age and Perceived Positive Instructor Behaviors

Ke and Kwak (2013) examined whether online participation, perception, and learning satisfaction remain stable across students' ages. The authors noted that older students spent more time on online activities, with a greater frequency of posting online messages and weekly checking of online messages. However, they also noted the results of an online transcript analysis of the postings, in which older adults did not contribute more meaningful messaging. The authors suggested that older learners may take more time or have difficulties filtering irrelevant information (as a result of cognitive aging). A number of authors have noted that older students spend more time in the online environment (DiBiase & Kidwai, 2010; Raidal & Volet, 2004). Northrup (2002) suggested that older students may prefer an experience similar to that of a traditional classroom experience.

Age has been considered by a number of authors using the Community of Inquiry (CoI) model (Garrison, Anderson, & Archer, 2000, 2010), and a significant body of research has been conducted on this model (Garrison & Arbaugh, 2007). This model has described an ideal online educational experience with cognitive (interaction with content), social (interaction with peers), and teaching components (interaction with instructor). Within this model, learning occurs from constructing personal meaning in a social process, and age is one of the demographic variables examined in this research. Generally, no differences were found based on age, but Akoyol, Ice, Garrison, and Mitchell (2010) discovered that young adults and elderly individuals perceived the cognitive (interaction with content) and teaching (interaction with instructor) components as one.

Within the above framework, if the object of an online class is to develop a community of inquiry, then the assumption is that one is operating at the higher levels described in Perry's (1981) model. Garrison (2011) suggested a CoI is "a group of individuals who collaboratively engage in purposeful critical discourse and reflection to construct personal meaning and confirm mutual understanding" (p. 15). Three interdependent elements are necessary for learning, and in all three areas the emphasis is on the personal construction of personally meaningful knowledge in a safe community of learners. This type of higher order model appears at odds with Perry's (1981) work with college students, many of whom are at lower levels of cognitive development.

Baturay and Yukselturk (2015) examined the extent that age and other variables accounted for student achievement. Seventy-six percent of the students were young adults in this study. Neither age nor gender were significant predictors of achievement. A linear regression model discovered only the learner's perceived preference for online learning accounted for significant variance in student achievement.

Simonds and Brock (2014) investigated the possible relationship between students' ages and students' preferences for certain types of online learning activities. The researchers grounded their work in the scholarship of teaching and learning (SoTL) model. There was a significant relationship between age and preference for learning activities. Older students were significantly more likely to cite watching videos (prerecorded videos and taped lectures) as a useful tool for learning. These older students carefully took notes from these videos as part of the learning

experience. Younger students spoke more positively about interactive methods, such as live chats and group projects. Simonds and Brock (2014) suggested that these findings are in line with a 2012 study by Koh and Lim.

Class Standing and Online Learning Instruction

Ke and Kwak (2013) also found that college education level positively correlated with time-commitment in online learning activities. They also identified a significant correlation between class standing as measured by educational level of undergraduate and graduate level students and the number of online posts/questions concerning course technology or assignment requirements. After interviewing respondents, the authors suggested that undergraduate students viewed online learning as "assignment-test-oriented"—a common pedagogical technique in online courses (p. 49). Students with higher education levels asked for more "dynamic" ways of learning to include "community-like" learning experiences. The authors speculated that students with higher educational levels tended to view web-based distance learning as a positive but less socially fulfilling experience.

Tonsing-Meyer (2013) asked graduate students about their preferences for online practices in relationship to what the authors termed the "instructor's learning activities." Analyses suggested that the read/write learning technique was emphasized in the vast majority of assignments. While the majority of students described their online experiences as positively affecting their learning, they also suggested that authentic interactions—including podcasts, forums, collaborative projects, and video interactions—were important for graduate students' online learning. Students' suggestions also included minimal turnaround time for assignments and timely responses to communications.

Bradford and Wyatt (2010) also examined whether class standing influenced the common elements of student satisfaction, defined as facilitated learning, engagement, and information fluency for online learners. *Facilitated learning* involved factors related to flexibility, scheduling, and control of learning. *Engagement* emphasized positive learning opportunities, including more interactions, more collaboration, and better interactions. *Information fluency* was an increased ability to use and evaluate information. The authors did find a significant effect on scores for facilitated learning (suggesting that higher level students saw more value in flexibility), information fluency, and the engagement dimensions, based on class standing. However, the error values accounted for most of the effect, suggesting class standing may have little influence when compared to other factors that may be at play. Artino (2008) also the emphasized differential support based on students' needs, suggesting undergraduate students may require more explicit support and intermediate assignments than graduate students. Also, the author cited research suggesting the benefit of greater use of self-regulatory strategies when activities are perceived as important or useful.

This study now seeks to examine whether age and/or class standing predict online students' preferred teaching behaviors. The following research questions (RQ) guided our study.

- RQ1: How does age influence students' perceptions of the importance of specific teaching behaviors in an online context?
- RQ2: How does class standing influence students' perceptions of the importance of specific teaching behaviors in an online context?

Methods

Procedure and Respondents

This study included two surveys of students enrolled in online courses. The first survey was completed in the spring and summer semesters of 2014 ($N = 357$), and the second was conducted during the summer semester of 2015 ($N = 367$). This study was conducted using responses from two different surveys primarily because the two-study format allowed for comparison between two data sets gathered at two different times. This process increases the reliability of this study's results.

The students who participated in these surveys were recruited from two universities, and each participant was invited to participate in only one of the surveys. One university is a large research institution in the Northeast the other is a mid-sized comprehensive university in the South. The online students included in both samples were diverse in terms of their majors, hailing from numerous fields of study. Respondents were also mostly female (Sample 1: 65.3%; Sample 2: 66.5%).

Online instruction during the summer at both of the institutions provides access to surveying the full breadth of online learners because there are many more traditional college students taking online classes while away from campus as well as a strong showing from the university's adult fully online student population. Because of this, we were able to reach all types of students, from traditional 18-year-old first-year students to 50-year-old-and-older adults taking online classes.

Instructors of online courses contacted their students using a recruitment message created by this study's researchers. All instructors were selected based on whether they were listed as the instructor of record for an online course during the semesters considered in this study. The instructors emailed their students, and students then completed the survey by following the link provided in the instructor's email. Respondents first consented to participate and then were asked questions about their perceptions of the importance of online teaching behaviors, multiple demographic variables (including age and class standing), and other items unrelated to the scope of this paper.

Independent Variables

The first independent variable considered in this study was online students' ages. Respondents' ages in this study ranged from 18 to 66 (Sample 1: 59.4% were 18–24 years old; Sample 2: 41.1% were 18–24 years old). In the first survey, age was measured as a grouped variable where respondents selected categories, beginning with 18–24 years old (25–34 years old: 20.7%; 35–41: 14.3%; 46–55: 4.2%; 56–66: 0.6%). In the second study, this variable was measured as a continuous variable, where individuals were allowed to select any age, beginning with 18 years old ($M = 30.12$, $SD = 10.23$).

The second independent variable in this study was the student's class standing, which is defined in this study as the level the student has reached based on the number of credit hours they have successfully accumulated (i.e., freshman, sophomore, junior, senior, graduate student). The greatest number of students in both samples identified their class standing as *senior* (Sample 1: 33.9%; Sample 2: 32.2%), but no class standing represented a majority of respondents. Students in both samples were freshmen (Sample 1: 6.2%; Sample 2: 8.7%), sophomores (Sample 1: 17.4%; Sample 2: 13.6%), juniors (Sample 1: 26.6%; Sample 2: 28.1%), and graduate students (Sample 1: 14.8%; Sample 2: 16.9%) as well. A very small percentage did not include their class standing (Sample 1: 1.1%; Sample 2: 0.5%). As such, the dispersion of class standing across the two samples was consistent.

	Sample 1		Sample 2	
	β	*t*	β	*t*
The instructor is available to help me when needed	.09	1.78	.03	0.60
Contacts me regarding my course progress	.17	3.20**	.06	1.13
Frequently communicates about course changes	.17	3.26**	.05	0.86
Provides clear grading criteria for assignments (e.g., rubrics, description of how assignments will be graded, common mistakes, etc.)	.12	2.28**	.02	0.38
Responds to my questions within 24 hours	.10	1.96	-.03	-0.64
Provides access to my course grades	.06	1.20	.00	0.07
Returns graded assignments with feedback within 7 days	.17	3.30**	.02	0.45
Adheres to a regular schedule of course activities	.03	0.61	.01	0.26
Instructor leaves evidence of their participation in the course (e.g., discussion boards, announcements, email, etc.)	.18	3.35**	.13	2.54**
Reminds me of course assignment(s) due dates	-.05	-0.90	-.11	-2.15**
Provides clear, detailed and meaningful feedback on assignments and exams	.20	3.90***	.12	2.32**
Requires me to provide and receive peer assessment	-.06	-1.06	.04	0.74
Requires me to participate in discussions	-.02	-0.29	.13	2.57**
Requires participation in team assignments	-.13	-2.52**	.11	2.14**
Requires me to share my knowledge and experiences with my classmates	.06	1.19	.08	1.44
Instructor points out places where students present opposing perspectives or conflicting opinions in course activities	.01	0.22	.03	0.55
Provides real world examples of course content	.07	1.37	.13	2.43**
Relates the course activities to my background, interests and experiences	-.10	-1.96	-.11	-2.05**
Requires me to apply what I learn to real world examples	.01	0.24	.12	2.33**
Knows how to use the online course tools	.04	0.75	.07	1.24
Creates a learning environment that is respectful to all students	.16	3.09**	.13	2.55**
Explains common misunderstandings of course concepts	.05	0.87	.03	0.49
Presents content in an understandable manner	.16	3.09**	.15	2.94**
Gives me opportunities to demonstrate my learning in a variety of ways	.06	1.06	.06	1.14
Provides opportunities to evaluate instructor at the end of the term	.05	0.84	.10	1.94
Solicits student feedback for course improvement	.01	0.21	.10	1.87
Is available to talk via phone, video chat, or other "real time" tools	.03	0.57	.07	1.37
Provides supplemental resources about the course content	.00	-0.01	.04	0.76
Requires synchronous sessions via an online tool such as Wimba, GoToMeeting, Skype, Google Hangout, etc.	-.22	-4.26***	-.06	-1.07
Requires me to frequently demonstrate my understanding of the course content (e.g., course quizzes, projects, practice exercises, revising assignments, etc.)	.02	0.33	.08	1.54
Presents frequent graded activities that relate to course content	-.01	-0.11	.10	1.97
Requires me to take responsibility and manage my own learning	.08	1.47	.15	2.96**
Provides technical support	.07	1.27	.09	1.70
Uses variety of content formats (e.g., videos, slides, journal articles, graphics, podcasts, etc.)	.02	0.44	.16	3.03**
Requires me to choose projects based on my interests	.02	0.38	-.08	-1.58

**$p < .05$; ***$p < .001$

Table 1. Regression Results for Age Predicting Preferred Teaching Behaviors

Dependent Variables

The online students included in this study also were asked to rate the importance of 35 teaching behaviors in terms of their ability to facilitate students' online learning, using a scale ranging from 1 (*Not at all important*) to 5 (*Extremely important*). These teaching behaviors included 35 statements that asked about the importance of particular teaching behaviors, which were identified through prior research on best practices in online instruction. Based on a previous study, Bigatel, Ragan, Kennan, May, and Redmond (2012) determined the importance of 64 teaching behaviors in online students' learning. The current study utilized the 35 teaching behaviors deemed of greatest importance in Bigatel et al.'s work. Of the 64 teaching behaviors originally tested, more than half ($N = 37$) resulted in a mean score of 6.0 or above on a 7-point scale. Redundant items were removed, resulting in the remaining 35 teaching behaviors examined in this study. (The exact wording of the items is presented in Table 1.)

Results

To begin, respondents' ages were used as the independent variable. They were used to test this variable's relationship with online students' preferences for particular online teaching behaviors—that is, whether older online students prefer different teaching behaviors than younger adults (i.e., those 18–24 years old). Several one-way regression models were run to test age's ability to predict each teaching behavior. For each sample, this procedure resulted in 35 separate regression models. Table 1 shows the relationships that resulted for both Sample 1 and Sample 2.

The results of these two data sets were then compared to determine similarities across both samples. This analysis strategy was used to ensure that the results provided in this study have proven reliable in two different sets of respondents at two different points in time. It is important to note that there were varying levels of statistical significance across the two samples. However, to more clearly show the consistently significant relationships, Table 2 illustrates when age consistently and significantly predicted online teaching behaviors in Sample 1 and Sample 2.

	Age	
	β	*t*
Instructor leaves evidence of their participation in the course (e.g., discussion boards, announcements, email, etc.)	.18/.13	3.35**/2.54**
Provides clear, detailed and meaningful feedback on assignments and exams	.20/.12	3.90***/2.32**
Creates a learning environment that is respectful to all students	.16/.13	3.09**/2.55**
Presents content in an understandable manner	.16/.15	3.09**/2.94**

$^{**}p < .05$; $^{***}p < .001$

Table 2. Replicated Results: Regression Results for Age Predicting Preferred Teaching Behaviors (Sample 1/Sample 2)

Age consistently predicted four teaching behaviors in both student samples. First, online students who were older found it important that their instructors leave evidence of their participation in the course through discussion board posts, announcements, emails, and so on. Conversely, younger students did not find this evidence of participation to be important. Second, older online students also wanted their instructors to provide clear, detailed, and meaningful feedback on students' assignments and exams, while younger students did not find this important. Third, older online learners found it important that their instructors create a learning environment that was respectful to all students; younger students did not find this respectful environment to be important in their learning. Finally,

older online students wanted content presented in an understandable manner, whereas younger students did not find it important that content be presented in this way.

The second independent variable—class standing—was then run as the independent variable in regression analyses similar to those previously described. That is, it was used to determine how it predicted online students' preferences for particular online teaching behaviors. Table 3 illustrates the relationships found through these tests.

	Sample 1		Sample 2	
	β	*t*	β	*t*
The instructor is available to help me when needed	.02	0.28	-.08	-1.56
Contacts me regarding my course progress	-.03	-0.47	-.09	-1.80
Frequently communicates about course changes	.02	0.44	-.01	-0.17
Provides clear grading criteria for assignments (e.g., rubrics, description of how assignments will be graded, common mistakes, etc.)	-.01	-0.16	-.06	-1.15
Responds to my questions within 24 hours	.02	0.43	-.07	-1.24
Provides access to my course grades	-.16	-2.99**	-.06	-1.20
Returns graded assignments with feedback within 7 days	-.09	-1.68	.07	1.41
Adheres to a regular schedule of course activities	-.06	-1.13	-.08	-1.56
Instructor leaves evidence of their participation in the course (e.g., discussion boards, announcements, email, etc.)	-.03	-0.53	-.03	-0.62
Reminds me of course assignment(s) due dates	-.16	-3.04**	-.20	-3.83***
Provides clear, detailed and meaningful feedback on assignments and exams	.10	1.95	-.03	-0.60
Requires me to provide and receive peer assessment	-.07	-1.25	.00	-0.08
Requires me to participate in discussions	.03	0.46	-.01	-0.14
Requires participation in team assignments	-.04	-0.73	.00	-0.03
Requires me to share my knowledge and experiences with my classmates	.01	0.17	.00	0.05
Instructor points out places where students present opposing perspectives or conflicting opinions in course activities	-.05	-0.99	-.04	-0.78
Provides real world examples of course content	-.04	-0.74	.07	1.24
Relates the course activities to my background, interests and experiences	-.10	-1.85	.04	0.71
Requires me to apply what I learn to real world examples	-.05	-0.96	.02	0.29
Knows how to use the online course tools	.00	-0.03	.00	0.04
Creates a learning environment that is respectful to all students	-.03	-0.49	-.01	-0.19
Explains common misunderstandings of course concepts	-.08	-1.55	-.04	-0.77
Presents content in an understandable manner	.02	0.35	-.03	-0.51
Gives me opportunities to demonstrate my learning in a variety of ways	.00	-0.06	-.02	-0.46
Provides opportunities to evaluate instructor at the end of the term	-.03	-0.59	-.05	-0.87
Solicits student feedback for course improvement	-.10	-1.91	.01	0.13
Is available to talk via phone, video chat, or other "real time" tools	-.18	-3.51**	-.02	-0.44
Provides supplemental resources about the course content	-.14	-2.63**	-.19	-3.64***
Requires synchronous sessions via an online tool such as Wimba, GoToMeeting, Skype, Google Hangout, etc.	-.11	-2.04**	-.04	-0.76
Requires me to frequently demonstrate my understanding of the course content (e.g., course quizzes, projects, practice exercises, revising assignments, etc.)	-.05	-0.97	-.12	-2.33**
Presents frequent graded activities that relate to course content	-.13	-2.39**	-.14	-2.72**
Requires me to take responsibility and manage my own learning	-.06	-1.05	-.08	-1.43
Provides technical support	-.06	-1.00	-.11	-2.19**
Uses variety of content formats (e.g., videos, slides, journal articles, graphics, podcasts, etc.)	-.12	-2.18**	-.08	-1.49
Requires me to choose projects based on my interests	-.07	-1.23	-.06	-1.17

**$p < .05$; ***$p < .001$

Table 3. Regression Results for Class Standing Predicting Preferred Teaching Behaviors

Illustrating the consistently significant results across Sample 1 and Sample 2, Table 4 shows the three teaching behaviors online students found important based on their class standing.

	β	*t*
Reminds me of course assignment(s) due dates	-.16/-.20	-3.04**/-3.83***
Provides supplemental resources about the course content	-.14/-.19	-2.63**/-3.64***
Presents frequent graded activities that relate to course content	-.13/-.14	-2.39**/-2.72**

$^{**}p < .05$; $^{***}p < .001$

Table 4. Replicated Results: Regression Results for Class Standing Predicting Preferred Teaching Behaviors (Sample 1/Sample 2)

First, students with more advanced class standings found it unimportant that their online instructors remind them of assignment due dates. On the other hand, students who weren't as far along in their coursework did find these reminders helpful. Second, online students who reported a higher class standing did not find it important that the instructor provide supplemental resources related to the course content. Students who had earned fewer credits did find these supplemental resources important. Finally, online students who had completed more coursework did not find it helpful when instructors presented frequent graded activities. Students with fewer course credits, however, found it important to have frequent graded activities.

Discussion

This study contributes to the growing body of literature about what makes a successful online learning environment. Specifically, it addresses assumptions made about online learning environments regarding self-determination and adult learners by measuring students' preferences for teaching behaviors that they believe help them succeed in online classrooms.

Of particular interest for online and adult educators and researchers is how few significant results were found (seven out of 35 teaching behaviors) related to this adult population's preference for particular teaching behaviors based on their ages and class standings. There were only seven teaching behaviors that were consistently related to differences in age and class standing among online students, and those behaviors do not fit neatly within the assumptions typically made about adult learners (Merriam, 2001; Huang, 2002; Ross-Gordon, 2003; Cercone, 2008). Additionally, some teaching behaviors that seem intuitively to fit within the construct of Knowles' adult learning theory (1989) did not register as significant outcomes for this population of adult learners. These findings should begin to raise questions about whether the assumptions made about adult learners actually manifest in online learning environments.

For example, a common assumption made about adult learners is that they like to connect their learning to their real-world life and work experiences (Knowles, 1989; Merriam & Brockett, 1999). But among the teaching behaviors included in this study, five addressed the connection between the students' real-world life to their coursework (i.e., "requires me to choose projects based on my interests"; "provides real-world examples of course content"; "requires me to apply what I learn to real-world examples"; "relates the course activities to my background, interests, and experiences"; and "requires me to share my knowledge and experiences with my classmates"). Of these five, *none* were significantly related to adult learners based on age or class standing across both samples.

Similarly, there were other teaching behaviors that ought to have registered as important to older students because they connect to adult learning theory. However, they did not. For example, Knowles (1989) and Merriam and Brockett's (1999) argument that adults want to feel accepted, respected, and supported seems to logically connect to the following teaching behaviors, but none were predicted by students' ages across both populations: "is available to talk via phone, video chat, or other 'real-time' tools"; "creates a learning environment that is respectful to all students"; "the instructor is available to help me when needed"; "responds to my questions within 24 hours"; "contacts me regarding my course progress"; "frequently communicates about course changes"; "reminds me of course assignment(s) due dates"; and "requires me to take responsibility and manage my own learning." Likewise, Knowles (1989) and Merriam and Brockett's (1999) argument that adults want to be treated as capable of directing their own learning was not reflected in this study's results, as the following teaching behaviors were not significantly predicted by students' ages across both populations: "requires me to take responsibility and manage my own learning"; "solicits student feedback for course improvement"; gives me opportunities to demonstrate my learning in a variety of ways"; and "requires me to choose projects based on my interests."

