

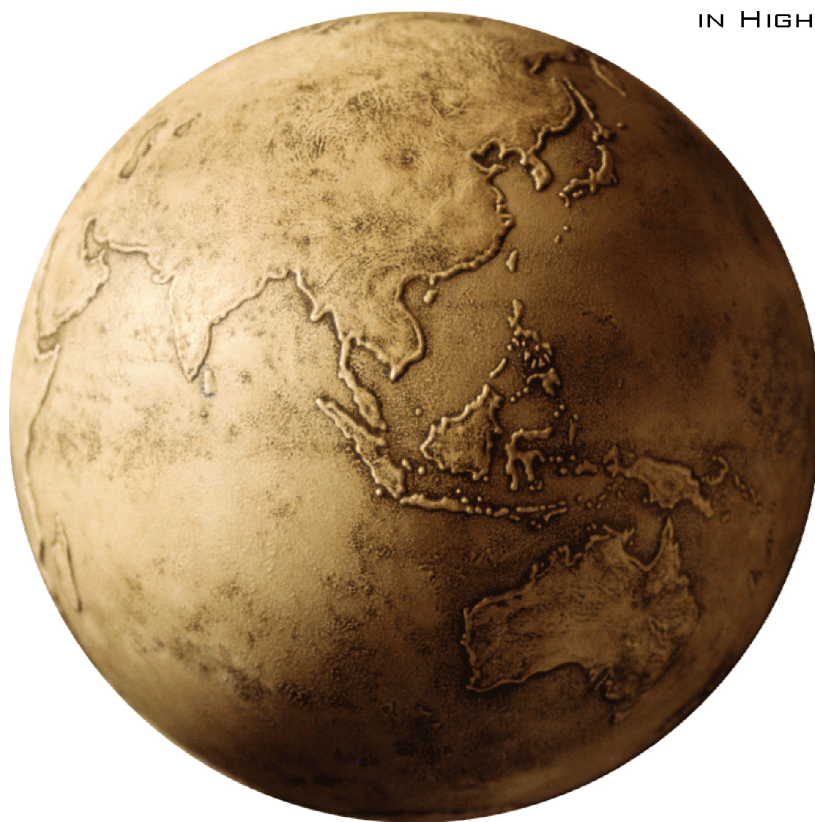
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IN HIGHER EDUCATION



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The International Journal of Teaching and Learning in Higher Education (ISSN 1812-9129) provides a forum for the dissemination of knowledge focused on the improvement of higher education across all content areas and delivery domains. The audience of the IJTLHE includes higher education faculty, staff, administrators, researchers, and students who are interested in improving post-secondary instruction. The IJTLHE is distributed electronically to maximize its availability to diverse academic populations, both nationally and internationally.

Submissions

The focus of the International Journal of Teaching and Learning in Higher Education is broad and includes all aspects of higher education pedagogy, but it focuses specifically on improving higher education pedagogy across all content areas, educational institutions, and levels of instructional expertise. Manuscripts submitted should be based on a

sound theoretical foundation and appeal to a wide higher education audience. Manuscripts of a theoretical, practical, or empirical nature are welcome and manuscripts that address innovative pedagogy are especially encouraged.

All submissions to IJTLHE must be made online through the Online Submission Form. In addition, all manuscripts should be submitted in English and in Microsoft Word format. The following Submission Guidelines pertain to all manuscript types, that is, Research Articles, Instructional Articles, and Review Articles. Ultimately, authors should follow the guidelines set forth in the most recent edition of the Publication Manual of the American Psychological Association (APA).

Review Process

Following a brief editorial review, each manuscript will be blind reviewed by two members of the Review Board. The review process will take approximately 90 days. At the end of the 90-day review process authors will be notified as to the status of their manuscripts - accept, revise and resubmit, or reject - and will receive substantive feedback from the reviewers. Manuscript authors are responsible for obtaining copyright permissions for any copyrighted materials included within manuscripts.

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Volume 31 • Number 1 • 2019

Research Articles

- Can L2 Less-proficient Adult Learners Become Skilled Readers? 1-10
Mei-Hui Chen
- Peer-supported Writing in Graduate Research Courses: A Mixed Methods Assessment 11-20
Michael Lyman and Christopher Keyes
- Making the Most of Online Discussion: A Retrospective Analysis 21-31
Tracy W. Smith
- Differentiated Impact of Flipped Instruction: When Would Flipped Instruction Work or Falter? 32-49
Wenliang He, Amanda Holton, Hengrui Gu, Mark Warschauer, and George Farkas
- Student Perceptions of the Influence of Choice, Ownership, and Voice in Learning and the Learning Environment 50-62
Tilisa Thibodeaux, Dwayne Harapnuik, and Cynthia Cummings
- Beyond the Click: Rethinking Assessment of an Adult Professional Development MOOC 63-72
Donna Ziegenfuss, Cynthia Furse, Edward Buendia, and Eliot Sykes
- Science Students' Responses to an Oral Communication Skills Development Initiative: Attitude and Motivation 73-85
Ingrid McLaren
- Students' Academic Self-efficacy in International Master's Degree Programs in Finnish Universities 86-95
Kalypso Filippou
- Evaluating Graduate Student Out-of-Class Learning: The Professional Field Trip 96-107
Rebecca M. Achen, Clint Warren, Amanda Fazzari, Hannah Jorich, and Kenneth Thorne
- Caring About Success: Students' Perceptions of Professors' Caring Matters More Than Grit 108-114
Allison A. Buskirk-Cohen and Aria Plants
- Effects of Individual and Situational Characteristics on the Use of Student-Centered Pedagogy in Calculus I 115-127
Rachel Keller and Estrella Johnson
- A Multi-Faceted and Practical Analysis of Online Courses at UHCL 128-138
Angela Kelling, Shanta Goswami Varma, and Nicholas J. Kelling

Instructional Articles

- The Continuous Case Study: Designing a Unique Assessment of Student Learning 139-146
Matthew W. Grimes
- Partnering for a Field-Based Residency: Challenges and Possibilities 147-153
Josephine Sarvis and Penny Silvers

Shifting Schemas: Perspectives and Practice in a Learner-Centered Course <i>Tisha Duncan and Rachel Redwine</i>	154-165
Cohort Learning: Supporting Transdisciplinary Communication and Problem-solving Skills in Graduate STEM Researchers <i>Megan O'Neill, Matthew P. Adams, Matthew J. Bandelt, Shawn A. Chester, Wenbo Cai, and Siva P.V. Nadimpalli</i>	166-175

Can L2 Less-proficient Adult Learners Become Skilled Readers?

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This study explored whether second-language (L2) less proficient adult learners can become skilled readers by investigating the effect on students' attitudes to strategy use when explicit instruction of metacognitive reading strategies is combined with an extensive reading approach. Studies have shown that proficient learners employ a wider range of metacognitive strategies than less proficient learners and use the strategies more efficiently and frequently. Teaching metacognitive strategies explicitly develops L2 learners into independent practitioners. Yet, little is known about the extent to which L2 less proficient students can incorporate metacognitive reading strategies in their reading. This paper addresses this issue by investigating students' attitudes towards, and the use of, metacognitive strategies. The study was designed as a case study, and interview data and reflective journals were collected. The results show that L2 less proficient adult learners can become skilled readers through explicit instruction of metacognitive reading strategies combined with an extensive reading approach. The findings of the study reflect on explicit teaching of metacognitive strategies and extensive reading. The researcher suggests the value of introducing metacognitive strategies into L2 reading classrooms to broaden the learning skills of less proficient learners.

The ability to read independently is a key aspect of autonomous learning. Understanding the text requires a variety of metacognitive strategies like planning before reading, monitoring comprehension, and evaluating the reading process. This shows the important role that metacognition plays in reading. In consequence, research in metacognitive strategy training has become more vital in recent years (Efklides & Misailidi, 2010).

Many researchers have argued that proficient learners employ a wider range of strategies more efficiently than less proficient learners (e.g., Griffiths, 2008). Empirical research also reveals that high frequency use of the strategies is significantly correlated with proficient learners (Sheorey & Mokhtari, 2001). Sheorey and Mokhtari's (2001), Upton's (1997), and Zhang's (2001) studies all suggested that proficient learners use a variety of global metacognitive strategies (e.g., prediction, identifying a text structure, questioning about the text, integration, commenting, inferring, and monitoring), while less proficient learners use more local strategies (e.g., paraphrasing and word solving). Pressley and Afflerbach (1995) found that skilled and efficient readers can orchestrate their cognitive resources by conducting planning, monitoring, evaluating, and using information or strategies available to them while making sense of the reading text. In contrast, unskilled or poor readers rarely monitor their reading comprehension and consider reading as a decoding process instead of a meaning-getting process, and as a result they fail to exercise control of the reading processes (Wagner & Sternberg, 1987); they are rather limited in their metacognitive knowledge about reading (Paris & Winograd, 1990). However, unskilled readers' metacognitive awareness of their own reading processes can be enhanced through direct instruction (Paris & Winograd, 1990). Thus, it is argued that if less proficient