By contrast, of the three teaching behaviors that were significantly predicted by age across both populations (i.e., "instructor leaves evidence of their participation in the course [e.g., discussion boards, announcements, email, etc.]"; "presents content in an understandable manner"; and "provides clear, detailed and meaningful feedback on assignments and exams"), only the last item connects intuitively to the tenets in adult learning theory. Demonstrating a preference for meaningful feedback is related to adults' preference for knowing why they are being asked to learn certain things (Knowles, 1989; Merriam & Brockett, 1999) and their desire to feel accepted, respected, and supported in the classroom environment (Merriam & Caffarella, 1999).

Additionally, Phirangee, Epp, and Hewitt (2016), found evidence that, contrary to assumptions about adult online learners and self-determination theory, graduate students (typically adults) preferred instructor facilitation to provide guidance and support in discussion forums compared to peer-facilitated methods. Furthermore, some studies found that high levels of instructor engagement and ongoing interactions with online students led to deeper and more critical thinking along with confidence in the safety of the learning environment, which resulted in successful learning (Agosto, Copeland, & Zach, 2013; Dzubinski, 2014; Zach & Agosto, 2009).

When this study's significant results are examined using Perry's theory of cognitive development (1981), the results are also counterintuitive. For example, all three of the significant teaching behaviors could connect to Perry's lower levels of development (e.g., dualism), where the instructor is viewed as the authority with all of the answers. This seems counterintuitive to the assumption that cognitive development progresses with age, experience, and time (Blimling, 2008; Kitchener et al., 1989), and one might expect to see older learners preferring teaching behaviors that reflect multiplistic, relativistic, and/or committed worldviews and teaching practices (Hood & Deopere, 2002). However, Hood and Deopere (2002) also found a pattern of more dualistic thinking among the older adults. Backward transition to lower levels of cognitive development has been observed (Fischer et al., 2003) and might apply to adults encountering challenging material or a new learning method or environment.

The dualism characterized in Perry's cognitive development theory may not adequately explain what appears to be a regression in cognitive development. Research literature supports the premise that adults are practical and oriented toward problem-solving behaviors (Merriam, 2001).

Both characteristics of being practical and oriented toward problem-solving may play out in ways that look like deferring to the instructor as the ultimate authority. Instead, the intention may be different: Practical, problem-solving adult learners may actually be using an interim strategy for coping with the uncertainty of a new learning environment (i.e., online) given that many adult learners are returning to a learning experience that may be vastly different from the one they left. Knowles, Holton, and Swanson (2011) assert that one of the foundations of the adult learning process is that adult learners determine what they need in order to learn so as to achieve their goals. Thus, what adults may need, at times, is to listen to an "expert" and orient themselves to the new learning environment. Furthermore, the teaching approaches many adults were accustomed to have vastly changed with the advent of learner-centered teaching, which more appropriately suits the online environment (Anderson, 2008; Harasim, 2000).

Moreover, the practical side of many adults may dictate that they step back from the need to control their own learning process in the interest of saving precious time for competing obligations (Park & Choi, 2009). Deferring to the instructor's authority might be a strategy to avoid wasting time and to achieve the learning outcomes more efficiently.

The assumption that all adults have full capacity to direct their own learning and exercise personal autonomy in every learning situation is generally not accepted (Knowles, Holton, & Swanson, 2011). Grow (1991) suggested that SDL is situational and that the instructor's job is to match their teaching approaches to where the learner is within one of four stages. This model of the instructor attempting to match their teaching strategies to the needs of the learner is exactly the point of this research project: that adaptive teaching behaviors can be utilized to create a more learner-centered online classroom which could, in turn, lead to greater student satisfaction and higher levels of achievement.

Stage	Learner	Instructor	Examples
Stage 1	Dependent	Authority, coach	Coaching, frequent feedback, prompts, informational lectures; efforts at overcoming deficiencies and/or resistance
Stage 2	Interested	Motivator, guide	Inspiring lectures plus guided discussions; guided goal-setting and learning strategies
Stage 3	Involved	Facilitator	Instructor-facilitated discussions where instructor participates as an equal; seminar settings, group projects.
Stage 4	Self-directed	Consultant, delegator	Internships, individual work, or self-directed study groups.

Table 5. Grow's Stages in Learning Autonomy

Pratt's (1998) four-quadrant model of high and low direction and support (affective encouragement) provides some explanation for variability in how much direction and instructor involvement is needed. In a given online class, one could encounter some learners who need a great deal of direction and emotional support (Quadrant 1), some that need direction but not much support (Quadrant 2), some who may act like they need support (Quadrant 3), and finally, some who prefer a true andragogical approach (Quadrant 4). To further complicate the picture, those same people may switch quadrants when learning different subject matter. Thus, contextual variables influence the assumptions we make about the behaviors of adult learners.

This study's significant results related to class standing are simpler to understand overall. It makes intuitive sense that students with higher class standings indicated they did not need reminders about course due dates while students with lower class standings did. Students with lower class standings might naturally want more scaffolding to successfully navigate the course. This might be especially relevant given that many students with lower class standings might be new to the institution, major, and/or the online learning environment all at the same time. But if this is true, it doesn't explain why other teaching behaviors that speak directly to learning support were not significantly predicted by online students' class standing. For example, class standing significantly predicted the importance of due-date reminders, but communicating changes to the course, being available to talk synchronously when needed, and responding quickly to questions were not significant outcomes.

Relatedly, students with higher class standings did not think frequent graded activities or supplemental resources were important, while students with lower class standings did. This result could speak to students' levels of comfort and confidence in their abilities to perform successfully. For example, as above, lower level students who are new to online learning, an institution, or a major might feel unsure about how they are performing. Frequent graded activities give these students multiple opportunities to check on their progress and gauge their performance, and supplemental resources might provide them with alternative ways to grasp course content.

Limitations and Future Research

Among this study's limitations is the fact that the first sample of online students did not see this survey's question groupings in random order. However, the second survey did randomize the questions. Though there is a possibility that the first survey's results are subject to response bias, the second sample eliminated this potential confound.

In addition, recruiting both samples from students taking online classes in the summer ensured a wide variety of students in the population, but there is no way to know whether the results might have been different with samples from fall and spring semesters. Finally, every effort was made to recruit students from as many academic disciplines as possible, but because the respondents were anonymous, there is no way of knowing if this was achieved.

Future research should focus on using online student samples from various universities in the United States from both fall and spring semesters. These replications should determine whether the results are consistent and reliable or whether the prior theoretical premises need to be revised based on the newer, online learning environment.

The list of teaching behaviors included in the survey is not exhaustive. It was limited to 35 teaching behaviors in order to avoid survey fatigue. Future research could involve a more comprehensive list in order to further delimit which teaching behaviors are effective for which students.

Conclusions

Retention is an ongoing concern for institutions offering online programs. As the number of online students increases, the demographic variables, learning preparation, confidence levels, and available time and commitment levels become more diversified. This research takes a first step toward addressing specific things online instructors can do to support individual students in their courses. Rather than following the formulaic teaching methods exemplified by the "sage on

the stage" lecture format, the more ability an instructor has to individualize their teaching and support methods, we believe, the more successful online students can be. Theoretically, instructors could administer a survey with the teaching behaviors in their classes and have an intervention guide of sorts to consult when they notice students are beginning to struggle. Future research by this team will attempt to build upon these strategies.

Recent work examining students' motivations for completing their education online might speak to many of the results found in this study. For example, Donaldson (1993) found that adult learners in online programs had very pragmatic motivations for their education. They placed higher value on working through the degree as simply and cleanly as possible, which may resonate as a "don't waste my time" attitude and may trump other learning theories (Donaldson, 1993). Taken together, the results presented here concerning students' ages seem to speak to this more utilitarian mindset; adult learners might say, "Give me the content in an organized manner, show me that you're in the course with me, and give me meaningful feedback."

If this is the case, it raises the question of whether online instructors need to consider more practical considerations in online pedagogy and instructional design. In some ways, this is a lesson already learned by institutions that offer faster paths to degree completion and shorter but more intensive courses (Choitz & Printz, 2008; Kucsera & Zimmaro, 2010). It might also be said to be in direct contradiction with what higher education has traditionally valued: depth and breadth of knowledge. Within this argument, the shadow of the debate about the value of the liberal arts education and the humanities versus a more professional, career-oriented approach to higher education also lurks. While this study did not reveal the results expected to be found in more traditional classrooms, viewed through accepted lenses such as adult learning theory and cognitive development theory, it did reveal evidence of a more pragmatic group of adult learners, particularly when considering the impact of age and class standing for online students.

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An Online Engagement Framework for Higher Education

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Abstract
Student engagement is understood to be an important benchmark and indicator of the quality of the student experience for higher education; yet the term *engagement* continues to be elusive to define and it is interpreted in different ways in the literature. This paper firstly presents a short review of the literature regarding online engagement in the higher education environment, moving beyond discipline-specific engagement. It then presents a conceptual framework which builds upon recurring themes within the literature, including students' beliefs, attitudes, and behaviors. The framework was developed by adopting a constant comparison method to analyse the literature, and to search for and identify current and emerging themes. The framework identifies indicators for five key elements of online engagement, and the authors propose that the framework provides a guide for researchers and academics when exploring online engagement from a conceptual, practical and research basis. Finally, the paper provides recommendations for practice, outlining how the framework might be used to reflect critically upon the effectiveness of online courses and their ability to engage students.

Keywords: Online engagement, higher education, conceptual framework, distance education, student engagement

Redmond, P., Heffernan, A., Abawi, L., Brown, A., & Henderson, R. (2018). An online engagement framework for higher education. *Online Learning, 22*(1), 183-204. doi:10.24059/olj.v22i1.1175

An Online Engagement Framework for Higher Education

This paper proposes a conceptual framework for online engagement. Student engagement in higher education has been an area highlighted consistently as having significant influence on student outcomes, including the successful completion of studies. Chen, Lambert, and Guidry (2010) suggested that student engagement in learning has a more significant impact on learning outcomes than who students are or where they enrol to study. As universities have increased their online presence and provided more opportunities for fully-online studies, student engagement in this mode requires further investigation and consideration. According to Coates (2009), student

engagement research in the past has "devoted relatively little attention to online learning" (p. 66), a view supported by others (e.g., Robinson & Hullinger, 2008), and Hampton and Pearce (2016) noted that being focused and engaged in course work as an online student is critical for success.

In addition, research has indicated that the majority of online learners are now non-traditional students who are balancing the competing demands of work, life, and study commitments and elect to study online for the convenience it offers (Chen, Lambert, & Guidry, 2010; Thompson, Miller, & Pomykal Franz, 2013). These external commitments and pressures have resulted in higher rates of student attrition (Meyer, 2014; Thompson et al., 2013) and, as such, online student engagement continues to be a pressing area for further exploration. Pittaway and Moss (2011) also raised the important theme of staff engagement, which "is essential before students can engage" (p. 141). This paper represents a form of staff engagement with these current and complex issues of teaching and learning.

A shift to online study requires adjustments to the teaching and learning practices traditionally associated with university learning environments. As Crampton, Ragusa, and Cavanagh (2012) highlighted, online environments are usually "characterised by different traditions, identities [and] expertise" (p. 2). Correlation has been found between students' grades and the resources accessed in online environments (Crampton et al., 2012), as well as the emotional and intellectual investment made by students when studying online (Pittaway & Moss, 2014). These two aspects are thus important considerations for course design and pedagogy for lecturers seeking to maximise the engagement of online students.

With an awareness of the importance of notions of online engagement, and a lack of consensus or clarity about what this might look like, a group of education academics in a regional university in Queensland, Australia, came together to explore notions of student online engagement. The complex nature of fully-online education has been highlighted as an area requiring further attention (Pittaway & Moss, 2011). This article contributes to this area of research by problematizing and rethinking the notion of student engagement in a higher education institution that has a long history of distance education and has moved strategically into online teaching and learning (Jones, Heffernan, & Albion, 2015), with over 70% of students choosing to study online. Working in this context of change, the education academics started to consider what such change might mean for their understandings about student engagement. The paper, then, draws together themes and findings from relevant literature relating to online student engagement and proposes a conceptual framework to explore online student engagement in higher education. We are cognizant that others have produced conceptual frameworks about engagement (e.g., Coates, 2007; Lawson & Lawson, 2013), but this one is different in that it draws on a systematic analysis of literature about the field, using the Framework Method of Gale, Heath, Cameron, Rashid, and Redwood (2013).

Defining Online Engagement

Engagement is a widely used term, but it appears to have a range of meanings and interpretations (Dixson, 2015; Lawson & Lawson, 2013; Taylor & Parsons, 2011). This is particularly the case in universities, where *student engagement* has become, according to Gibbs (2014), "one of the most ubiquitous buzzwords" (para 2). Gibbs argued that the term is "now used to refer to so many different things that it is difficult to keep track of what people are actually talking about" (para 2). Krause (2005) explained that *student engagement* is "a catch-all term most commonly used to describe a compendium of behaviours" (p. 3) that involve student learning. She

defined it in terms of the "time, energy, and resources students devote to activities designed to enhance learning at university" (p. 3). Similarly, the Macquarie University Learning and Teaching Centre (2009) defined engagement as "the extent or quality with which students are committed and actively involved in their learning" (p. 1).

These definitions have emphasised individuals' engagement with learning rather than their interactions with staff or other students, even though such interaction has been identified as another key influencer of engagement (Chen, Lambert, & Guidry, 2010). Aligned with this view is an expectation around staff engagement and the role of academics as facilitators of conversations. Fleckhammer and Wise (2011) noted that "online students … need to be able to engage with their learning in an independent style, but it may be that overall academic engagement can be facilitated for this cohort by developing a greater sense of social engagement" (p. 393). As Coates (2006) explained, social relationships are important, alongside academic engagement. This ties in with the work of Kift (2004) and Rhodes and Nevill (2004), who indicated that engagement is affected by student experience and transitions which have implications for the pedagogical practices taken by faculty members in online learning environments.

These multiple conceptualisations of engagement have resulted in diverse views about what engagement is and about the place and interconnectedness of cognitive, socio-cultural, affective, behavioral, ecological and organizational factors and even the actions of students as a collective (Kahn, Everington, Kelm, Reid, & Watkins, 2017; Lawson & Lawson, 2013; Reeve & Tseng, 2011). The importance of these connections and the implications for practice are evidenced by their inclusion in the conceptual framework for engagement presented in this paper. The literature presents a picture of students who choose to study online and reflects the need for faculty to foster learning environments where traditional teacher-student and student-student interactions can be translated into online study, due to the common needs and aspirations of online learners. As Coates (2006) highlighted, "institutions are responsible for creating environments that make learning possible, that afford opportunities to learn," but "the final responsibility for learning … rests with students" (p. 29).

Online Student Demographics and Needs

Findings from the literature (e.g., Oblinger, 2003; Krause, 2006) have indicated that university students who choose to study online are inclined to do so because it provides flexibility, enabling them to balance external commitments with their studies. Nevertheless, study sometimes "runs the risk of simply becoming another appointment or engagement in the daily diary, along with paid work and a range of other commitments beyond the campus" (Krause, 2006, p. 3). Since online learners tend to be non-traditional students and are often adult learners who face competing demands, including family and work responsibilities, this can result in challenges to their ability to "work within the routine of a typical classroom" (Scheg, 2014, p. 8). Studies have highlighted that employment, childcare options, and financial constraints can have an impact on students' decisions whether to study online or face-to-face (Chen et al., 2010; Thompson et al., 2013), and these same factors can have an impact on their ability to succeed.

Although online learning provides an opportunity for non-traditional students to achieve their educational goals or aspirations while balancing these complex demands, some studies have suggested that the external demands sometimes pose challenges that make it difficult to prioritise study (Thompson et al., 2013). Chen et al. (2010), therefore, emphasised the importance of ensuring quality in programs and pedagogy so that online students receive the same level of

support as face-to-face students, cautioning that a tiered system of educational segregation could potentially result if this was not consciously addressed. This is particularly important given the disproportionate number of minority, part-time, and working-class students who elect to study online (Chen et al., 2010). Support for students is therefore vital to ensure student engagement and positive learning outcomes from study. As such, it is necessary to further explore what the literature highlights as key principles of student engagement in online learning.

Engagement in Online Higher Education

The literature on engagement reinforces its importance in online teaching and learning, although Bowen (2005) suggested that there is a lack of consensus about what engagement means in practice. Although much of the literature related to online engagement incorporates the three key areas of behavioral, emotional, and cognitive engagement (Fredericks, Blumenfeld, & Paris, 2004; Reeve & Tseng, 2011) as they affect students' attitudes and motivations, Lawson and Lawson (2013) suggest that there is a need for a "more nuanced and less formulaic conception of student engagement" (p. 433). In doing that, we emphasise the clear distinction between traditional face-to-face learning environments and online learning environments and posit that the shift of higher education institutions to online presents challenges for course design and pedagogical practice.

We propose an interdisciplinary conceptual framework designed specifically for reflecting on online student engagement in higher education, using categories drawn from the themes within the literature base. We now explain the methodology that was used, before presenting the framework and a discussion of the literature and thinking that informed its construction.

Methods

The proposed conceptual framework is grounded in a social constructionist approach (Mallon, 2013), combined with deductive thematic analysis for the specific purpose of creating an evaluative framework to explore online learning-based practices linked to student engagement. As noted by Bradley, Curry, and Devers (2007), a deductive analysis allows "new inquiries to benefit from and build on previous insights in the field" (p. 1763), but it does not preclude new categories. Social constructionism endorses a subjectivist view of knowledge where knowledge is outcome of social interchange (Guterman, 2006). A useful way of thinking about social construction is that it has two parts: "X socially constructs Y" (Mallon, 2013, para 4). In this paper, for example, a group of researchers (Xs) worked together as agents for the filtering and adaption of existing knowledge and the inputting of additional contextual and experiential knowledge in order to co-construct a knowledge or conceptual framework (Y), based on agreed categories or themes.

Social scientists use a number of terms to describe themes within their data, for example, categories, codes, labels, thematic units, and concepts (Ryan & Bernard, 2003). In the health sciences, a recently developed method for the management and analysis of qualitative data is the Framework Method (Gale et al., 2013). This method uses identifiers such as analytic memos, categories, codes, indexes and themes to organise and then analyse broad types of data. The Framework Method is not aligned to any one epistemological stance, but instead it is a flexible tool that can be adapted for any qualitative generation of themes. It has been used largely to explore transcripts from interviews or focus groups, but it may, "in principle, be adapted for other types of textual data, including documents … or field notes from observations" (Gale et al., 2013, p. 2).

As the authors of the Framework Method (Gale et al., 2013) indicated, those using the method need to consider whether and why the framework might be useful to a particular situation. In the case of the current examination of literature about student engagement in online learning, the framework offered a way of accommodating varied data that were related to "similar topics" (Gale et al., 2013, p. 2). Thus, the framework offered a way of systematically categorizing data and generating descriptions and explanations.

With this in mind, the Framework Method (Gale et al., 2013) was adapted and used to develop a conceptual framework, with the intent that further data collation and analysis would be undertaken by the researchers. This will be done by using the framework that is developed and documenting analytic memos and observations of practices related to a range of teacher education courses within the authors' institution of higher education.

To commence the creation of the initial framework, the key concepts and indicators from existing research about engaging online learners were collated using an a priori approach. The literature was explored, and each researcher used a constant comparison method to collate both current and emerging themes. Although often associated with grounded theory, constant comparison is a useful method for theme identification from any text (Leech & Onwuegbuzie, 2007). The researchers individually and then collectively used a deductive approach to filter concepts, indicators, categories, and implications from the literature and identify additional themes that were then superimposed over the existing ones.

This process ensured that individual interpretations of the literature were discussed and collectively explored in detail before completing the deductive process of determining the final themes. It acknowledged the work done by others in the field, as well adding insight with new shared understandings prior to the construction of the framework. A three-phase filtering process was then employed to: a) ensure shared understandings of what was meant by the terms used within the framework; b) guarantee that the wording was succinct and relevant; and, c) provide assurance of future usability and broad applicability. Figure 1 provides an overview of the deductive process that was used.

The resulting framework and process were then shared with national and international experts in online teaching and learning and feedback was requested and received. Final refinements were then made according to this feedback. Figure 2 lists the six-stage process that was used to develop the framework.