learners are equipped with metacognitive reading strategies, they can also become skilled readers and successful learners. As Iwai (2011) argues, it is essential for second language (L2) teachers to teach metacognitive strategies explicitly, provide diverse methods, and assist L2 students' learning to develop them into independent practitioners. Without equipping L2 learners with metacognitive reading strategies, L2 learners can suffer from, and have negative attitudes towards, reading (Lee, Schallert, & Kim, 2015). Further, metacognitive reading strategies can be exercised through extensive reading (ER) because ER increases students' feelings of comfort and reduces anxiety towards L2 reading (Yamashita, 2013), as well as enhancing motivation (de Morgado, 2009). However, studies concerning the impact of the instruction of metacognitive reading strategies on L2 less proficient learners' reading performance have been limited. Therefore, the present study aimed to conduct explicit instruction of metacognitive reading strategies, combined with an ER approach, to equip L2 less proficient learners with metacognitive reading strategies.

Metacognition

Metacognition, referring to the ability to reflect upon, understand, and control one's learning, is fundamental and essential in language learning (Flavell, Miller, & Miller, 2002). Metacognition has two dimensions: knowledge of cognition and regulation of cognition (Flavell, 1976). Knowledge of cognition contains three factors that facilitate the reflective aspect of metacognition: declarative knowledge (knowledge about self and about strategies, e.g., understanding what reading strategies are), procedural knowledge (knowledge about how to use strategies, e.g., knowing how to actually use reading strategies), and conditional knowledge (knowledge about when and why to

use strategies, e.g., understanding which reading strategies are most suitable for different tasks to achieve the reading goals) (Jacobs & Paris, 1987). Regulation of cognition, comprising selecting proper approaches and organizing processes of how to effectively conduct the strategies, contains five strategies that support the control aspect of learning, including planning, information management strategies, comprehension monitoring, debugging strategies, and evaluation (Baker, 1989). Overall, metacognitive strategies can be applied to various learning areas like speaking, reading, writing, listening, and social interaction.

Metacognitive Reading Strategies

Metacognitive strategies specific to reading are categorized into three strategies: planning, monitoring, and evaluating (Israel, 2007; Pressley & Afflerbach, 1995). Planning strategies are used before reading to assist learners to get a general idea of the text and to activate learners' schemata for reading. Examples of planning strategies include previewing the general information like screening a title, heading, and illustration; checking the text structure (e.g., cause and effect); and setting the goals for reading. Monitoring strategies are employed during reading to comprehend the text. Monitoring strategies are comprehending vocabulary, self-questioning (reflecting on the extent to which readers understand what they read), summarizing, identifying the main idea of each paragraph, and determining which part of the text can be focused on or ignored based on the goals of the reading task. Evaluating strategies are used after reading to reflect on how to apply what learners have read to other situations. Evaluating strategies include identifying with the author or the character in the book, having a better perspective of the context described in the book, and assessing what to do with the information gained in the book.

One major difficulty encountered by many L2 readers while reading is a lack of linguistic knowledge. To deal with unknown words, guessing the meaning from context is identified as a very effective strategy by many researchers (e.g., Nation, 2008). Recognizing an appropriate meaning of a word requires figuring out the useful cues from the vocabulary itself, the context, and/or the illustrations. Inferring word meaning from context can be challenging for L2 learners due to the limited linguistic knowledge of the target language (Walters, 2006). However, empirical study (Kulaç & Walters, 2016) has shown that the instruction of contextual inferencing strategies enhances L2 learners' attitudes towards reading.