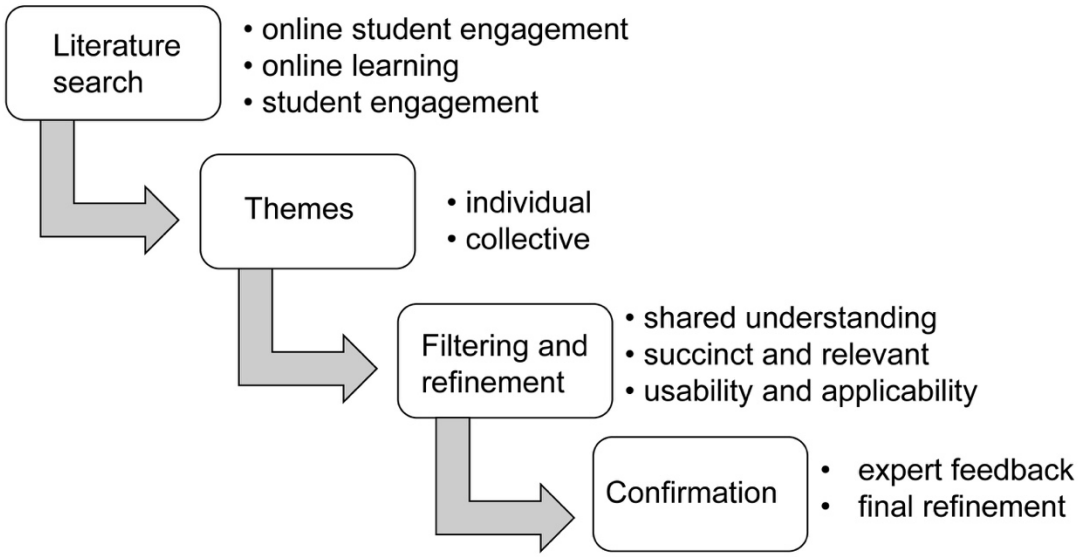

Figure 1. The Deductive Process

Stage 1: Each researcher explored the literature to come up with a first take on the related themes according to common terms or ideas until these became repetitive and no new ideas emerged.
Stage 2: Three researchers worked together to filter these into related groups of ideas and then to refine theme terminology.
Stage 3: The whole team further refined elements and indicators according to the shared understandings.
Stage 4: An initial framework was created.
Stage 5: Expert feedback was requested from six national and international experts deemed as authorities on online teaching and learning.
Stage 6: Adjustments were then made according to the feedback received.

Figure 2. The Six-Stage Process for Framework Development

Proposed Conceptual Framework for Online Engagement

Internationally, survey instruments have been developed to measure student engagement in higher education. The surveys all build on the initial instrument, the National Survey of Student Engagement (NSSE) developed in the United States (The Trustees of Indiana University, 2016), and also used in Canada. Australia has the Australasian Survey of Student Engagement (AUSSE) (Australian Council for Educational Research, n.d.), also used by New Zealand, and the Student Experience Survey (SES), part of the Quality Indicators for Learning and Teaching (QiLT) (Australian Government Department of Education and Training, 2015, 2016a, 2016b), whilst the United Kingdom uses the United Kingdom Engagement Survey (UKES) (Higher Education Academy, 2015).

Allen, Seaman, Poulin, and Straut (2016) have been tracking online education in the United States for 13 years. In their 2015 report, they found that 29% of higher education students take at least one distance course and that this number was growing. At the regional university where the current research took place, 70% of the students were studying externally or online. Meyer (2014) identified that "achieving student engagement in online courses may be more important than it is in on-campus courses because online students have fewer ways to be engaged with the institution and perhaps greater demands on their time and attention as well" (p. 1). With such a large number of students embarking on higher education study without traditional face-to-face supports, it is essential to understand how to improve teaching and learning for enhanced online engagement. Krause and Coates (2008) have called for "a more robust theorising of the engagement concept that encompasses both quantitative and qualitative measures" (p. 493).

In response to this challenge, the authors propose a way of understanding the various types of engagement that work together to connect students with learning. The literature (Pittaway, 2012; Weimer, 2016) speaks to a number of elements of engagement which may be defined separately but are interconnected in practice because, as Weimer (2016) reminded us, engagement is a "multidimensional construct" (para 7).

Many past explorations around face-to-face engagement have been limited to three major types of engagement: behavioral, emotional and cognitive. Our overview of engagement, as seen in Figure 3, provides a detailed approach to exploring engagement within online environments. The figure presents five elements of engagement for teaching and learning in the online space: social engagement, cognitive engagement, behavioral engagement, collaborative engagement, and emotional engagement. These five elements are considered crucial for effective student engagement within the online learning and teaching environment. That is not to say that these same elements do not also have a place when investigating face-to-face learning or more traditional distance learning contexts.

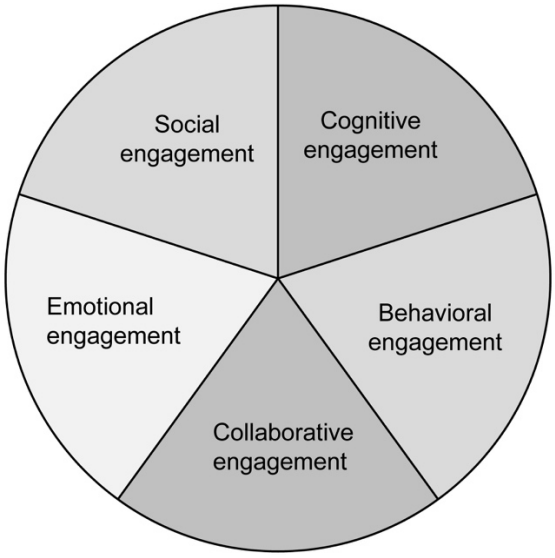

Figure 3. Online Engagement Framework Overview

The authors posit that the online engagement framework presented here is a multidimensional construct with interrelated elements that impact on student engagement in online settings. The framework can be utilised by academics to reflect upon the learning engagement within their online courses and the implications for personal teaching practice as well as course and, ultimately, program design.

The online engagement framework for higher education presented in Table 1 provides a summary of the elements and the indicators for each element. The framework has emerged from a social constructionist perspective in higher education where asynchronous and synchronous group discussions occur as an intentional way to promote individual and group learning. It is not hierarchical or linear in nature, nor is each element meant to be explored as an isolated process. Rather, the framework provides a tool to unpack the dynamic nature of online engagement.

Online Engagement Element	Indicators (illustrative only)
Social engagement	Building community Creating a sense of belonging Developing relationships Establishing trust
Cognitive engagement	Thinking critically Activating metacognition Integrating ideas Justifying decisions Developing deep discipline understandings Distributing expertise
Behavioral engagement	Developing academic skills Identifying opportunities and challenges Developing multidisciplinary skills Developing agency Upholding online learning norms Supporting and encouraging peers
Collaborative engagement	Learning with peers Relating to faculty members Connecting to institutional opportunities Developing professional networks
Emotional engagement	Managing expectations Articulating assumptions Recognising motivations Committing to learning

Table 1. Online Engagement Framework for Higher Education

As explained, the online engagement framework is intended to propose a theoretical view of student engagement that builds on related literature and the filtering of literature themes into key concepts. The five interrelated elements provide a tool for instructors, instructional designers, and researchers to facilitate and evaluate online student engagement. Each element of the framework, and the related literature, along with indicators, are discussed in detail below. Note that the indicators are illustrative only and are not meant to be a definitive list.

Results

Social Engagement

Social engagement refers to "students' social investment in the collegiate experience" (Knight, 2013, p. 73). It includes participation in academic as well as non-academic activities which occur outside the virtual classroom, such as recreation or social functions, along with discussions of a social nature (Coates, 2006). It is a way of creating purposeful relationships with others. In an online environment, social interactions are often in the form of students talking about themselves and their contexts; they may result in ongoing interactions through social media. According to Krause (2005), "opportunities for social engagement are equally as important as intellectual pursuits" (p. 9). Social engagement is certainly of key importance when students are required to work with peers for assessment and/or learning tasks and it is related to social-emotional buy-in as well as social interactions (Sinha, Rogat, Adams-Wiggins, & Hmelo-Silver, 2015).

The literature also refers to concepts such as relational engagement (Billet, 2008) and social presence (Garrison, Anderson, & Archer, 2000), which are related to social engagement. Table 2 presents a summary of the literature and the indicators for the social engagement element.

Online Engagement Element	Indicators (illustrative only)
Social engagement (Billet, 2008; Chen, Lambert, & Guidry, 2010; Cheng, Liang & Tsai, 2013; Dennen, 2008; Garrison, Anderson, & Archer, 2000; Knight, 2013; Krause, 2005; Pittaway & Moss, 2014; Australian Government Department of Education and Training, 2016a); Sinha, Rogat, Adams-Wiggins, & Hmelo-Silver, 2015; Wright, Jones, & D'Alba, 2013)	Building community Creating a sense of belonging Developing relationships Establishing trust

Table 2. Indicators for Social Engagement

Social engagement in an online environment can be illustrated through actions that build community such as social forums and the use of open communication platforms. It includes the development of relationships with peers and instructors, whether via friendships and interactions beyond study requirements or effective working and studying relationships. Informal or social engagement opportunities with instructors are important for students' learning, both online and face-to-face (Chen, Lambert, & Guidry, 2010). Social engagement involves building rapport, respect, and trust to create a sense of belonging and group cohesion within a learning community (Sinha, Rogat, Adams-Wiggins, & Hmelo-Silver, 2015; Wright, Jones, & D'Alba, 2013).

Cognitive Engagement

Cognitive engagement is the active process of learning. Bowen (2005) stated that this type of engagement is the most fundamental form of engagement. This was supported by Fredricks, Blumenfeld, and Paris (2004) who identified cognitive engagement as students engaged in the learning process to "comprehend complex ideas and master difficult skills" (p. 60). It is related to

what students do and think to promote learning. Bowen (2005) continued by referring to the process as students "paying attention to the learning" and becoming "engaged learners" (p. 5). In the literature, it is not clearly defined and is often linked with concepts such as motivation to learn, values and beliefs, metacognition and self-regulation, and strategy use and effort (Fredricks, Blumenfeld, & Paris, 2004; Greene, 2015).

There are different levels of cognition, normally referred to as deep and surface (Fredricks, Blumenfeld, & Paris, 2004; Henri, 1992). In the online space, surface cognitive engagement would be contributions that offer solutions without judgement or justification; repeating ideas without clarification; or general agreement with others without explanation or further contribution. Students who work at this level can easily be distracted, employ avoidance strategies, and focus on completing the task as a means to an end rather than learning from the task (Fredricks, Blumenfeld, & Paris, 2004). Those students who display deep cognitive engagement demonstrate more complex processes. Their online posts justify or compare ideas and solutions; they integrate ideas from multiple sources, provide new information, judgements, or integration of information, and can support their ideas (Henri, 1992). Learners working at deep cognitive levels have a psychological investment in learning, a preference towards challenge, as well as a desire to go beyond base requirements. They sustain engagement through persistence and can find relevance in new information by aligning it with previous knowledge. Instructors can impact the level of cognitive engagement based on the requirements of activities and assessment tasks.

Other terms which align with the element of cognitive engagement are disciplinary engagement (Hickey, Quick, & Shen, 2015), intellectual engagement (Pittaway & Moss, 2014), academic challenge (Center for Postsecondary Research, Indiana University School of Education, 2016), and cognitive presence (Garrison, Anderson, & Archer, 2000).

Online Engagement Element	**Indicators (illustrative only)**
Cognitive engagement (Center for Postsecondary Research, Indiana University School of Education, 2016; Coates, 2009; Engle & Conant, 2002; Fredricks, Blumenfeld, & Paris, 2004; Garrison, Anderson, & Archer, 2000; Greene, 2015; Hickery, Quick, & Shen, 2015; Meyer, 2014; Petty & Farinde, 2013; Pittaway & Moss, 2014; Redmond, 2014; Reeve & Tseng, 2011; Weimer, 2016)	Thinking critically Activating metacognition Integrating ideas Justifying decisions Developing deep discipline understandings Distributing expertise

Table 3. Indicators for Cognitive Engagement

Bowen (2005) pointed out that "as students attempt to reconcile what they learn with what they previously believed, they demonstrate growth in understanding, values, and commitment typical of mature cognitive development" (p. 5). This might also be known as the acceptance or embracing of cognitive dissonance. Learners who are deeply cognitively engaged self-regulate or "use metacognitive strategies to plan, monitor, and evaluate their cognition when accomplishing tasks" (Fredricks, Blumenfeld, & Paris, 2004, p. 64).

High levels of cognitive engagement do not occur outside of a particular context. They always occur in a discipline context. However, the strategies students use for cognitive engagement, such as critical thinking, metacognition, integration, and justification, are multidisciplinary and can be used in any learning situation. Learning that is discipline-specific, such as developing deep discipline-specific conceptual understandings, discipline-specific metalanguage, and discipline expertise change as students move from one discipline to another.

Behavioral Engagement

In their investigation of engagement, Fredricks, Blumenfeld, and Paris (2004) found three dimensions of positive behavioral engagement. First, positive behaviors such as adhering to rules and norms, asking questions, contributing to discussions, and paying attention; second, active participation in academic activities; and third, participation in extracurricular or non-academic activities within the educational institution. In the end, however, they described behavioral engagement as "doing the work and following the rules" (p. 65).

Behavioral engagement is also referred to in the literature with terms such as academic engagement (Pittaway & Moss, 2014; Young, 2010), agency engagement (Reeve & Tseng, 2011), learning presence (Shea et al., 2012), self-regulating behaviors (Cheng, Liang, & Tsai, 2013), skills engagement (Handelsman, Briggs, Sullivan, & Towler, 2005), and verbal and nonverbal attentiveness (Weimer, 2016). The indicators for the behavioral element of online engagement are provided in Table 4.

Online Engagement Element	Indicators (illustrative only)
Behavioral engagement (Cheng, Liang, & Tsai, 2013; Coates, 2009; Fredricks, Blumenfeld, & Paris, 2004; Handelsman, Briggs, Sullivan, & Towler, 2005; Meyer, 2014; Center for Postsecondary Research, Indiana University School of Education, 2016; Petty & Farinde, 2013; Pittaway & Moss, 2014; Reeve & Tseng, 2011; Shea et al., 2012; Weimer, 2016)	Developing academic skills Identifying opportunities and challenges Developing multidisciplinary skills Developing agency Upholding online learning norms Supporting and encouraging peers

Table 4. Indicators for Behavioral Engagement

Students who are behaviorally engaged "are characterized by [their] positive conduct, class participation, involvement in the learning task, high effort and persistence, positive attitudes, and self-regulation of their learning" (Young, 2010, p. 2). They also support and encourage their peers to follow procedures, actively participate in the learning process, reduce disruptive behaviors and complete academic tasks (Fredricks, Blumenfeld, & Paris, 2004). Students who are behaviorally engaged communicate interest in learning and find personal relevance; they also seek help when required and provide assistance to others.

In addition to these learning behaviors students develop academic skills which contribute to their successful learning outcomes. These include skills such as academic reading, writing and listening, planning, time management, and goal setting (Pittaway & Moss, 2014).

Collaborative Engagement

Collaborative engagement is related to the development of different relationships and networks that support learning, including collaboration with peers, instructors, industry, and the educational institution. The concepts of social and emotional engagement indicate that connecting with others for both educational and non-educational activities is beneficial from an academic, social, and emotional perspective.

Similar concepts discussed in the literature include professional engagement (Pittaway & Moss, 2014); learning with peers (Center for Postsecondary Research, Indiana University School of Education, 2016), experiences with faculty (Center for Postsecondary Research, Indiana University School of Education, 2016), enriching educational experience (Meyer, 2014), and campus environment (Center for Postsecondary Research, Indiana University School of Education, 2016).

Online Engagement Element	Indicators (illustrative only)
Collaborative engagement (Center for Postsecondary Research, Indiana University School of Education, 2016; Coates, 2009; Dennen, 2008; Meyer, 2014; Pittaway & Moss, 2014; Australian Government Department of Education and Training, 2016a; Reeve & Tseng, 2011)	Learning with peers Relating to faculty members Connecting to institutional opportunities Developing professional networks

Table 5. Indicators for Collaborative Engagement

Collaboration with peers is related to engagement for academically worthwhile purposes, for example, discussion, tutoring, study groups, and group tasks or assessment. Students studying online are more likely to have to collaborate online because they are less likely to be located geographically near peers.

Collaborative engagement with faculty and the institution is largely related to the development of supportive learning environments. From an academic perspective, instructors regularly establish a requirement for collaborative engagement through the use of group or team activities and assessment.

Engagement with peers and professionals in industry is often related to establishing personal and professional learning networks (Albion, 2014). Both can be useful for entry into a profession, to assist continuing professional learning, and to ensure sustained industry relevance and currency. Engagement with industry is more critical in programs that are aligned with specific professions (Pittaway & Moss, 2014).

Emotional Engagement

Emotional engagement refers to students' emotional reaction to learning. It is related to their feelings or attitudes towards learning and can be attributed to the affective or emotional component of engagement. Sinatra, Heddy, and Lombardi (2015) reported that "both negative and positive emotions can facilitate activation of attention and engagement" (p. 2). It includes emotional reactions to people in the educational context such as peers and teachers, or to the educational institution itself, the subject matter or discipline, or the tasks that students are expected to do. In summary, emotional engagement includes "interest, values, and emotions" (Fredricks, Blumenfeld, & Paris, 2004, p. 65).

Other terms found in the literature to discuss this type of engagement include personal engagement (Pittaway, 2012), emotional presence (Cleveland-Innes & Campbell, 2012), affective reactions (Fredricks, Blumenfeld, & Paris, 2004), and psychological engagement (Vogt, 2016). Cleveland-Innes and Campbell (2012) stated that "emotion is identified as important to student adjustment to the role of online learner" (p. 272), and online instructors should determine how best to harness emotion for effective learning and teaching.

Element	Indicators (illustrative only)
Emotional engagement (Cleveland-Innes, & Campbell, 2012; Fredricks, Blumenfeld, & Paris, 2004; Meyer, 2014; Petty & Farinde, 2013; Pittaway, 2012; Pittaway & Moss, 2014; Reeve & Tseng, 2011; Vogt, 2016; Weimer, 2016)	Managing expectations Articulating assumptions Recognizing motivations Committing to learning

Table 6. Indicators for Emotional Engagement

From a review of the literature, the authors provide four indicators which exemplify emotional engagement, as seen in Table 6: managing expectations, articulating assumptions, recognizing motivations, and committing to learning. Students' emotional engagement can be observed through their attitude, enthusiasm, interest, anxiety or enjoyment in the learning process. Positive emotional engagement would be displayed by students who value learning or the acquisition of knowledge and skills and appreciate success.

Discussion

Although the literature points to the value of employing student engagement techniques in online learning to increase student engagement, which in turn translates to producing a better quality of graduate (Meyer, 2014; Teacher Education Ministerial Advisory Group, 2014), there is still confusion in terms of "what counts" as online engagement (Bowen, 2005), what this might look like in practice, and the types of approaches that might be employed. Researchers such as Pittaway and Moss (2011) suggested that before students engage it is essential that staff adopt engagement practices. However, although the number of higher education students studying online and taking online courses continues to grow (Allen, Seaman, Poulin, & Straut, 2016), there are still gaps in the research, literature, and models to guide academic practice, including the

complexities linked to online learning and strategies to support engagement. In this paper, the authors have drawn from, and reflected on, the existing body of literature, problematized the notion of student online engagement, and contributed to new understandings of online engagement. This has resulted in the construction of an Online Engagement Framework for Higher Education.

Although the authors of this paper do not claim to offer a panacea for curing all the difficulties and ambiguities associated with online engagement, we nevertheless offer a robust framework that others (including instructors, instructional designers, course teams, program coordinators, policy advisors, advisory groups, and researchers) may find of value as a point of reference, particularly in helping to reflect upon their respective decision-making processes prior to and during the process of supporting the student online learning journey. We hope the framework also serves as an audit and reflection tool, to think about, inform, and perhaps even challenge others to critically consider the types of strategies they employ for facilitating different types of online engagement within their contexts. This process, utilising the framework offered here, will hopefully prove to be invaluable in assisting critical reflection about online engagement from a range of different lenses and pedagogical positions.

Furthermore, the authors of this paper are aware of the complexity and variation in learning environments and contexts in which educators and students are positioned. Therefore, the worth that others will ascribe to the online engagement framework will be dependent on a range of elements and contextual factors. As a final intended contribution of this paper within the field of online learning and engagement, the authors offer a number of recommendations. These are targeted to different audiences, with the common denominators of thinking about and employing strategies to support online learning engagement. We hope that readers will find value in these suggestions, particularly in seeing relevance and application when moving through the process of deploying the framework in teaching practice. These points are offered only as a potential guide to assist in the consideration of opportunities for clarifying and perhaps "thinking otherwise" about online engagement in the multiple forms in which it is understood. Our ultimate goal is to build capacity for supporting and enhancing online students' learning journeys.

Instructors: A Lens to Plan Teaching and Learning

With so many students now moving to online learning (Chen, Lambert, & Guidry, 2010; Thompson et al., 2013) and courses increasingly now offered online, the Online Engagement Framework for Higher Education offers instructors a lens for planning teaching and learning. This includes employing the online engagement framework as an audit tool, or point of reference, when considering the types of engagement currently demonstrated by students, and the relevant indicators of the various elements of the framework. The use of the framework will enable instructors to consider whether some forms of engagement might be privileged, and whether other forms of engagement need to be utilised more often to heighten engagement, and therefore to enhance student learning. The online engagement framework may also help to confirm the elements of engagement currently employed in teaching and learning practices that are identified as a best fit for the intended learning outcomes of a course. However, as Bower (2001) pointed out, instructors may be challenged to adjust their current pedagogical practices or may even resist any suggestion of change to practice.

The online engagement framework also offers instructors an opportunity to think more deeply about the associated indicators of engagement: to think about how engagement might look in relation to better supporting the diversity of students engaging in online study, as well as about

the types of engagement strategies that would enable the stories and voices of students to be heard. The framework offers a reference point for thinking about the elements and types of engagement that might better afford opportunities for students to share the richness of their backgrounds, experiences, and understandings with others. It also asks us, as faculty, to think about elements and types of engagement that afford students opportunities to learn from and with others, and to think about the types of engagement that provide equitable and effective learning and teaching opportunities for all students.

Instructional Designers: Assisting Instructors to Plan for Active Engagement

The online engagement framework also offers instructional designers a framework to share, as well as a guide for assisting instructors to reflect upon and plan for activities and conditions which enhance active online engagement (Coates, 2009). This might include instructional designers and institutional learning and teaching facilitators referring instructors to the extensive discussion and related literature that unpacks each of the five online engagement framework elements. Targeted suggestions could also be offered regarding ways to design courses and learning experiences that integrate specific indicators to enhance and facilitate online learning and engagement for students.

With the theme of social engagement and connectedness particularly prevalent in a range of engagement frameworks (Australian Government Department of Education and Training, 2016a; Cheng, Liang, & Tsai, 2013; Dennen, 2008; Garrison, Anderson, & Archer, 2000; Pittaway & Moss, 2014), and the value students place on levels of instructor and classmate interaction (Gerhardt, 2016), instructional designers may wish to use the online engagement framework to highlight the associated indicators or processes that effectively support the element of social engagement. As such, the online engagement framework may be utilised as a tool to raise awareness and build capacity with instructors in relation to the elements and indicators of engagement.

Teaching Teams: A Tool for Critical Reflection

As part of a teaching teams' annual course review, and as part of completing the cycle of moderation, the online engagement framework offers academics a tool for critical reflection, through auditing the types of engagement employed in their courses. Teams could also reflect critically on the effectiveness of each of the approaches in addressing and supporting the student learning journey and course learning objectives. As research indicates that strategies employed to support student engagement are contextual in relation to factors such as the student cohort, the course, and the course content (Lawrence, Dashwood, Burton, & Brown, 2013), the online engagement framework offers teaching teams a valuable reference point for considering the "best fit" of engagement indicators for the types of learning and the students in their courses.

Teaching teams may wish to adopt a pragmatic approach of making better use of learning analytics to monitor, better understand, and evaluate levels of student engagement, again using the online engagement framework as a reference point. This in turn will help inform future course offerings, approaches, course materials, and pedagogical practices. For example, in reviewing learning analytics, it might be identified that some students who missed online classes or scheduled chat sessions did not access the recordings or transcripts of these sessions and did not access the discussion boards or emails (Thompson et al., 2013). As part of a course team review, instructors may choose to explore engagement options to better support these particular students and foster motivation and engagement in the future. They may also wish to utilise the indicators of the online

engagement framework to help inform future course design and pedagogical practice and with the aim of facilitating higher levels of academic engagement and motivation for online students.

Program Level: A Review Across Courses

At a broader programmatic level, and for those instructors whose role is associated with program or institutional teaching and learning, the online engagement framework offers a tool for auditing the types of engagement employed across a program. Such a process could provide insight into which elements and processes are privileged, popular, and utilised, as well as identify which elements may not have much exposure. This in turn could provoke robust professional and pedagogical conversations and questions with program teams, in relation to the visible trends, and the impact of not employing other engagement indicators and elements.

At a program level, the online engagement framework offers a way of challenging existing discourse and introducing alternative discourse about understandings of engagement, as well as processes and strategies that support quality and effective student engagement. Drawing upon the online engagement framework as an interdisciplinary frame and reference point, program teams may be better able to respond proactively to government reports and public discussions. The framework could be used to explain and clarify the elements, strategies, and pedagogies employed by institutions to support learning and teaching that enhance student engagement.

Macro Level: A Reference Point to Inform Interpretations and Benchmarking of Engagement

Finally, the authors suggest that the online engagement framework can potentially provide professionals involved in determining quality indicators for learning and teaching (see Australian Government Department of Education and Training, 2016a, 2016b), policy advisors and advisory groups with a reference point to inform the structuring and thinking behind institutional and systemic tools that seek to categorise engagement, student satisfaction, and other forms and measurements. For example, the online engagement framework could help to inform and frame future higher education learning and teaching surveys, by adopting a more comprehensive interpretation and lens for determining learner engagement in the online environment. This would help to widen the lens beyond the current narrow view of engagement, which is limited to exploring an aspect such as "interactions among students and teaching staff" (Australian Government Department of Education and Training, 2016b). A spinoff of this might be a shift in the public's perception of reports and reviews regarding the indicators of quality teaching and learning in higher education.

With a plethora of studies and research reporting on teaching and learning in higher education, it is hoped that researchers who in the future might wish to investigate the types and levels of online engagement might refer to and draw upon the elements of engagement and the associated discussion outlined in this paper. This would foster consideration and thinking about how online engagement is understood, and where it might be evidenced in practice. Researchers may wish to use the online engagement framework to problematize understandings of online student engagement. The elements of the online engagement framework may provide useful categories for investigating the types of engagement that are privileged and the barriers to employing other types of engagement in particular contexts.

Next Steps

Future research surrounding the Online Engagement Framework for Higher Education is expected to take place in four phases. First, the framework is yet to be statistically validated.

Although the framework has been developed from the literature and the research team has sought feedback from experts in the field, it is critical to determine the reliability and validity of the framework. A second phase to this research is for the research team to use the framework as a lens to unpack the engagement within their own courses.

The third phase is to work with students to reflect upon the framework and to have them determine how it might help their studies and how it might assist them to unpack their actual levels of engagement in their online studies. Finally, the framework should be explored by academics in different disciplines and other universities to see if it is valid in a range of different contexts. We invite other instructors and researchers to use the framework across various populations and disciplines to assist in the validation of the online engagement framework and to comment on its robustness.

Conclusion

The goal of this research was to develop an Online Engagement Framework for Higher Education. The framework was developed from a review of the relevant literature that explores engagement in educational contexts. The framework that was developed includes five key elements considered essential to effective online learning: social engagement, cognitive engagement, behavioral engagement, collaborative engagement, and emotional engagement. For each of the elements, indicators have been generated to provide illustrative examples of what each element of engagement might look like. Considerable work remains to be completed in order to validate the framework.

Learning and teaching online is complex and we continue to learn how to more effectively support the online learning journeys of students. Educators and researchers will continue to develop tools and strategies to overcome the challenges of our work in the online space. However, there is much we can do to create online learning environments that enhance learning and teaching outcomes, provide opportunities for students to engage online, and to foster connections with each other, instructors, the educational institution, and industry while developing strong disciplinary knowledge and multidisciplinary skills. We believe that the framework that has been designed offers instructors, designers, and researchers who work in the online space a template to guide their work. As the number of students enrolling in online courses in higher education is on the rise, it is important that we explore the nature and the quality of engagement.

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Engagement Matters: Student Perceptions on the Importance of Engagement Strategies in the Online Learning Environment

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Abstract
Student engagement increases student satisfaction, enhances student motivation to learn, reduces the sense of isolation, and improves student performance in online courses. This survey-based research study examines student perception on various engagement strategies used in online courses based on Moore's interaction framework. One hundred and fifty-five students completed a 38-item survey on learner-to-learner, learner-to-instructor, and learner-to-content engagement strategies. Learner-to-instructor engagement strategies seemed to be most valued among the three categories. Icebreaker/introduction discussions and working collaboratively using online communication tools were rated the most beneficial engagement strategies in the learner-to-learner category, whereas sending regular announcements or email reminders and providing grading rubrics for all assignments were rated most beneficial in learner-to-instructor category. In the learner-content category, students mentioned working on real-world projects and having discussions with structured or guiding questions were the most beneficial. This study also analyzed the effect of age, gender, and years of online learning experience differences on students' perception of engagement strategies. The results of the study have implications for online instructors, instructional designers, and administrators who wish to enhance engagement in the online courses.

Keywords: online learning, asynchronous, engagement, student perception

Martin, F. & Bolliger, D.U. (2018). Engagement matters: Student perceptions on the importance of engagement strategies in the online learning environment. *Online Learning 22*(1), 205-222. doi:10.24059/olj.v22i1.1092

Engagement Matters: Student Perceptions on the Importance of Engagement Strategies in the Online Learning Environment

Engagement is crucial to student learning and satisfaction in online courses. The definition of engagement has been extensively explored in distance and online learning literature for decades. *Student engagement* is defined as "the student's psychological investment in and effort directed

toward learning, understanding, or mastering the knowledge, skills, or crafts that academic work is intended to promote" (Newmann, Wehlage, & Lamborn, 1992, p. 12). Student engagement in online learning is very important because online learners seem to have fewer opportunities to be engaged with the institution. Hence, it is essential to create multiple opportunities for student engagement in the online environment. The need for engagement has resulted in the development of guidelines for designing effective online courses (Roblyer & Ekhaml, 2000). Engagement strategies are aimed at providing positive learner experiences including active learning opportunities, such as participating in collaborative group work, having students facilitate presentations and discussions, sharing resources actively, creating course assignments with hands-on components, and integrating case studies and reflections. Banna, Lin, Stewart, and Fialkowski (2015) stress that engagement is the key solution to the issue of learner isolation, dropout, retention, and graduation rate in online learning. Meyer (2014), Banna et al. (2015), and Britt (2015) assert the importance of student engagement to online learning because they believe student engagement can be shown as evidence of students' considerable effort required for their cognitive development and their given ability to create their own knowledge, leading to a high level of student success.

According to Banna et al. (2015), if content played a central focus in the past, engagement plays an important role in stimulating online learning today. To boost student engagement, three basic engagement techniques of online learning have been identified: student-content, student-instructor, and student-student (Bernard et al., 2009). Lear, Ansorge, and Steckelberg (2010) say that interactions with content, peers, and instructors help online learners become active and more engaged in their courses. Interactivity and sense of community result in high-quality instruction and more effective learning outcomes.

Review of Related Literature

Framework

Interaction and engagement are closely related and even used interchangeably. Student engagement is developed through interaction (Anderson, 2003), and fostering interaction is important in online learning. On reviewing research in the higher education context, Chickering and Gamson (1987) proposed a framework to ensure students' engagement: "Seven Principles for Good Practice in Undergraduate Education." The seven principles identified in this framework list that students are more engaged when the instruction (1) increases the contact between student and faculty, (2) provides opportunities for students to work in cooperation, (3) encourages students to use active learning strategies, (4) provides timely feedback on students' academic progression, (5) requires students to spend quality time on academic tasks, (6) establishes high standards for acceptable academic work, and (7) addresses different learner needs in the learning process. Several of these seven principles apply to the online learning environment even though they were proposed for the face-to-face classroom.

Moore (1993) identified three types of interaction inherent in effective online courses: (1) learner-to-learner interaction, (2) learner-to-instructor interaction, and (3) learner-to-content interaction. This was used as the guiding framework for this study (see Figure 1). Lear et al. (2010) found that interactions with peers, instructors, and content help online learners become active and more engaged in their courses.

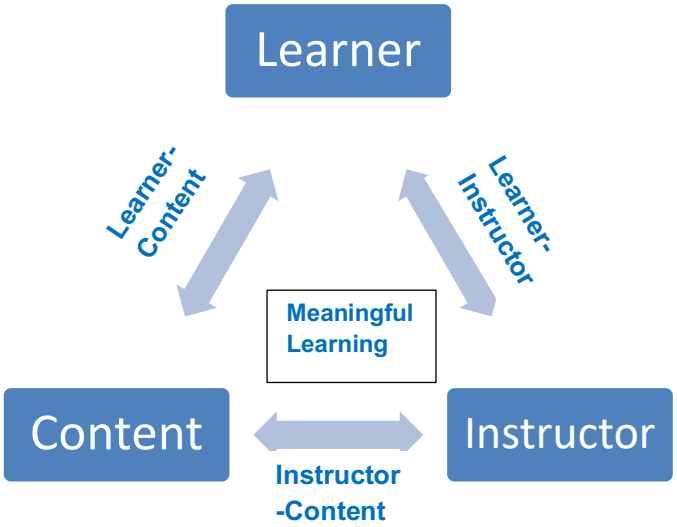

Figure 1. Types of interactions, based on Moore's framework.

Lear et al. (2010) depicted the distance education online environment interactivity/community-process model (see Figure 2) showing the relationship between interactivity, sense of community, and the engaged learner. They found interactivity and sense of community correlated to learner engagement.

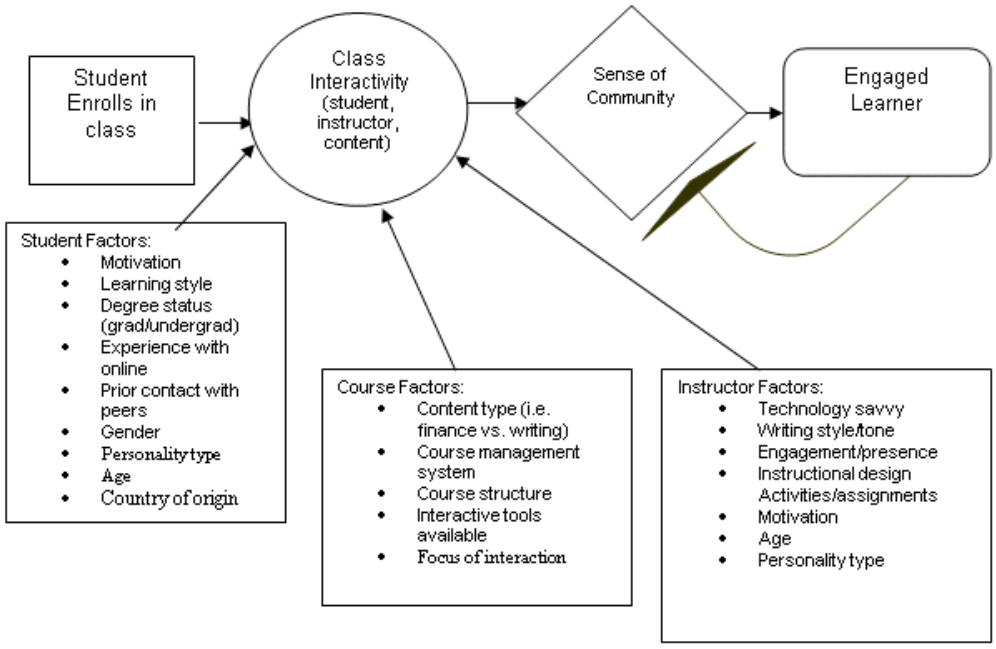

Figure 2. Distance education online environment interactivity/community-process model. From "Interactivity/Community Process Model for the Online Education Environment," by J. L. Lear, C. Ansorge, and A. Steckelberg, 2010, *Journal of Online Learning and Teaching, 6*, p. 74. Reprinted with permission.

Learner-to-Learner Engagement

Learner-to-learner interaction is extremely valuable for online learning and leads to student engagement. To prevent online students from experiencing potential boredom and isolation in the learning environment, it is essential to build activities that enhance engagement. These activities assist students in feeling connected and can create a dynamic sense of community. Revere and Kovach (2011) and Banna et al. (2015) found that traditional technologies for engaged learning, such as discussion boards, chat sessions, blogs, wikis, group tasks, or peer assessment, have served well in promoting student-to-student interaction in online courses. The authors highly recommend the use of web-based applications, such as Twitter feeds, Google applications, or audio and video technology like Wimba Collaboration Suite, in order to improve engagement in online courses. Shea, Fredericksen, Pickett, Pelz, and Swan (2001), in a survey of 3,800 students, found that when a greater percentage of the course grade was based on discussions, students were more satisfied, and they thought they learned more. Learners thought that they had more interaction with their peers and instructor. Banna et al. (2015) suggest using videoconferencing or chatting in synchronous activities, and discussion boards in asynchronous activities; they enhance student-to-student interaction. Utilization of social media in online courses provides an opportunity to enhance engagement through social interaction (Everson, Gundlach, & Miller, 2013; Tess, 2013).

Learner-to-Instructor Engagement

Learner-to-instructor interaction leads to higher student engagement in online courses (Dixson, 2010; Gayton & McEwen, 2007). The use of multiple student-instructor communication channels may be highly related to student engagement. It is recommended that online instructors pay special attention to student-instructor interactions because they may affect learning outcomes (Dixson, 2010; Gayton & McEwen, 2007). The authors found rapport and collaboration between students and instructors in an interactive and cohesive environment, including group work and instructive feedback, are important for student engagement resulting in learning success. Students often contact instructors about assignments, course materials, and grades; but to be more effective, online instruction should include opportunities for students to interact with one another and instructors pertaining to what makes their learning meaningful. In addition, Gayton and McEwen (2007) stress that instructors' presence in online courses is required in terms of actively involving students in their courses; however, online instructors should be minimally active in discussions when online courses are purposefully designed so that the more students engage, the more meaningful learning outcomes will be. Dixson (2010) and King (2014) also agree that there must be cooperation and collaboration between students and instructors in online courses in order to increase online student engagement.

Research has found that rapport and collaboration between students and instructors in an interactive environment are important. King (2014) found that students rated thorough and timely instructor feedback on their work as most valuable so that they can make improvements in their learning process. Mini videos and screencasting are techniques to increase instructor visibility that have been believed to bring many pedagogical benefits. Dixson (2010) and King (2014) stress that consistent interaction with students at the individual and group levels help set academic expectations among students. Instructor assessment of student work and participation using stated grading policy, providing summative feedback, and posting grades within a specified time frame can be highly beneficial. Revere and Kovach (2011) and Robinson and Hullinger (2008) suggest the use of new but well-established technologies, such as discussion boards, chat sessions, blogs, wikis, group tasks, Twitter, Skype, YouTube, and Ning networks, to foster student engagement

through course design and technology integration. These technologies are also used for effective social-networking activities in online active learning for increasing student engagement.

Learner-to-Content Engagement

Learner-to-content engagement is the process of intellectually interacting with the content, which can change a learner's understanding and perspectives (Moore, 1993). Abrami, Bernard, Bures, Borokhovski, and Tamim (2011) state that student-to-content interaction can occur while watching instructional videos, interacting with multimedia, and searching for information. Both synchronous and asynchronous delivery are seen as effective options that help online students in accessing content for critical interaction (Banna et al., 2015). Online instructors are advised to invest sufficient time searching for scholarly reading and interactive instructional materials and designing well-thought-out assessments for the purpose of encouraging student-to-content engagement (Abrami et al., 2011; Banna et al., 2015). Real-world application of projects that enhances subject mastery and critical thinking skills is one strategy related to fostering learner-to-content engagement. It refers to authenticity of the course content shown through real-world examples (Britt, 2015). Revere and Kovach (2011) recommend making the content come alive using appropriate technology, which enhances student engagement. Online instructors should be critical in choosing material and content when they wish to engage students more in their courses. Online students should not merely be given a list of resources, but instead instructors should design authentic activities that provide opportunities to examine the tasks from different perspectives and that encourage students to wisely use relevant information in the process. Dixson (2010) reports that students found a variety of activities made them feel engaged, including course management system features, effective communication, and course facilitation strategies.

Purpose of the Study

The purpose of this study is to investigate the importance of engagement strategies to online learners. The following research questions guided the study:

1. Which strategies do students perceive to be important in enhancing learner-learner, learner-instructor, and learner-content engagement in the online environment?
2. Which strategies do students identify as most valuable and least valuable to engaging them in the online learning environment?
3. Are there differences in responses based on individual differences, such as gender, age, and experience with online courses?

Methodology

Setting, Sample, and Participants

The sample consisted of online students at eight universities across the United States. The researchers solicited the assistance of faculty members who taught in online graduate programs at these institutions in a variety of programs to invite enrolled students via electronic mailing lists to participate in the study. These universities were selected because they are diverse in geography and size (student enrollment numbers), and both teaching and research universities were included. A total of 155 participants completed the online survey.

Participants. Most participants were female (67.8%), whereas 32.2% were male. Their ages ranged from 20 to 67 (M = 39.6). Over half of them (51.7%) were enrolled in a master's degree program. Other students identified themselves as doctoral (35.2%), postdoctoral (5.5%),

postbachelor (4.1%), and postmaster (2.1%) students; 1.4% of participants were pursuing a graduate certificate. Most participants were studying in the discipline of education (85.5%), whereas others were in health sciences (8.9%), engineering (2.8%), arts and sciences (2.1%), and business (0.7%). Participants reported they had completed anywhere from 0 to 100 online courses (M = 14.0).

Data Collection

Data were collected during the spring 2016 semester via an online survey instrument that was housed on a secure server at one of the institutions affiliated with the researchers. Faculty members were asked to forward the invitation to participate in the study to students enrolled in their online programs via email distribution lists. Prior to the data collection, approvals from all relevant institutional review boards were obtained. The invitation included a cover letter with information about the study and a link to the online survey. Participation was voluntary, and all responses were anonymous. After approximately two weeks, one reminder was sent to all students. Participants were able to register for the drawing of three $25.00 gift cards.

Instrument

The instrument was developed by the researchers after conducting an extensive literature review on student engagement in higher education. Likert-type items were developed based on three types of interaction (Moore, 1993): student-to-student, student-to-instructor, and student-to-content. The original instrument included a total of 47 questions: 36 Likert items, three open-ended questions, and eight demographic questions.

The instrument was reviewed by five members of an expert panel prior to the data collection. All participating experts had at least seven years of online teaching experience in higher education; two of them were also experts in research methods. They were provided with a copy of the instrument and instructions to review all questions, make changes, and add or delete relevant items.

The expert review resulted in the modification, addition, and deletion of several questions and a revised Likert scale. The final version of the instrument included 38 total questions: 29 Likert-type items ranging from 1 (*very unimportant*) to 5 (*very important*), three open-ended questions, and six demographic questions. The demographic questions included age and gender, current student status and number of online courses completed, and discipline and major. After the data collection phase, Cronbach's alpha coefficients were calculated to ensure the instrument's internal reliability. The instrument had an internal reliability coefficient of .87, and the reliability for the three subscales were satisfactory: (a) learner-to-learner (a = .74), (b) learner-to-instructor (a = .73), and (c) learner-to-content (a = .73).

Data Analysis

Because nine cases had one third of their data missing, they were deleted from the data set. The deletion of these cases left a total of 146 valid cases. Missing values were replaced with the series mean, and frequencies and descriptive statistics were generated. Three new variables were created based on the three types of interaction. Independent samples t-tests and a series of analyses of variance were run to ascertain differences in responses based on gender, age, and experience with online courses. Topic and analytical coding were used to analyze responses to the three open-ended questions (Flick, 2006; Richards, 2009). Responses were coded to detect and create categories, and emerging categories were sorted and compared in order to develop common themes.

Results

Importance of Student Engagement Strategies

In general, participants thought that engagement strategies listed on the instrument were somewhat important. Possible total scale scores ranged from 29 to 145 (based on 29 items with a range of 1 to 5), and respondents' scores ranged from 84 to 145 (M = 113.74; SD = 12.06). Their total mean scores ranged from 2.90 to 5.00 (M = 3.92; SD = 0.42).

On the learner-to-learner subscale, over 80% of respondents agreed that Item 3 (81.4%) was important or very important; this item had not only the highest mean score on this subscale (Table 1) but also the only mean score above 4.0. Over 70% agreed that Item 8 (78.1%) and Item 7 (76.1%) were important or very important. More than 60% of students believed that Item 5 (69.7%), Item 9 (66.9%), and Item 4 (64.6%) were important or very important.

Item	*M*	*SD*
1. Students use a virtual lounge where they can meet informally to share common interests.	3.03	1.17
2. Students complete an integrated profile on the learning management system that is accessible in all courses.	3.45	0.97
3. Students introduce themselves using an icebreaker discussion.	4.08	0.93
4. Students moderate discussions.	3.55	0.93
5. Students have choices in the selection of readings (articles, books) that drive discussion group formation.	3.78	0.95
6. Students post audio and/or video files in threaded discussions instead of only written responses.	3.60	0.92
7. Students interact with peers through student presentations (asynchronously or synchronously).	3.89	0.93
8. Students work collaboratively using online communication tools to complete case studies, projects, reports, etc.	3.94	1.07
9. Students peer-review classmates' work.	3.66	1.09
10. Students are required to rate individual performance of team members on projects.	3.38	1.13

Note: Scale ranging from 1 (*very unimportant*) to 5 (*very important*).

Table 1. Means and Standard Deviations for Items on the Learner-to-Learner Subscale

The majority of participants valued engagement strategies on the learner-to-instructor subscale. Item 12 had the highest mean score (M = 4.53; SD = 0.67), with 94.4% of students agreeing that it is important or very important (Table 2), and 90.1% agreed with Item 19. Over 80% of students agreed with Item 11 (89.3%), Item 13 (89.1%), and Item 15 (87.5%). Only two items on this subscale received a mean score below 4.0.

Item	*M*	*SD*
11. The instructor refers to students by name in discussion forums.	4.13	0.87
12. The instructor sends/posts regular announcements or email reminders.	4.53	0.67
13. The instructor creates a forum for students to contact the instructor with questions about the course.	4.36	0.81
14. The instructor creates a course orientation for students.	4.10	0.92
15. The instructor posts a "due date checklist" at the end of each instructional unit.	4.33	0.89
16. The instructor creates short videos to increase instructor presence in the course.	4.04	0.98
17. The instructor provides feedback using various modalities (e.g., text, audio, video, and visuals).	4.05	0.88
18. The instructor provides students with an opportunity to reflect (e.g., via a journal or surveys).	3.67	0.99
19. The instructor posts grading rubrics for all assignments.	4.41	0.79
20. The instructor uses various features in synchronous sessions to interact with students (e.g., polls, emoticons, whiteboard, text, or audio and video chat).	3.85	0.88

Note: Scale ranging from 1 (*very unimportant*) to 5 (*very important*).

Table 2. Means and Standard Deviations for Items on the Learner-to-Instructor Subscale

Over 90% of respondents agreed that Item 24 (95.2%) and Item 28 (92.4%) were important or very important strategies to engage online students. Eighty-two percent of participants agreed that Item 22 was important to very important. Five items on this subscale had a mean score of 4.0 or above, and the item with the highest mean score was Item 28 (Table 3).

Item	*M*	*SD*
21. Students interact with content in more than one format (e.g., text, video, audio, interactive games, or simulations).	4.17	0.81
22. Students use optional online resources to explore topics in more depth.	4.09	0.72
23. Students experience live, synchronous web conferencing for class events and/or guest talks.	3.40	1.06
24. Discussions are structured with guiding questions and/or prompts to deepen their understanding of the content.	4.39	0.66
25. Students research an approved topic and present their findings in a delivery method of their choice (e.g., discussions forum, chat, web conference, multimedia presentation).	3.97	0.82
26. Students search for and select applicable materials (e.g., articles, books) based on their interests.	3.97	0.81
27. Students have an opportunity to reflect on important elements of the course (e.g., use of communication tools, their learning, team projects, and community).	4.00	0.81
28. Students work on realistic scenarios to apply content (e.g., case studies, reports, research papers, presentations, client projects).	4.40	0.65
29. Students use self-tests to check their understanding of materials.	3.54	0.98

Note: Scale ranging from 1 (*very unimportant*) to 5 (*very important*).

Table 3. Means and Standard Deviations for Items on the Learner-to-Content Subscale

Of the three subscales, the learner-to-instructor subscale had the highest mean score (Table 4). This indicates that, in general, online learners most valued strategies that provide interaction between learners and instructors. Strategies used to facilitate learner-to-learner interaction were thought of as least important.

Subscale	*M*	*SD*
Learner-to-learner	3.63	0.56
Learner-to-instructor	4.15	0.47
Learner-to-content	3.99	0.46

Note: Scale ranging from 1 (*very unimportant*) to 5 (*very important*).

Table 4. Means and Standard Deviations for Subscales

Most Valuable Strategies

In response to the open-ended question "What is the most valuable strategy to engage you as an online learner?" a total of 232 strategies were mentioned by 138 respondents. Most comments pertained to the course itself (n = 146); other comments related to instructors (n = 68) and other students (n = 18) (Table 5). When students wrote about course materials, they liked video lectures and preferred to have content presented in a variety of formats (e.g., multimedia files). Several also appreciated the integration of videos, a well-prepared and well-structured course with relevant information and visuals, and a flexible approach.

Sixteen individuals thought online discussions were important in the engagement of online students. They felt that instructors should form small groups for discussions, post prompts that "encourage deep reflection" and "deeper understanding," and require students to participate. They also believed that multiple types of media should be used for responses of instructors and students. Finally, they felt that instructions, directions, and guidelines need to be clear. This category included clear course goals, criteria, expectations, and rubrics. A few students mentioned the need of a list with all due dates and checklists.

Thirteen students valued online, synchronous meetings (e.g., videoconferencing), online video chat or chat sessions as strategies to be engaged. Real-world, authentic, and meaningful assignments kept students engaged in their learning process. Ten participants appreciated being able to select topics for course assignments based on their interests and the opportunity to pick relevant readings. Two students liked the peer review of assignments.

Course		Instructor		Peers	
Course materials	48	Feedback	27	Interaction	16
Discussions	31	Interaction/presence	26	Community	2
Instructions/guidelines	28	Support	15		
Online meetings	13				
Assignments	12				
Choices	10				
Assessment	4				

Note: Response count. Respondents could mention multiple strategies.

Table 5. Categories of Valuable Engagement Strategies Reported by Respondents (n = 138)

Instructor feedback was important to several students. Students expected timely feedback that was detailed, personalized, and constructive. A few liked to get video or audio feedback from the instructor. Interaction with the instructor and instructor presence were perceived as valuable by 14 and 12 respondents, respectively. Several learners needed their instructors to be responsive and supportive. They felt that instructors should respond to questions promptly and develop a relationship with the student. For example, one person wrote, "It is so encouraging to believe that the instructor is getting to know me as an individual, and is willing to connect with me personally." A person who encountered an unsupportive instructor wrote, "I felt that I was lonely in the desert .... Preparing a well-designed curricula without instructor support does not mean that students will be engaged as planned."

Online student interaction with peers was deemed valuable by several students. They liked to work on collaborative group activities or assignments and enjoyed when their peers were involved in the discussions. Two individuals mentioned the importance of community and the formation of relationships with other learners.

Least Valuable Strategies

When asked "What is the least valuable strategy to engage you as an online learner?" a total of 33 strategies were mentioned by 123 respondents. Thirty of these strategies regarded the course, whereas two strategies were specific to the instructor, and one regarded peers. The least valuable strategies reported were the integration of discussion forums (n = 28) followed by synchronous meetings, group, and peer review work (n = 18). For example, one student commented, "I simply find little value in reading and replying to a classmate's post. It's just not how I want to learn or interact in an online course. Even when discussions are set up following best practices, they simply feel like busy work consuming time." Regarding synchronous sessions, one student wrote, "I prefer to mull over deeper ideas and concepts before responding. I feel synchronous sessions are more of a social strategy. They lend well to becoming connected with the group, however, I do not gain much as far as learning and content." One student offered a perspective on the use of group projects. The person wrote, "We are all adults with busy lives - we take online classes so we don't have to cater to another person's schedule." While videos and synchronous meetings were listed by students as the most valuable strategies, they were also listed as least valuable strategies by other students.

Course		Instructor		Peers	
Online discussions	28	Not seeing the instructor	3	Group projects and peer review work	18
Synchronous meetings	10	Not receiving reminders	1		
Long text readings	10				
Videos	8				
Too much interaction	6				
Too many forms of media	6				

Table 5. Categories of Least Valuable Engagement Strategies Reported by Respondents (n = 123)

Other Beneficial Strategies

In response to the open-ended question "What strategies not included in this questionnaire are beneficial to you as an online learner?" a total of 64 other strategies were mentioned by 90

respondents. Fifty-seven strategies addressed the course, five strategies were specific to the instructor, and two strategies pertained to the peers. Real-world applications and video lectures were listed as beneficial by five respondents each, and being able to see the instructor was considered beneficial by four respondents. Timely feedback, networking with peers, and clear schedules/syllabi and expectations were rated as beneficial by three respondents each. One student commented, "I think meeting synchronously 2-3 times during a semester would be very beneficial. This could either be one-on-one with the instructor, or in small groups (via Skype or Google Hangouts). I think this would help create community and be a good way for instructors to check-in with students, get feedback, and get a pulse for how learners are doing."

Course		Instructor		Peers	
Real-world applications	5	Seeing the instructor	4	Networking with peers	3
Video lectures	5	Timely feedback	3		

Table 5. Categories of Beneficial Engagement Strategies Not Listed on the Questionnaire Reported by Respondents (n = 90)

Individual Differences

Gender. An independent samples t-test was performed to evaluate whether females and males had statistically significant different responses to the items on the instrument and its subscales. The test was significant for Item 22, $t(141) = 2.03$, $p = .04$. For female students it was more important ($M = 4.18$) to use additional online resources to explore topics in more depth than for male students ($M = 3.92$).

Age. A series of one-way analysis of variance (ANOVA) tests were conducted to evaluate the differences in age and online course experiences. The ANOVA was significant for Item 12, $F(3, 134) = 4.31$, $p = .01$. Follow-up tests were conducted to evaluate pairwise differences among the means. Because the group sizes were unequal, the assumption was made that the variances among the groups were not homogenous; therefore, Dunnett's C test was used. There was a significant difference in the mean scores between individuals 20–29 years of age ($M = 4.77$, $SD = 0.42$) and 40–49 ($M = 4.21$, $SD = 0.89$). Students in the younger group thought it was more important for instructors to send or post regular announcements or email reminders than students in the older age group. The 95% confidence interval for the pairwise difference was 0.08 to 1.04.

Level of experience. Respondents were sorted into three groups based on the successful completion of the number of online courses: 0–5 (low), 6–10 (medium), and 11 or more (high). The ANOVAs were significant for three items. There was a significant difference for Item 1, $F(2, 139) = 7.64$, $p = 0.001$. The use of an informal virtual lounge was valued more by students with a low level of online course experience ($M = 3.51$, $SD = 1.12$) than by students with a high level of experience ($M = 2.64$, $SD = 1.14$).

There were statistically significant differences for Item 12, $F(2, 139) = 8.29$, $p < .001$. Students in the low group ($M = 4.80$, $SD = 0.46$) and medium group ($M = 4.68$, $SD = 0.62$) thought that it was more important for an instructor to post announcements and send email messages regularly than students in the high group ($M = 4.31$, $SD = 0.74$).

Results for Item 21 were also significant, $F(2, 139) = 3.15$, $p = .046$. Medium experience users ($M = 4.39$, $SD = 0.68$) believed it was more important to interact with a variety of types of content than students in the high experience group ($M = 3.99$, $SD = 0.83$). The 95% confidence intervals for the pairwise differences were 0.31 to 1.43 (Item 1); 0.21 to 0.78, and 0.05 to 0.70 (Item 12); and 0.05 to 0.77 (Item 21).

Discussion

Learner-to-Learner Engagement

In this study, quantitative findings show that students rated the icebreaker discussion as the most important engagement strategy. Baker (2011) recommends using icebreaker discussions where instructors can designate a rotating icebreaker role within each group. The findings of this study are consistent with findings of Reushle and Mitchell (2009), who also emphasize the importance of icebreaking activities in online learning settings to create and enhance a supportive and friendly atmosphere. Moreover, Watkins (2014) discusses icebreaker activities to create interactive, meaningful, and entertaining experiences for students.

Working collaboratively using online communication tools was rated second highest. In one of the open-ended questions, group work was rated as the least valuable strategy. This may explain why some students rated this item low; some students simply do not enjoy collaborating with peers. Beck (2010) states that students who are unable to ask questions directly and do not receive feedback from instructors depend more on other students and end up working collaboratively with each other. Lowyck and Pöysä (2001) mention that collaborative learning strengthens learners' analytical skills and enables them to further their knowledge.

Using a virtual lounge for discussions outside of class was rated as the least important strategy. Most participants in this study were graduate students and likely work full-time. Time may be a significant factor in whether a virtual lounge for discussions outside of class is useful for them. It may be that undergraduates or traditional master's level students who work part-time might find it more valuable. Also, some students may be communicating privately through email and other methods, as they might prefer their privacy. They may be getting enough socialization through the other course activities and, hence, they rated this as an unimportant strategy. This is inconsistent with previous findings from Harrell (2008), who praised the role of virtual lounges in building relationship among students. Graduate students may not have the time to participate in virtual lounges for discussion outside of class. Students can be enrolled in different courses but get together in lounges and can have formal or informal conversations. Nicholson (2002) also reported a positive impact on communication with the use of instant online messaging. It assisted in building a sense of community and provided opportunities for getting involved in communications pertaining to class or institutions.

Learner-to-Instructor Engagement

Sending regular announcements or email reminders was rated as a very important engagement strategy. Ko and Rossen (2010) also talk about the importance of sending email announcements in a course. They mention that emails allow course participants to have a record of course communications. Cuthrell and Lyon (2007) think that sending emails enables instructors to reach out to all students.

Providing grading rubrics for all assignments was rated as the next most important engagement strategy in this category. This finding is consistent with that of other researchers. For example, Gayton and McEwen (2007) believe that the use of rubrics is an effective technique for online assessment. They report that rubrics are valued by both students and instructors. Bali and Ramadan (2007) found positive outcomes with the use of rubrics in online assessment. According to the authors, rubrics allow better and more accurate evaluation of students.

Providing students with an opportunity to reflect (e.g., via a journal or surveys) was rated as not important. This finding is inconsistent with prior findings. Other authors (Asterhan & Schwarz, 2007; Martin & Ertzberger, 2016), point out that reflection provides meaningful learning. They discuss the value of students sharing ideas, its influence on academic outcomes, and the development of critical thinking skills.

Learner-to-Content Engagement

Working on realistic scenarios (e.g., case studies, reports, research papers, presentations, client projects) was listed as the most beneficial strategy. Active learning strategies have been found to be an effective way to engage students and improve their academic outcomes (Felder & Brent, 1996). Moreover, Stavredes and Herder (2014), discuss how important it is to choose and design course material and activities in a way that enables learners to explore, discover, and perfect their skills and gain knowledge.

Discussions that are structured and include guiding questions and/or prompts to deepen their understanding of the content was rated as another very important engagement strategy. Asynchronous online discussions are valuable in online learning. When they are guided by the instructor, they have the ability to develop students' cognitive skills and deepen their understanding of the content (Gilbert & Dabbagh, 2005). Garrison and Cleveland-Innes (2005) point to the importance of quality contributions in online discussions.

In some course, students experience live, synchronous web conferencing sessions for class events and/or guest talks. However, in this study this was rated as not very important compared to other strategies. The finding from this study is inconsistent with prior findings. Ward, Peters, and Shelley (2010) found that courses with synchronous conferences were perceived to be of better quality by students compared to courses that were entirely asynchronous. Parker and Martin (2010) found that the integration of synchronous meetings in online courses can be beneficial to students because it increases student interaction. Students can develop their technology skills, and they have opportunities to interact with the instructor. One reason for the low rating of synchronous sessions in this study may be that respondents were enrolled in courses delivered mostly asynchronously.

Other Strategies

Our findings show that including a variety of course materials were very beneficial to online students. This is supported by Ko and Rossen (2010), who recommend using a variety of instructional material, including instructor generated resources, web resources, book chapters, multimedia resources, and instructional videos.

Interestingly, some students thought that online discussions were the least valuable strategy, which contradicted other results that showed discussions deepen students' understanding of content. However, respondents pointed out that structured discussions with guiding questions and/or prompts are more beneficial than unstructured discussions. Gašević, Adesope, Joksimović, and Kovanović (2015) found that high levels of cognitive presence in student-to-student discussions can be achieved by using externally facilitated regulation scaffolding and computer-supported collaborative learning with role assignment.

Real-world application was a strategy that was rated as very important. Blumenfeld et al. (1991) stress the importance of project-based learning and the engagement of students in the investigation of authentic problems where motivation and thought are sustained.

Though discussions were considered as the most valuable strategy in the quantitative data, they were considered as the least valuable strategy in the open-ended responses. This could have been due to the way the discussion forums were designed. When discussions are structured with guiding questions and/or prompts to deepen their understanding of the content, students consider them beneficial, according to the Likert-scale response in the Learner-to-content category.

Limitations and Future Research

Some methodological limitations need to be mentioned. First, the sample size is relatively small, and the sample was drawn from a limited number of universities. However, the list of universities included different classifications of universities and different geographical regions. Second, all data were self-reported due to the nature of the study. Third, the list of strategies is not an exhaustive list of all possible strategies that may be used to engage students in online classrooms. Last, respondents were solicited from multiple universities across the United States. The researchers had no control over the design and delivery of courses, programs, or strategies used by instructors. All of these elements impact the students' learning experience and influence their perceptions. Students whose instructors have not used some of these strategies may rate these strategies of lower importance. Readers should interpret the results with caution due to these limitations because results may have limited generalizability in different settings and contexts.

Other researchers could examine additional engagement strategies that are not included in the survey utilized to collect data in this study. Future research could focus on examining faculty perceptions of engagement strategies and compare differences between faculty and student perceptions. It would be worthwhile to investigate the perceptions of undergraduate students pertaining to engagement strategies and identify strategies that are more important to undergraduate versus graduate students.

Conclusions

This study confirms the importance of all three types of engagement strategies in online learning, especially learner-to-instructor engagement. This reinforces the belief that institutions need to design and deliver engaging learning experiences for students to succeed in online learning. Many of the strategies were highly rated by students and course designers, and instructors can use any of these strategies to enhance interaction in their online courses. The findings suggest that engagement can be enhanced both in the interactive design of online courses and also in the facilitation of the online courses. Instructor facilitation is crucial; hence, instructors need to have strategies for time management and engaging discourse.

The results from this study benefit (1) online instructors who are looking for various engagement strategies to implement in their online courses, (2) instructional designers who assist in the design and development of online courses, and (3) administrators who are looking at ways to increase engagement in online courses institution-wide. This study also adds to the research literature and assists other researchers in building on engagement strategies for online learning.

It is important to note that engagement strategies that support interactions with instructors were valued more than strategies that aimed at interactions with learning material and other learners. Instructor presence is very important to online learners. They want to know that someone "on the other end" is paying attention. Online learners want instructors who support, listen to, and communicate with them. As some of the participants mentioned, they appreciate frequent updates

from their instructors and want to have an instructor who is not only responsive but supportive. Not surprisingly, students who participated in this study expected instructors to assist them in their learning and create meaningful leaning experiences, as evidenced by their assigning relatively high ratings for items pertaining to grading rubrics, checklists, forums, and student orientations.

The most important element in online learning is the instructor (Bolliger & Martindale, 2004), although in some cases it is difficult to separate course material and instructional technology from the instructor. Instructors who wish to teach online or improve their online teaching effectiveness, instructional designers who want to build engaging online courses, and administrators who support staff and faculty working in successful online programs need to be aware of the importance of this fact.

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Online Student Use of a Proximate Community of Engagement in an Independent Study Program

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Abstract
Research has suggested that independent study students in online courses may benefit from engaging with a proximate community of engagement (PCE) and that students perceive that such engagement will help them succeed. Independent Study students were surveyed at the completion of their course to assess the level at which they actually interacted with a PCE. Survey findings were confirmed with follow-up interviews with students and their parents to triangulate survey data. Findings revealed that students in the study interacted with a PCE when completing the course. The percentage of students actually engaged with a PCE was lower than the percentages of students from a previous study who perceived that such engagement would be helpful. The research suggests that students made aware of the benefits of a PCE at the beginning of the course, and who receive coaching to curate that community as an assignment in the course, will be more likely to receive the learning benefits of community engagement. Future research to confirm the value of engaging with a proximate community, identifying most helpful and effective interactions, and helping students curate such a community are proposed.

Keywords: independent study, adolescent, online courses, online community, adolescent community of engagement, proximate community of engagement

Oviatt, D.R., Graham, C.G., Borup, J. & Davies, R.S. (2018). Online student use of a proximate community of engagement in an independent study program. *Online Learning 22*(1), 223-251. doi:10.24059/olj.v22i1.1153

Online Student Use of a Proximate Community of Engagement

K-12 online courses are often used to increase access and support timely graduation by providing "the freedom and independence of time and place" (Anderson, 2008). Credit recovery, or a repeat enrollment in a course which the student had previously attempted and failed (Watson & Gemin, 2008), is the most frequent reason students enroll in an online course (Glass, 2009; Watson & Gemin, 2008; Wicks, 2010). The majority of K-12 online enrollments are also used to

supplement students' face-to-face course work and researchers estimated that there were 2.7 million students enrolled in 4.5 million supplemental courses in the 2014-15 school year (Gemin, Pape, Vashaw, & Watson, 2015).

Online course designs generally employ methods of delivery with variable degrees of required interaction (Barbour & Reeves, 2009). Research has suggested that interactive, community-centered courses may provide greater learning achievement than traditional independent study models of distance education (Boling, Hough, Krinsky, Saleem, & Stevens, 2012; Garrison, Anderson, & Archer, 2000). However, increasing the levels of interaction between instructors and students offers less student flexibility—the reason many students seek online courses in the first place (Anderson, 2008). As a result, many supplemental course providers have resisted increasing learner interaction requirements at the cost of student flexibility. In fact, even full-time, online charter schools organized similar to their brick-and-mortar counterparts depend heavily on independent study courses (Gill, et al., 2015; Hasler Waters, 2012).

Research on structured communities supporting adolescent learners concludes that interactions in learning communities are critical components of learning success. Borup, West, Graham, & Davies (2014) proposed the adolescent community of engagement (ACE) framework which identified critical roles, functions, and activities or interactions within a community of engagement for adolescent students enrolled in online courses. The ACE framework posits "that as parents, teachers, and peers become more engaged, students are more likely to increase their engagement" (Borup et al., 2014, p. 112). Although independent study courses do not require much human interaction, Anderson (2008) observed that students engaged in independent study are not alone, often having access to peers and family members who support and assist them. Students could derive some of the benefits of community-centered learning through interactions with people nearby (parents, teachers, other adults, students, other peers) and still maintain the desired high level of flexibility. Oviatt, Graham, Borup, and Davies (2016) labeled such a community of local individuals supporting online independent study learners a *proximate community of engagement* (PCE). A PCE may be even more important for credit recovery (CR) enrollments. Oviatt et al. (2016) found that online CR students value support from a PCE more than their non-credit-recovery (NCR) peers. However, CR students may be less inclined to seek support or less aware that support is needed or available (Oliver, Osborne, Patel, & Kleimann, 2009).

Although previous research found that students perceive the value of establishing a PCE (see Oviatt et al., 2016), little is known regarding how successful they are at actually establishing one. Using the interactions and activities described in the ACE framework as a foundation, this study used self-report surveys and semi-structured interviews with students and their parents to document evidences of student use of a PCE and sought to identify differences in the use of a PCE based on whether the student was enrolled for CR or NCR reasons. Specifically, the study asked three research questions:

1. Which specific interactions or activities described in the ACE framework were utilized by the students as they completed an independent study course?
2. Who interacted with the students, in what ACE framework activities/roles did they function, and where were they located (proximate, distant)?
3. Are there significant statistical differences in the level of participation in specific ACE framework interactions based on a student's CR or NCR classification?

Review of Related Literature

This literature review examines the characteristics of adolescent learners important to course designs, particularly credit recovery learners, and then considers the roles and functions of participants in the adolescent community of engagement (ACE) framework and pertinent research specific to the benefits of each role in the community.

Adolescent Student Support

Adolescent students tend to have fewer self-regulatory and metacognitive abilities than adults and require more support and higher quality interactions to persist to course completion (Barbour & Reeves, 2009; Borup. Graham, & Davies, 2013a; Cavanaugh, Barbour, & Clark 2009; Cavanaugh, Gillan, Kromrey, Hess, & Blomeyer, 2004; Moore 1989). For instance, adolescent learners have not developed the abilities that allow them to recognize learning challenges and adopt cognitive and behavioral strategies that lead to successful completion of learning tasks without support (Pintrich & De Groot, 1990). Supporting adolescent students may require providers to understand whether the student has selected the supplemental course for credit recovery (CR) or non-credit recovery (NCR) reasons (Authors, 2016).

Watson & Gemin (2008) define CR as a repeat attempt in a course that the student previously completed and failed. CR is the most common reason for enrollment in supplemental courses (Glass, 2009; Watson & Gemin, 2008). An iNACOL, (2013) study found that 62% of supplemental course enrollments are credit recovery. Watson & Gemin, (2008) observed that "many educators are finding that online and blended learning are effective ways to reach students who fail one or more courses, become disengaged, or who seek an alternative to traditional education" (Watson & Gemin, 2008, p. 3). Adolescent CR students face challenges in addition to those mentioned earlier for adolescent students in general. These additional challenges may include lower self-confidence due to previous failure, lower levels of technical literacy and access to technology, and challenging life and family circumstances that affect their ability to adequately attend classes (either physically or online) without additional support and encouragement (Oliver et al., 2009; Roblyer & Marshall, 2002; Watson & Gemin, 2008).

NCR reasons for taking the course can be either elective or required. Elective reasons include: flexibility, accessing courses not available at their local schools, accelerated learning opportunities, conflict avoidance, homeschooling, and recovering missed credits due to extra-curricular activities or avocations (Ahn, 2011; Authors, 2013b; Erb, 2004; Farrell, 1999; Hasler Waters, Menchaca, & Borup, 2014; Rice, 2006; Shea, Li, & Pickett, 2006; Snyder, 1997; Watson, Pape, Murin, Gemin, & Vashaw, 2014). Required reasons include: concerns about safety and security, homebound students, and those with family responsibilities not allowing school attendance (Ahn, 2011; Daum & Buschner, 2014; Erb, 2004; O'Hanlon, 2009; Shea, Li, & Pickett, 2006; Staker, 2011; Wicks, 2010). Earlier research shows that CR students perceive the need for support at significantly higher levels than NCR students (Oviatt et al., 2016).

The ACE Framework

The ACE framework (Borup et al., 2014) identifies specific roles fulfilled by various actors in an online learning community. Those roles are: student, teacher, peer learners, and parents. The framework suggests that a greater level of engagement by the three roles external to the student (i.e. teachers, peer learners, and parents) will lead to a greater level of engagement by the student (see Figure 1). Greater affective, behavioral, and cognitive student engagement is the goal of the ACE framework.

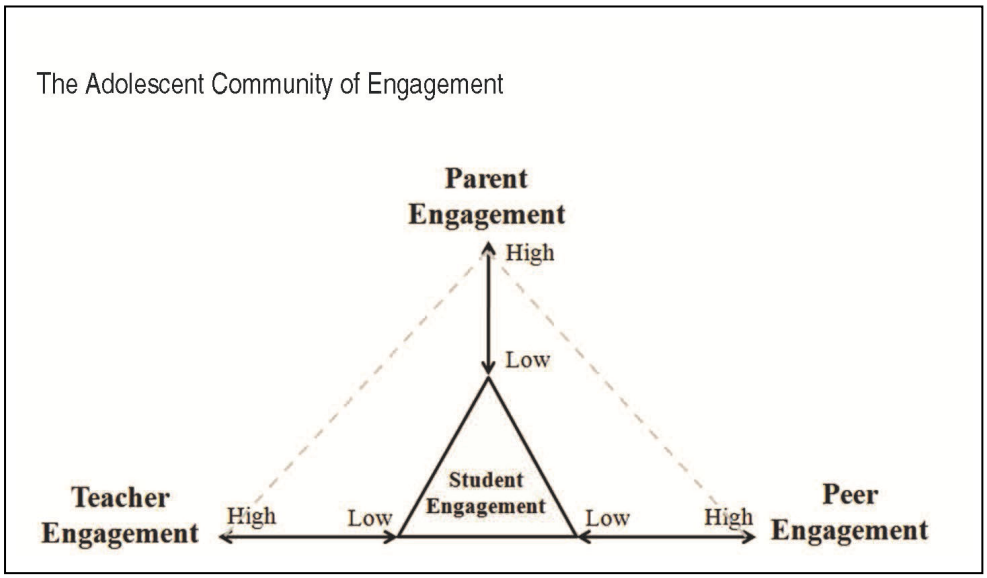

Figure 1. ACE framework from Borup et al. (2014, p. 111)

In the following sections, we will discuss the unique functions and interactions associated with each role in the ACE framework. Although this article focuses on a community of engagement in an independent study context, research examining independent study courses is especially limited and we have included research examining other learning models in our review.

The elements of the ACE framework are:

- Roles (teacher, parent, peer)
- Functions served by each role as they interaction with the students
- Activities or interactions which promote student engagement

The functions described in the ACE framework often overlap and can be performed by supporters acting in each of these roles (see Table 1).

		ACE Role		
Function	Task	Teacher	Parent	Peer
Facilitating (Monitoring & Motivating)				
	Nurture	X	X	
	Monitor	X	X	
	Motivate	X	X	X
	Facilitate Discourse & Communication	X		
	Volunteer		X	
Organizing				
	Organize Materials and Environment	X	X	
	Design Materials	X		
	Organize Timeliness and Schedule	X	X	
Instructing				
	Provide Instruction	X	X	X
	Assignment Help	X	X	X
	Collaboration			X

Table 1. Overlapping Roles and Functions in ACE Framework (Borup, et al. 2014)

Borup et al. (2014) added that the functions and activities can vary greatly across programs and depends in part on the learning model used. In an independent study context, research showed that students perceived that help from parents and teachers proximate to their location would improve the chances of successfully completing their online course. The research also revealed that students expected to rely on their parents most frequently for help in nearly every activity or interaction described in the ACE framework (Oviatt et al., 2016).

Teacher Role

Teacher engagement in the ACE framework includes efforts to design course materials and deadlines, provide instruction, and facilitate interaction (Borup et al., 2014). O'Leary and Quinlan (2007) noted that pervasive online teacher-student interaction must exist if a course is to be effective. The functions and activities of the teacher in an independent study course differ dramatically from that required in more collaborative, community-centered courses. Most teacher-student interactions designed in an independent study course are distant and asynchronous, and a "lack of actual teaching . . . occurs" (Barbour 2009, p. 13). Independent study course designs rely on learner-content interactions to replace much of the instructing activity performed by teachers in more collaborative courses (Moore, 1989). Students interact primarily with the course materials for these instructing activities (Barbour, 2009) though providers expect some instructing support from the parents (Hasler, Waters, & Leong, 2014; Stevens & Borup, 2015).

To facilitate interaction, teachers nurture, motivate, and mentor. These engagement activities can be performed by teachers or on-site facilitators (Borup, Graham, & Drysdale, 2014) and may "be performed by one or more individuals depending on the context and the instruction model" (Borup et al. 2014, p. 113).

Parent Role

The parent engagement in the ACE framework includes "facilitating interaction, organizing students' environment, and instructing students" (Borup et al., 2014). As mentioned previously, virtual schools expect the parent to assume some teacher responsibilities in an

independent study course, particularly facilitating interaction through mentoring students and providing instruction (Barbour, 2009; Hasler Waters & Leong, 2014). Hasler Waters & Leong (2014) described parents in online course settings as a "co-educator" (p. 33) or "learning coach" (p.34). The limited interactions between the online teacher and the student in an independent study course means that parents need to interact frequently in order to effectively fulfill their co-educator duties (Hasler Waters & Leong, 2014).

Parents are not content experts. In their review of parental engagement literature, Stevens and Borup (2015) cautioned that parents' provision of instructional support may be important but that they "typically lack the content expertise to directly instruct students on specific course material, especially in older grades" (p. 111). They further encouraged online programs to understand the "benefits and drawbacks of parental instructional support and to work with parents so that they understand and fulfill their roles in ways that facilitate—not inhibit—student learning" (p. 112).

In another study, Borup (2016) noted that teachers are supportive of the instructional activities (tutoring) provided by parents "if the parents had the knowledge and the skills to do so" (p. 77). Other researchers have cautioned that there is a continuum of parent involvement where parents can be so uninvolved that students are not supported, or so highly involved that students are not required to learn on their own (Hasler Waters & Leong, 2014; Hasler Waters, et al., 2014). Schools and teachers must design courses which allow parents to adequately perform appropriate co-educator functions while also recognizing and facilitating those functions that require the teacher's expertise (Hasler Waters, 2012). Cavanaugh et al. (2009) suggested that virtual schools who require parent involvement must have school policies requiring communication between the school and the parent. Hasler Waters et al. (2014) suggested that virtual schools should provide training and supports for parents as facilitators, instructors, motivators and articulate communication guidelines to support parental engagement. They noted that research presently does not "clearly . . . define variables associated with parental involvement in K-12 online learning" (Hasler Waters et al., 2014, p. 318) and that "studies . . . hint at how parents might fill in a much needed gap when teachers are not present" (p. 320).

Virtual schools respond to the expectation of parental involvement to mentor students by developing parent mentoring guides (Michigan Virtual University, 2016a; OVA, 2015) and parental contracts (FLVS, 2016). These materials explain school policies and parent support expectations so that they adequately fill the gap identified by Hasler Waters et al. (2014).

Peer Role

Peer engagement in the ACE framework is expressed through collaboration that provides instructional and motivational support. Parent and teacher roles overlap and are present in online courses regardless of format but collaborative peer learning interactions are less frequently designed into self-paced courses (Gill et al., 2015). Required peer collaborations negatively impact the flexibility students are seeking when they enroll in an independent study course (Anderson, 2008) but are viewed as an important best practice for online courses (Ferdig, Cavanaugh, DiPietro, Black, & Dawson, 2009; iNACOL, 2011).

Students acting as peers are critical participants in collaborative, constructivist, community-centered courses (Kreijns, Kirschner, & Jochems, 2003). Student peers can provide instruction from their own knowledge (Gunawardena, Lowe, & Anderson, 1998) and also act to motivate other learners (Moore, 1989). Researchers reported that students appreciated engagement

with peers, believing that they these interactions were valuable to their learning (Borup et al., 2013a) and that they learned more when given the opportunity to teach other students through peer tutoring, peer review, and peer feedback and assessment (Corrigan & Graciun, 2012; Garrett Dikkers, Whiteside, & Lewis, 2013). Research also showed a positive correlation between learner-learner interactions and course outcomes (Borup et al., 2013a). The lack of peer interactions intentionally designed into independent study courses prevents students from deriving many of the benefits associated with peer engagement in the research. Oviatt et al. (2016) found that students do not perceive as much value in peer interactions as they do parent and teacher interactions, but may interact if peer interactions are suggested in the course design and peers are available to them locally.

These three ACE framework roles external to the student help adolescent students engage and persist in an online course. This research was intended to identify the degree to which these three roles were evident in the experience of online independent study students. Understanding whether students received help, who helped them, and the proximity of that help to the student has important implications for the design of independent study courses to improve student success.

Methods

The researchers used a mixed methods design, combining both quantitative and qualitative data sources with a goal to create a study whose "strength . . . is greater than either qualitative or quantitative research" (Creswell, 2009, p. 4). The specific approach was a survey and phenomenological "sequential explanatory design" (Cresswell, Plano Clark, Gutmann, & Hanson, 2003) where quantitative survey data were collected and then follow-up, qualitative, semi-structured interviews were conducted to triangulate survey data for accuracy and to better understand students' lived experiences curating and utilizing a proximate support community.

Setting and Participants

The non-random voluntary sample for this study consisted of adolescent students who completed an online independent study high school course offered through the distance education program of a large university in the western United States. The program offers courses in an instructor-led format requiring synchronous interactions as well as an independent, self-paced, student-led format in which synchronous interactions are available but not required. During the data collection period, emails were sent to all students who completed an independent study version of a high school course inviting them to participate in an online survey and offered an incentive for their participation. When a student completed the survey, they were offered an additional incentive in order to recruit volunteers for follow-up interviews. Detailed sample information and response rates are reported in the findings below.

Instrumentation

The data collection instruments included a self-report survey and a script prepared for semi-structured interviews.

Self-report survey instrument. Study participants completed an online self-report survey that asked whether they participated in activities described in the ACE framework (Borup et al., 2014). The survey was adapted from the instrument developed for a study of student perceptions of the value of participation in a proximate community of engagement (Oviatt et al., 2016). However, certain teacher-student interactions from the ACE framework, such as "ask questions"

or "draw attention to certain concepts," (Borup et al., 2014, p. 116) are less observable in an independent study course and were therefore excluded from the survey. Other activities and interactions suggested in the ACE framework, such as the parent role activity of "help[ing the student] develop . . . social and behavioral skills" (Borup et al., 2014, p. 118), were judged too difficult to operationalize or observe and were also excluded from the survey. The resulting instrument included 18 items intended to measure whether the student participated with a proximate community in one of the ACE framework activities.

Once the instrument was prepared, two separate steps were taken to assure the researchers that the survey items accurately reflected the presence of the underlying interactions or activities the instrument was intended to measure. The first was an expert review by the lead developer of the ACE framework, who suggested changes for clarity. The second was the administration of the instrument using a think-aloud protocol (Ericsson & Simon, 1984; Fonteyn, Kuipers, & Grobe, 1993) to a student enrolling in an online course at the offices of the course provider. These two reviews improved survey clarity and provided assurance that the instrument could be relied upon to provide evidence of the targeted activity or interaction.

Qualitative interview script (triangulation). The intent of this study was to identify actual student engagement with a PCE. The literature suggests that parents and students do not always perceive their interactions the same way (Borup et al., 2013b). The interviews were intended to confirm the reported interactions. The interview script was derived from the survey instrument, one interview question per survey item. After training, teaching assistants and tutors from the course provider conducted the interviews.

Data Analysis

The data analysis plan is outlined in Table 2. The calculations and qualitative analysis approach are explained below.

Quantitative survey analysis. We calculated descriptive statistics for each survey item to measure the frequencies of help received. We further analyzed the data to identify differences between credit-recovery (CR) and non-credit-recovery (NCR) students. The variables for comparison were categorical (i.e. *Yes* or *No*; *Teacher, Parent, Peer* or *Other*; *Local, Distant* or *Other*). We performed a Fisher's Exact test calculation in the categorical variables of *Yes* or *No* (2x2 = CR or NCR, Yes or No) to analyze the actual use of the support community. Chi-square statistic calculations were used to compare the distributions of those with whom a student interacted between the CR and NCR groups. These calculations were 2x4 (Cr or NCR x Role [T*eacher, Parent, Peer, Other*]) and 2x3 (CR or NCR x Location [L*ocal, Distant, Other*]). Results were considered significant at the .05 level.

Questions	Data Collection Method	Analysis Method
1, 2	Survey items 9-25 ask about student participation in a specific activity interacting with a member of a proximate community and the person(s) with whom they interacted.	Descriptive statistics/frequencies
3	Survey items 6-8 to categorize the student into the CR or NCR group for analysis and compare data for items 9-25 grouped by student demographic strata.	Calculate Chi-Square statistics to identify significant differences between CR & NCR group responses.
1-3	Semi-structured interview of students and a parent	Independent rater review of responses to confirm survey answer. A follow-up iterative process of coding the responses to identify key themes, similarities, and differences across the data (Glaser, 1965; Ezzy, 2002).

Table 2. Plan for Data Collection and Analysis Methods for Study of ACE Framework (Completed)

Qualitative interview analysis. Follow-up interviews were conducted with student/parent pairs in an effort to triangulate the survey responses through interviews. The interviewer used the student's survey responses and modified the interview questions to confirm the student's response. Interview answers were recorded, transcribed, and entered into an Excel spreadsheet. The lead author and two members of the research department of the course provider independently evaluated the interview transcripts. When a student and/or parent interview response indicated that the student's survey response was accurate, the response was considered confirmed. Where a student or parent response to the interviewer indicated that the student's survey response was not accurate, the response was considered in conflict. These three independent ratings were then compared for reliability. The same three independent raters then attempted to analyze the interview responses using constant comparative coding (Glaser, 1965; Ezzy, 2002) to identify common themes or patterns emerging from the interview transcripts regarding the nature of interactions with the different members of the support community.

Results

The course provider in this study provides supplemental online courses and generally does not provide a full-time option for high school students. The supplemental nature of the relationship has, in the past, resulted in minimal response rates when the provider has attempted to collect data from students and parents after course completion. This pattern was observed in the low response rates experienced in this study, particularly the response to interview requests.

Survey and Interview Responses

A total of 7,148 emails were sent to students who completed an independent study course during the two periods of data collection. A total of 1,264 students clicked through the link to begin the online survey. Of those students, 1,088 actually completed the survey, a response rate of 15.2%. The survey data were reviewed and surveys which were not substantially completed were removed from the data set. We considered a survey substantially complete if the student left two or fewer

questions unanswered. A total of 1,055 surveys were considered substantially complete and comprised the data set for our analysis. The number of responses included in the data set varied from 1,046 to 1,055 for the different survey items (see Table 3).

Category	Item #	Survey Item ("Did someone …")	n	Yes n	Yes %	No n	No %
Instructing interactions	10	Review the policies of the online school and course with you at beginning of course?	1,054	627	59.5%	427	40.5%
	15	Explain course readings and materials when you had questions?	1,052	511	48.6%	541	51.4%
	16	Help you with questions about assignments, papers, quizzes, etc.?	1,052	420	39.9%	632	60.1%
	22	Help you learn how to self-regulate and learn in an online course?	1,046	297	28.4%	749	71.6%
	11	Set aside a regular time to meet with you?	1,053	291	27.6%	762	72.4%
	18	Teach you how to use the technology and resolve technical problems?	1,051	267	25.4%	784	74.6%
	17	Talk to the provider or online teacher on your behalf?	1,050	241	23.0%	809	77.0%
	23	Show you how to search online, and in other library and community resources?	1,051	194	18.5%	857	81.5%
	25	Taking the same subject or course collaboratively study with you as you completed the course?	1,049	133	12.7%	916	87.3%
Organizing and facilitating interactions	9	Provide a designated place of study and access to technology and materials?	1,055	805	76.3%	250	23.7%
	13	Help you set specific goals and deadlines?	1,055	456	43.2%	599	56.8%
	12	Help you organize and plan your time and create a regular schedule to work on the course?	1,052	401	38.1%	651	61.9%
	24	Arrange contacts with student peers for study and collaboration?	1,049	64	6.1%	985	93.9%
Monitoring and motivating interactions	19	Encourage and praise you for staying engaged in the course?	1,049	679	64.7%	370	35.3%
	14	Check on your progress and remind you to keep working and stay on schedule?	1,055	656	62.2%	399	37.8%
	20	Encourage you to keep working when you were feeling unsuccessful?	1,046	607	58.0%	439	42.0%
	21	Regularly check your grades and provide praise and encouragement as needed?	1,049	516	49.2%	533	50.8%

Table 3. Reported Independent Study Student ACE Framework Interactions with Support Community

A total of 128 student/parent pairs indicated an initial willingness to participate in a follow-up interview. The provider research team analyzed the quantitative survey responses to identify a purposeful sample from those willing participants which would reflect the overall mix of different survey answers. A total of 57 student/parent pairs were invited to participate in an interview of which nine student/parent pairs ultimately agreed to be interviewed.

The quantitative and qualitative findings are reported in the narrative for each of the research questions that follow. Any names used are pseudonyms and no personally identifiable information was provided to the researchers.

Research Question #1: ACE Framework Elements Used

Students completing a course were asked if they received help from others acting in the roles described in the ACE framework. The analysis that follows is organized by the three primary functions served by those acting in these roles in the ACE framework: instructing activities, organizing and facilitating activities, and monitoring and motivating activities. These three primary functions align with the facilitator roles described in the literature (Authors, 2014; Borup et al., 2014) and align with the report of an earlier PCE study (Authors, 2016). Peer interactions are an important element in the ACE community and occur as students participate in instructing activities (collaborate to share previous knowledge and co-construct meaning) and motivating activities (provide encouragement and stimulate engagement). Collaborative peer interactions were categorized as an instructing activity for these findings.

Table 3 reports the survey responses for each item in the survey organized by the three functional categories. The data are sorted by the percentage of *yes* responses to the survey items in descending order. Items where greater than 50% of the students answered *yes* (they received help) were considered *valued* by the students. Items where students reported that they had been helped in 40% - 50% of the responses were considered *moderately valued*. Those items where less than 40% of the students reported that they had received help were considered of *limited value* to the students.

Instructing activities. Only one instructing activity was considered valued by the students. Just under 60% of the students reported interacting with someone who reviewed the policies of the online school and course at the beginning of the course. Two instructing activities were classified as moderately valued. Those activities were receiving help from someone who explained course materials when the student had questions (49%), and receiving help from someone who answered their questions about assignments, papers, and quizzes (40%). The least valued instructing activities related to online and non-online search help (19%) and collaboration with another student in the course (13%). Qualitative data suggests that the students did not seek help with searches because they were confident in their own abilities. One student, Latisha, reported that interactions intended to help her search for information online or in other resources "would not have been helpful" because "she knew how to search on Google and go to the library." Another student, Kathy, said, "I didn't feel like I really needed to learn how to Google."

Students also reported that they did not participate in peer collaboration because they expected to work independently and preferred independence when choosing to enroll in the course. Wanda, a mother of a student, said, "I much prefer the way that [course provider] does it where you sign up, you either do it or you don't. … Both of us [student and parent] prefer the independent part of the independent study." Alex, Wanda's child, said, "nobody helped me but I preferred that." Even though the students did not collaborate with peers, when asked if they thought that

peer collaboration would have been helpful, students said that there might be value in "hear[ing another student's] view and what they had to say on the subject" or that a peer "might have insight that I don't." These responses suggest that the students understood that peer interactions could have assisted their learning.

Organizing and facilitating activities. Students reported that they were provided a designated place of study and access to needed technology and materials in 76% of the responses. This was the only organizing and facilitating activity categorized as valued. The frequency was borne out in the interviews where eight of the nine students reported that they had received such help. For one student, "help" included parents who "made sure that I got a computer that had capabilities to get me on the internet and stuff" and a counselor who provided an "empty English storage closet" so that the student could "have a quiet space and do some of the online interview things."

Interactions helping the student to set specific goals and deadlines seemed to be moderately valued. Students reported this type of help in 43% of the survey responses. Eight of the nine students interviewed reported receiving help with these activities, including parents or counselors who sat down with them at the beginning of the course when they were falling behind. As one student noted, "my mom just kept badgering me until I finished it."

The other two organizing and facilitating activities (help with planning time and creating a regular schedule for course work (38%) and arranging contacts with student peers (6%) were least valued by the students. Five of the nine students interviewed received help planning a regular schedule. One of the students who did not receive such help told the interviewer "I was more behind than I would have liked. But if I was told that I should make it a daily class, and make it a priority then I probably would have." None of the interviewed students reported help to make contacts with another student for collaboration or study but indicated that they believed peer collaboration would have helped them "understand a concept I'm struggling with" or would have helped them "better understand and remember the things I studied" although students did not believe that such collaboration was necessary.

Monitoring and motivating activities. Monitoring and motivating activities were most frequently utilized by the students. Three of the four activities appeared to be valued by students: encouragement and praise for engagement (65%), checks on progress and reminders to stay on schedule (62%), and encouragement to keep working when students felt unsuccessful (58%). The fourth interaction in this category, regular checks on grades and providing praise and encouragement as needed (49%), was at the high end of the moderately valued classification. These monitoring and motivating activities tend to be personal and interactive and are generally more available to students from local resources, particularly parents, teachers, and counselors. This may account for the higher rates of utilization of a PCE for the monitoring and motivating activities.

Common patterns in interview responses included interactions where parents or school personnel regularly asked the student about their progress and preparation. Chris told the interviewer, "my parents and . . . teacher at school just regularly checked in on me to make sure I was staying on top of things." Kathy reported an incident when her "principal pulled me off to the side one day during lunch and like asked me where I was in the course. I said 'still lesson one' and he said, 'Oh, we can't see that on our side.' I said, 'yeah, it will be done tonight.'" Jane said that her mother checked on her preparations and offered encouragement and support. She said, "when I would be taking self-check, if I didn't have a good enough grade she would have me go back and

re-take it until I had a grade I was happy with." When preparing for her final exam, Jane said, "I was a little nervous about it so she sat down with me and helped me study for it and feel more comfortable about taking the exam." These interview responses indicate that the concerned engagement and interaction by the student's parents and school personnel provided encouragement and motivation for the student to persist and increased their engagement.

Summary. Students in this study selected a self-paced, student-led course with minimal required interactions. Students expected to work independently which is reflected in the lower levels of reported interactions in instructing and organizing/facilitating activities. The activities most valued by students were those related to course content (explanations of course policies, content and assignments), place and technology resources, and motivation and engagement through encouragement and monitoring student performance.

Research Question #2: Who Interacted with the Student?

Students responding that they had received help through an ACE activity were prompted with a list of people with whom they may have interacted. Local options included parents and other family members, teachers or counselors at their local school, students at their local school, and their friends. Distant options included teachers and tutors from the course provider and distant student peers enrolled in the online course. Students were asked to select all those with whom they interacted. Family members were included in the parent role. Teachers, counselors, and TA/tutors were included in the teacher role. Students were also given the option to identify an "other" individual with whom they interacted. When a student chose the "other" option, they were asked to describe that individual. These "other" resources were analyzed and categorized in the parent, teacher, or peer role or left in the "other" category as appropriate. Table 4 reports the roles from the ACE framework with which the students reported interactions.

Category	Item #	Survey Item ("Did someone …")	n	Teacher Role		Parent Role		Peer Role		Other
				Local	*Online*	*Parent*	*Other Family*	*Local*	*Online*	
Instructing interactions	**10**	Review the policies of the online school and course with you at beginning of course?	**736**	**29.9%**		**66.6%**		**3.0%**		**0.5%**
				26.8%	*3.1%*	*61.8%*	*4.8%*	*1.9%*	*1.1%*	
	15	Explain course readings and materials when you had questions?	**642**	**22.6%**		**64.0%**		**11.1%**		**2.3%**
				10.9%	*11.7%*	*55.9%*	*10.1%*	*7.8%*	*3.3%*	
	16	Help you with questions about assignments, papers, quizzes, etc.?	**529**	**17.8%**		**66.4%**		**13.0%**		**2.8%**
				9.8%	*7.9%*	*55.4%*	*11.0%*	*8.5%*	*4.5%*	
	22	Help you learn how to self-regulate and learn in an online course?	**360**	**18.9%**		**76.1%**		**4.4%**		**0.6%**
				12.2%	*6.7%*	*65.6%*	*10.6%*	*3.8%*	*0.6%*	
	11	Set aside a regular time to meet with you?	**338**	**31.4%**		**62.1%**		**3.8%**		**2.7%**
				28.1%	*3.3%*	*58.0%*	*4.1%*	*3.0%*	*0.8%*	
	18	Teach you how to use the technology and resolve technical problems?	**300**	**30.0%**		**64.7%**		**4.7%**		**0.7%**
				10.7%	*19.3%*	*59.0%*	*5.7%*	*3.7%*	*1.0%*	
	17	Talk to the provider or online teacher on your behalf?	**237**	**27.0%**		**70.9%**		**1.7%**		**0.4%**
				20.3%	*6.7%*	*69.6%*	*1.3%*	*1.7%*	*0.0%*	
	23	Show you how to search online, and in other library and community resources?	**225**	**25.8%**		**68.4%**		**4.9%**		**0.9%**
				17.8%	*8.0%*	*58.7%*	*9.7%*	*4.0%*	*0.9%*	
	25	Taking the same subject or course collaboratively study with you as you completed the course?	**164**	**NA**		**NA**		**99.4%**		**0.6%**
				NA	*NA*	*NA*	*NA*	*72.0%*	*27.4%*	

Table 4. Reported Independent Study Student Interactions by ACE Framework Roles

Category	Item #	Survey Item ("Did someone …")	n	Teacher Role		Parent Role		Peer Role		Other
				Local	*Online*	*Parent*	*Other Family*	*Local*	*Online*	
Organizing and facilitating interactions	**9**	Provide a designated place of study and access to technology and materials?	**1,073**	**23.6%**		**70.6%**		**5.5%**		**0.3%**
				21.8%	*1.8%*	*65.2%*	*5.4%*	*3.7%*	*1.8%*	
	13	Help you set specific goals and deadlines?	**529**	**22.7%**		**73.9%**		**2.8%**		**0.6%**
				19.5%	*3.2%*	*67.7%*	*6.2%*	*2.3%*	*0.5%*	
	12	Help you organize and plan your time and create a regular schedule to work on the course?	**463**	**20.3%**		**74.9%**		**3.9%**		**0.9%**
				18.1%	*2.2%*	*69.5%*	*5.4%*	*2.6%*	*1.3%*	
	24	Arrange contacts with student peers for study and collaboration?	**81**	**14.8%**		**42.0%**		**42.0%**		**1.2%**
				9.9%	*4.9%*	*35.8%*	*6.2%*	*28.4%*	*13.6%*	
Monitoring and motivating interactions	**19**	Encourage and praise you for staying engaged in the course?	**913**	**16.2%**		**77.6%**		**5.8%**		**0.4%**
				13.5%	*2.7%*	*68.6%*	*9.0%*	*4.8%*	*1.0%*	
	14	Check on your progress and remind you to keep working and stay on schedule?	**780**	**18.2%**		**78.2%**		**2.6%**		**1.0%**
				16.4%	*1.8%*	*72.8%*	*5.4%*	*1.6%*	*1.0%*	
	20	Encourage you to keep working when you were feeling unsuccessful?	**809**	**14.0%**		**78.6%**		**7.2%**		**0.2%**
				11.4%	*2.6%*	*69.0%*	*9.6%*	*5.9%*	*1.3%*	
	21	Regularly check your grades and provide praise and encouragement as needed?	**606**	**13.4%**		**83.8%**		**2.0%**		**0.8%**
				11.6%	*1.8%*	*77.7%*	*6.1%*	*1.5%*	*0.5%*	

Table 4 (cont). Reported Independent Study Student Interactions by ACE Framework Roles

Overall, students reported that they received help from the parent role more than twice as frequently as they received help from those acting in teacher or peer roles. Two survey items were exceptions to this finding. The atypical items measured peer-related activities described in the ACE framework. Students who received help arranging contacts with other students (an organizing and facilitating function) reported that help came equally from parents (42%) and peers (42%). Those students reporting that they had collaborated with another student (an instructing function) identified a peer student as the person with whom they interacted in 99.4% of responses.

Instructing activities. The instructing activities in the ACE framework are those where parents most often assume the traditional teacher role: provide instruction, answer content and course questions, help with learning and study skills, and monitor student progress.

ACE roles providing support in instructing activities. Those in the parent role interacted most frequently with students for every instructing activity in the survey except the activity of peer

collaboration. Parents were identified in approximately two-thirds of the survey responses for non-peer instructing activities. Parents were engaged to help the student learn self-regulation skills including how to learn in an online course (76%). Parents also spoke to the online school or instructor on behalf of the student (71%), and showed the student how to search resources (68%).

One student said that her parent helped her learn how to learn in the online course by providing

> A head start with what I should focus on, then the rest of the time I was supposed to work on it on my own and figure out what works best for me and eventually I got the hang of what worked and what didn't work and how often I needed to work to progress at the level I needed.

Another student said that her parent "used the online chat" and "instant messaged the program [provider]" when there were questions about things that were unclear.

The instructing activities with the highest percentage of support from teachers included routine meetings with the student (31%), technical support (30%), and course or school policy review (30%). Kris reported that "every week we had a check-in of how far I've gone, what lessons I need to do . . . to meet these [course] checkpoints." Christopher said that he met "every three weeks . . . with the teacher and discussed how things were going."

Location of individuals providing help. Table 5 reports the location of the person who provided help to students.

The majority of students identified individuals acting in the parent role (a local resource) and teacher role (a local or distant resource) as the source of help for instructing activities. Students reported receiving help from a local teacher or counselor at more than twice the frequency of help received from the distant online instructor. The course-specific interactions of help with technology support (19% distant vs 11% local) and answering questions about the course readings and materials (12% distant, 11% local) were the only items where the online instructor helped more than a local teacher. One instructing activity, collaborating with another student, is peer-specific. Students who collaborated with another student identified a local student peer in 73% of the responses with 27% identifying a distant student. This finding suggests that some students were enrolled in the course with local peers who formed a proximate community to support one another.

Organizing and facilitating activities. One of the four facilitating and organizing activities occurs when peer interactions are arranged. Students who received this help reported it from parents and peers equally (42% of responses for each). Students identified a teacher in 15% of responses for this activity. Students relied more on parents and local teachers for help with other organizing and facilitating activities. These activities involve organizing and planning place, technology and other resources, or activity and time management. Students reported receiving this help from parents and teachers in more than 94% of responses for each of these three organizing activities. Parents provided at least 71% of the help for each item and students reported help from local resources in at least 96% of their responses.

Category	Item #	Survey Item ("I will be more successful if someone …")	n	Local			Distance		Other
				Teacher	*Parent Family*	*Student Peer*	*Teacher*	*Student Peer*	
Instructing Interactions	**10**	Review the policies of the online school and course with you at beginning of course?	736		**95.3%**		**4.2%**		**0.5%**
				26.8%	*66.6%*	*1.9%*	*3.1%*	*1.1%*	
	15	Explain course readings and materials when you had questions?	642		**82.7%**		**15.0%**		**2.3%**
				10.9%	*64.0%*	*7.8%*	*11.7%*	*3.3%*	
	16	Help you with questions about assignments, papers, quizzes, etc.?	529		**84.7%**		**12.5%**		**2.8%**
				9.8%	*66.4%*	*8.5%*	*7.9%*	*4.5%*	
	22	Help you learn how to self-regulate and learn in an online course?	360		**92.2%**		**7.2%**		**0.6%**
				12.2%	*76.1%*	*3.9%*	*6.7%*	*0.5%*	
	11	Set aside a regular time to meet with you?	338		**93.2%**		**4.1%**		**2.7%**
				28.1%	*62.1%*	*3.0%*	*3.3%*	*0.9%*	
	18	Teach you how to use the technology and resolve technical problems?	300		**79.0%**		**20.3%**		**0.7%**
				10.7%	*64.6%*	*3.7%*	*19.3%*	*1.0%*	
	17	Talk to the provider or online teacher on your behalf?	237		**92.8%**		**6.8%**		**0.4%**
				20.3%	*70.9%*	*1.7%*	*6.8%*	*0.0%*	
	23	Show you how to search online, and in other library and community resources?	225		**90.2%**		**8.9%**		**0.9%**
				17.8%	*68.4%*	*4.0%*	*8.0%*	*0.9%*	
	25	Taking the same subject or course collaboratively study with you as you completed the course?	164		**72.0%**		**27.4%**		**0.6%**
				NA	*NA*	*72.0%*	*NA*	*27.4%*	
Organizing and Facilitating Interactions	**9**	Provide a designated place of study and access to technology and materials?	1,073		**96.1%**		**3.6%**		**0.3%**
				21.8%	*70.6%*	*3.7%*	*1.8%*		
	13	Help you set specific goals and deadlines?	529		**95.7%**		**3.8%**		**0.6%**
				19.5%	*73.9%*	*2.3%*	*3.2%*	*0.6%*	
	12	Help you organize and plan your time and create a regular schedule?	463		**95.7%**		**3.5%**		**0.9%**
				18.1%	*74.9%*	*2.6%*	*2.2%*	*1.3%*	
	24	Arrange contacts with student peers for study and collaboration?	81		**80.2%**		**18.5%**		**1.2%**
				9.9%	*42.0%*	*28.4%*	*4.9%*	*13.6%*	

Table 5. Location of Student Identified Resource Accessed for Support

Category	Item #	Survey Item ("I will be more successful if someone …")	n	Local			Distance		Other
				Teacher	*Parent Family*	*Student Peer*	*Teacher*	*Student Peer*	
Monitoring and Motivating Interactions	**19**	Encourage and praise you for staying engaged in the course?	913		**95.8%**		**3.7%**		**0.4%**
				13.5%	*77.5%*	*4.8%*	*2.7%*	*1.0%*	
	14	Check on your progress and remind you to keep working and stay on schedule?	780		**96.2%**		**2.8%**		**1.0%**
				16.4%	*78.2%*	*1.5%*	*1.8%*	*1.0%*	
	20	Encourage you to keep working when you were feeling unsuccessful?	809		**95.9%**		**3.8%**		**0.2%**
				11.4%	*78.6%*	*5.9%*	*2.6%*	*1.2%*	
	21	Regularly check your grades and provide praise and encouragement as needed?	606		**96.9%**		**2.3%**		**0.8%**
				11.6%	*83.8%*	*1.5%*	*1.8%*	*0.5%*	

Table 5 (cont). Location of Student Identified Resource Accessed for Support

Monitoring and motivating activities. These activities offer praise and encouragement, and monitor student progress. Offering encouragement and immediate feedback are important activities that promote student engagement (de la Varre, Keane, & Irvin, 2011) and are effective when provided through personal face-to-face communications (Harms, Niederhauser, Davis, Roblyer, & Gilbert, 2006). Students relied upon parents and teachers when helped in this category with at least 93% of students reporting help from parents and teachers for these four items. Approximately 96% of that help came from local individuals.

Interview responses indicated that students valued these personal interactions. One student said that he stayed engaged when, "my parents and that teacher at the school just regularly checked on to make sure I was staying on top of things." Another student said that "they [parents] would check my grades once a month . . . and if [they] noticed that my grades were down . . . but . . . [if I] didn't get on it soon enough then they would encourage me to keep working harder." Students reported that praise and encouragement were also important, especially when they felt discouraged and anxious about success in the course. One student said, "when I would get a good grade on something I would tell my parents and they'd be like 'good job.'" Another student said that she was discouraged about her grade towards the end of the course and concerned about the final, but her parents "helped me with studying tips and I was able to get it done and get the grade that I wanted."

Summary. Students received help with these activities from parents and local teachers. This finding aligns with research and provider expectations that support provided to distance learning students in online courses will largely come from parents acting in their co-educator role with course designs intended to replace the teacher with parent interactions (Barbour, 2009; Gill et al. 2015; Hasler Waters & Leong, 2014).

Research Question #3: Differences in Credit Recovery and Non-credit Recovery Students?

The third research question asked whether statistically significant differences existed between the responses of non-credit-recovery (NCR) students and those of credit recovery (CR)

students. The analysis investigated significant group differences in the help students received, the role with which students interacted, and the location of the individual(s) who helped.

The data set included 1,055 survey responses. Of the total responses, 70 were from CR students (6.6%). The literature identified credit recovery as the most prevalent reason students take supplemental courses (Glass, 2009; Watson & Gemin, 2008; Watson et al., 2014, Wicks, 2010) and reported ranges from 20% of enrollments in one large virtual school (Watson & Gemin, 2008) to 62% in another study (iNACOL, 2003). The observed proportion of CR students in this study (6.6%) is much lower than expected. This is consistent with another study in partnership with the same course provider (Oviatt et al., 2016). As with that study, the smaller proportion of CR students may be due to the difference in the student population attracted to this particular provider, the sampling criteria, or the times of the school year in which the data were collected. The difference in both studies "creates challenges with generalizing the findings to other independent study students and providers" (Oviatt et al., 2016, p. 354).

Statistical Calculations and Results

The survey included 18 items associated with the elements of the ACE framework. Because some of the expected cell values were less than five, a Fisher's Exact statistic was calculated comparing the frequency of reported student interactions by CR and NCR groups for each item. Chi-square statistics were calculated to identify significant differences between the groups in the help reported by activity or interaction, ACE role providing help, and the location of the person(s) with whom the student interacted (local or distant). Differences were considered significant at an alpha of .05.

The effect size (association) of the statistic was calculated using eta squared (η^2) for the Fisher's Exact test (frequency difference) and Cramer's V (φ_c) for the Chi-squared statistics reported for the differences in role and location. The effect sizes were interpreted for η^2 as small ($.0099 < \eta^2 < .0588$), medium ($.0588 < \eta^2 < .1379$), and large ($\eta^2 > .1379$) effect size (Cohen, 1969, p. 278-280). The effect sizes were interpreted for φ_c as small ($0.10 < \varphi_c < 0.30$), medium ($0.30 < \varphi_c < 0.50$), or large ($\varphi_c > 0.50$) effect size (Cohen, 1992, p. 157).

Differences in frequency of interactions. There was only one survey item with a significant difference between the two groups in reported interactions with others. That survey item asked whether students collaborated with another student during the course. NCR students reported collaborating with another student in 13.3% of their responses while CR students reported collaboration in only 4.3% of their responses. This difference was significant using the Fisher's Exact test ($p = .04$, $\eta^2 = .03$, a small effect). All other group differences were non-significant.

Differences in frequency of interaction by role. When students reported that they had interacted with another person they also reported the person(s) with whom they interacted by ACE framework role: teacher, parent, or peer. Chi-square statistics were calculated comparing the distribution of the roles (teacher, parent, peers) with whom the students interacted by group. The effect sizes were calculated using Cramer's V (φ_c). Two items on the survey revealed significant group differences in terms of the roles with which students interacted. All other group differences were non-significant. The two interactions or activities consisted of arranging contacts with other students and learning how to study in an online course.

Someone arranged contacts with other students. CR students receiving this help reported that 100% of that help came from a parent. NCR students received this help from a parent (40%),

a teacher (15%) and a peer or other resource (45%). The different distribution of the role providing help was significant ($\chi^2(3) = 85.7$, $p < .001$, $\varphi_c = .65$, a large effect).

Someone helped learn to self-regulate and study in an online course. CR students who received help reported receiving that help from a parent (73%) or a teacher (27%). NCR students reported receiving that help from a parent (76%), a teacher (18%) or a peer or other resource (6%). That difference in the distribution was significant ($\chi^2(3) = 7.9$, $p = .049$, $\varphi_c = .20$, a medium effect).

Differences in frequency of interaction by location. We derived the location of the person with whom the students interacted from role with whom the student interacted (see research question #2). Chi-square statistics were calculated to identify significant differences between the CR and NCR groups. The effect sizes were calculated using Cramer's V (φ_c). Three survey items demonstrated a significant difference in the response distribution. Differences between the groups for all other survey items were non-significant. The three items with significant differences included arranging contacts with other students, collaboration with other students, and help with questions about assignments, papers, and quizzes.

Someone arranged contacts with other students. CR students receiving this help identified a parent (local) in 100% of responses. NCR students reported received this help from a local resource (80%) or a distant or other resource (20%) in their responses. This difference in the location of the person providing help was significant ($\chi^2(2) = 22.2$, $p < .001$, $\varphi_c = .33$, a medium effect).

Collaborated with other students. CR students who collaborated with another student reported collaborating with a local student in 100% of their responses. NCR students reported collaboration with local students (71%) or distant students or other resources (29%). This difference in the location of help between the two groups was significant ($\chi^2(2) = 33.9$, $p < .001$, $\varphi_c = .41$, a medium effect).

Someone helped with questions about assignments, papers, quizzes, etc. CR students reported receiving help with this item from local resources (87%), distant resources (5%) or other resources (8%). NCR students reported receiving help from local resources (85%), distant resources (13%) and other resources (2%). The differences in the distribution of the responses between the two groups was significant ($\chi^2(2) = 7.2$, $p = .028$, $\varphi_c = .19$, a small effect).

Summary of statistical calculations and results. The minimal number of survey items with significant differences between the CR and NCR groups indicates PCE interactions were similar for both groups.

Validation of Survey Results through Interview

Three independent raters reviewed the survey responses to triangulate the survey results by determining whether the interview answers confirmed or conflicted with the student's survey response. There were 161 student and 39 parent responses in the interview transcripts pertinent to the analysis. Of the 200 total responses, 189 confirmed the student's survey response (94.5%) and 11 conflicted with the student's survey response (5.5%). Comparison of the independent rater evaluations of the confirm/conflict measurement found 100% rater agreement. The results triangulate the survey data and support survey validity.

The independent raters used elements of constant, comparative coding to further attempt to identify emerging themes and patterns from the interview transcripts (Glaser, 1965; Ezzy, 2002).

The paucity of rich information available in the survey transcripts made effective use of this qualitative analysis technique impractical and we were unable to identify meaningful themes and patterns. All three members of the analysis team independently noted this deficiency and agreed that future research would require better training of interviewers and more carefully conducted interviews to receive the desired awareness of the student experience with a PCE.

Discussion

This study revealed that students engaged the resources of a proximate community of engagement (PCE) when they completed an independent study course. This occurred without coaching or instruction at the beginning of the course. The survey and interview data showed that parents were students' primary source of help, aligning with co-educator expectations in the literature (Barbour, 2009; Gill, et al, 2015; Hasler Waters & Leong, 2014). Local teachers were the second most relied-upon resource who helped students.

The literature acknowledges this expectation for parental engagement in critical teaching responsibilities to provide educational support as mentors (or learning coaches), monitors, motivators, and enforcers (Chan, Wilkinson, Graham, Borup, & Skeen, 2011; Hasler Waters, 2012; Hasler Waters & Leong, 2014; Kanuka, 2008). Researchers have expressed concern about the "quality of the educational support that that parents give students" in online learning settings (Hasler Waters & Leong, 2014, p. 33). The findings in this study suggest that there may be a need to inform parents, local teachers, counselors, or other school personnel about their need to act as members of a PCE to support students.

Online course providers must give parents the information and tools they need to understand and act in their crucial teacher functions (Stevens & Borup, 2015) and researchers note that frequent teacher-parent communication is important (Cavanaugh et al., 2009). One interesting example of this importance was revealed in this study. Analysis of parents' interview responses indicate that the communicated expectations of the course provider concerning frequency of student activity, critical deadlines, and the nature of the LMS tools available were either inadequate or may have been ignored. Deficiencies in these communications and the quality of the educational support provided by the parents and other local school resources have implications for course design and research.

Implications for Practitioners

Weiner (2003) observed that structure was important to student success in online courses. Cavanaugh (2013) wrote that structured courses included "clear expectations, concrete deadlines with some flexibility, outlines of course requirements" (p. 175). Hasler Waters and Leong (2014) noted that parents may need training in their supportive roles if online schools are going to rely upon them as co-educators. Lack of training and communication clarity may affect the quality of the student's experience and learning achievement.

Student and parent confusion about course structure. Students in this study struggled to understand how to best manage their efforts in the course. This resulted from a lack of clarity concerning expectations and deadlines, and the capabilities of the LMS that support meeting those expectations. Interview responses showed that parents and students struggled to understand the course expectations and structure. One student said,

> It would be helpful if I was told in the beginning of the course, like, this should be an everyday thing. I didn't realize that until I was half way through and I was more behind than I would have liked. But if I was told that I should make it a daily class an make it a priority then I probably would have.

This same student's parent said, "It wasn't until the end of the course that we were able to really analyze the work expected and to adequately schedule time and internet access in order to complete the course." The parent went on to say that "the hard part . . . was to know if progress was adequate. . . neither of us were aware if progress was adequate at any point during the course." Another parent reported that the student got to the end of the course and was ready to take the final online but was told that the student could not take the final in that class without first obtaining clearance from the online instructor and that "in the end we, we had to actually put the final off two weeks."

The tragedy in these instances is that there were eager students and supportive and engaged parents, but poor communications and course structure did not allow parents to act effectively in their co-educator role. The lack of clear communications about available tools and course expectations at the beginning of the course meant that student and parent had to negotiate the course and learn from the experience rather than being prepared to perform as expected by the provider. Further research revealed that the course provider offers guidance on their website to inform parents and students about these expectations and tools. Designing these communications into course content in the first lesson would better inform students and parents. Making a review of these communications a graded assignment may draw appropriate attention to expectations and tools.

Providing adequate information regarding support expectations. Anderson (2008) observed that course providers often expect parents to provide support in the place of teachers. Several online schools provide parents helpful direction through webpages (eschool, n.d.; LANV, n.d.), handbooks (FLVS, 2016; OVA, 2015), and guidebooks (Michigan Virtual University, 2016a; 2016b). These tools are intended to support student success in online courses by helping parents better act in their roles as facilitators for their students. The Ohio Virtual Academy provides a "parent compact" outlining 10 specific expectations for parents (OVA, 2015, pp. 3-4). The Florida Virtual School (FLVS) "has the expectation that parents/guardians will be involved in their child's learning . . . and begin building strong teacher-student-parent relationships" (FLVS, p. 9. Parent or Legal Guardian section). FLVS also asks parents to monitor their student's learning gains and compliance with school policies regarding academic honesty. These publications are intended to help parents fulfill their roles. Practitioners should consider the importance of providing similar published guidance to parents and creating "contracts" that specify expectations. Designing a "discovery and agreement" process as an introductory activity in each course will draw attention to expectations and tools and, hence, promote student success.

Creating awareness of PCE advantages. Oviatt et al. (2016) found that students perceive value in help received from a PCE. This study found that students use the resources of a PCE during the course, but at much lower levels than that described in the earlier study. The differences in the findings of the two studies are described in Table 6.

Category	Item #	Survey Item ("Did someone …")	Perceived Help Needed[1] n	Perceived Help Needed[1] %	Actually Helped n	Actually Helped %
Instructing interactions	10	Review the policies of the online school and course with you at beginning of course?	1,009	65.6%	1,054	59.5%
	11	Set aside a regular time to meet with you?	1,007	66.5%	1,053	27.6%
	15	Explain course readings and materials when you had questions?	1,005	90.6%	1,052	48.6%
	16	Help you with questions about assignments, papers, quizzes, etc.?	1,005	83.9%	1,052	39.9%
	17	Talk to the provider or online teacher on your behalf?	1,006	60.5%	1,050	23.0%
	18	Teach you how to use the technology and resolve technical problems?	1,006	54.8%	1,051	25.4%
	22	Help you learn how to self-regulate and learn in an online course?	1,004	63.6%	1,046	28.4%
	23	Show you how to search online, and in other library and community resources?	1,008	54.8%	1,051	18.5%
	25	Taking the same subject or course collaboratively study with you as you completed the course?	1,006	50.9%	1,049	12.7%
Organizing and facilitating interactions	9	Provide a designated place of study and access to technology and materials?	1,007	86.8%	1,055	76.3%
	12	Help you organize and plan your time and create a regular schedule to work on the course?	1,008	70.1%	1,052	38.1%
	13	Help you set specific goals and deadlines?	1,004	73.6%	1,055	43.2%
	24	Arrange contacts with student peers for study and collaboration?	1,006	47.9%	1,049	6.1%
Monitoring and motivating interactions	14	Check on your progress and remind you to keep working and stay on schedule?	1,005	75.7%	1,055	62.2%
	19	Encourage and praise you for staying engaged in the course?	1,006	68.8%	1,049	64.7%
	20	Encourage you to keep working when you were feeling unsuccessful?	1,005	75.3%	1,046	58.0%
	21	Regularly check your grades and provide praise and encouragement as needed?	1,006	67.9%	1,049	49.2%

[1] From Oviatt et al. (2016)

Table 6. Reported Independent Study Student Perceptions and Use of Proximate Community Support

These two studies were conducted with the same course provider. The samples were independent and sampled at different points in the course lifecycle (upon enrollment and upon completion). It is likely that a strong suggestion-bias is present in the earlier study which increased the percentage of students perceiving such interactions would be valuable. Students in the present study did not have the benefit of similar questions at the beginning of the course. The earlier study suggests that such questions at the beginning of the course could influence curation of a PCE for helpful interactions. Instructional designers could increase the quantity and frequency of these helping interactions with a PCE through an introductory curating activity. Referencing an online resource such as the Student Success Toolbox (2016) is one way that students can be encouraged

identify resources available to curate a PCE. Making that PCE discovery and curation process a graded assignment early in the course would help students plan, curate, and participate with a PCE as they complete the course.

Implications for Researchers

Potter (1999) observed that students may be isolated but are never alone. This study revealed that students access a PCE even when they are not instructed to do so. Parents, other family members, teachers, and counselors naturally make themselves available to students enrolled in independent study courses. Investigators can provide research-based data on the structure, nature, frequency, and duration of interactions with a PCE that are most beneficial to students' success. These studies could correlate (a) the specific interactions and student engagement and learning achievement (b) the frequency of interactions and learning achievement, (c) the specific role providing help and learning achievement, and so on. Studies could also evaluate the impact of orientation activities, graded curation assignments, and published support materials on the formation and functioning of a PCE.

These PCE studies investigated student samples that were independent. Research replicating these earlier studies using a dependent sample consisting of the same students at the beginning and completion of a course will reveal the impact of suggesting available help effects actual engagement with a PCE, supporting the value of curation activities in early lessons.

Limitations and Future Research

Several variables important to the circumstances of the student and the support provided were not included in this study. Among the more important are the socioeconomic status (SES) of the student and parent, and the educational attainment of the parent. The absence of these variables limits the transferability of these findings and provides a rich area for future research of the correlation of these variables to student engagement with a PCE and parental engagement as part of the PCE. The percentage of CR students in this study was much lower than that reported in other studies and may also affect transferability to other students and providers. Phenomenological studies can be impacted by "too narrow and homogenous a sample [which] may make judgments about transferability and links to other . . . groups more difficult" (Pringle, Drummond, McLafferty, & Hendry, 2010). Research conducted with other providers could validate and improve the strengths of the findings of this study. Additional studies correlating the nature, frequency, and structure of PCE communities and interactions with student outcomes will add to the knowledge of how to best create and interact with a PCE.

Conclusion

The research on student use of a PCE shows that students perceive that help from that community would be important to their course success (Oviatt et al., 2016) and that students naturally use these community resources without prompting or coaching (this study). Effective independent study course designs inform students about the interactions that will help them as they complete the course, and then coach them in the curation of a PCE to provide that support. Students who effectively create and interact with a PCE may derive the learning benefits associated with collaborative communities while also experiencing the flexibility prompting their enrollment in an independent study course.

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