Benefits of Metacognitive Strategy Instruction in L2 Reading

Salataci and Akyel (2002) investigated the effectiveness of metacognitive strategy instruction on

university L2 students' use of metacognitive strategies during reading. The study revealed that local strategies (e.g., using a dictionary and focusing on grammar or word meaning) were employed less often after the four-week training than before, and after instruction the use of global strategies (e.g., predicting, skimming for main ideas, and summarizing) increased. Fung, Wilkinson, and Moore (2003), exploring the extent to which learning metacognitive strategies impacted on L2 reading comprehension, found that students benefited from the instruction of metacognitive reading strategies and developed appropriate usage of the strategies. Dabarera, Renandya, and Zhang (2014), investigating the impact of metacognitive strategy instruction on L2 reading comprehension among Year 1 Secondary students in Singapore, revealed that metacognitive strategy instruction has a positive impact on increasing metacognitive awareness and reading comprehension, as well as that metacognitive awareness-raising is closely related to reading comprehension improvement. The teaching of reading strategies like identifying the topic sentence, pinpointing the main idea of a paragraph, guessing the meaning from the context, and finding key words improves reading comprehension and learner awareness while using strategies (Kusiak, 2001) and enhances the use of strategies (Shih, 2015).

Extensive Reading

Hafiz and Tudor (1989) defined extensive reading (ER) as "the reading of large amounts of material in the second language (L2) over time for personal pleasure or interest, and without the addition of productive tasks or follow-up language work" (p. 4). It is intended to build good reading habits and L2 linguistic knowledge and to develop a liking for reading (Richard & Schmidt, 2002), and it is a lifelong method for L2 acquisition and intellectual growth (Krashen, 2004). ER is more individualized and designed to replicate real-life reading by focusing on meaning and general comprehension. There are some crucial principles for conceptualizing ER in a teaching/learning process:

- There is easy access to a variety of reading materials on a wide range of topics at different levels of linguistic difficulty;
- Learners choose what they want to read according to their interest and L2 level and then read unassisted and as much as possible;
- Reading is its own reward, providing advantages such as pleasure and new information;
- Students silently read at their own pace, usually faster rather than slower; and
- The teacher plays a role model of a reader, guiding the students rather than teaching them explicitly (Day & Bamford, 2002).

Empirical studies have reported beneficial effects of ER on L2 competence, including vocabulary (Horst, 2005; Wang, 2013), reading comprehension (Yamashita, 2008), spelling (Polak & Krashen, 1988), writing (Lee, 2005), listening (Robb & Kano, 2013), general L2 proficiency (Manson & Krashen, 1997), grammar (Lee et al., 2015) and reading speed (Huffman, 2014). Yet, it needs to be noted that ER does not always yield positive impact on L2 learning. Reasons for the ineffectiveness of ER on L2 competence can be an overwhelming proportion of reading (Lai, 1993), the duration of the ER program (Lee, 2007), and student L2 level and inappropriate reading materials (Lee et al., 2015). Overall, the benefit of ER might be manifested more quickly in general reading skills than in L2 linguistic ability like vocabulary, spelling, and morphosyntax (Yamashita, 2008).

Research Questions

The present study conducted an intervention of explicit instruction of metacognitive reading strategies combined with an extensive reading approach to enhance L2 less proficient students' metacognitive reading strategies and to develop the characteristics of skilled readers such as orchestrating cognitive resources by conducting planning, monitoring, evaluating, and considering reading as a meaning-getting process instead of a decoding process. The research attempted to answer one main research question with two sub-questions. They are as follows:

This is the main question of the study: Can L2 less proficient adult learners become skilled readers?

The sub-questions include the following:

1. What are L2 less proficient adult students' attitudes towards explicit instruction of metacognitive reading strategies combined with an extensive reading approach?
2. How does explicit instruction of metacognitive reading strategies combined with an extensive reading approach affect L2 less proficient adult students' use of metacognitive reading strategies?

Method

This study was designed as a case study of an intervention. According to Yin (2003) a case study design answers "how" and "why" questions; an empirical inquiry reveals a current phenomenon within its real-life context. It allowed the researcher to reveal L2 less proficient adult learners' attitudes towards explicit instruction of metacognitive reading strategies combined with ER and provide an in depth analysis of their use of metacognitive strategies.

Participants

This study recruited eight adult students (3 males and 5 females), with seven majoring in business administration and one in German. The students, aged between 20 and 29, had daytime jobs and attended the night program of a university in Taiwan. They were identified by their English Language teachers as less proficient learners who exhibited low confidence in their language skills and were in danger of not completing their English course. They were recommended to take this additional voluntary training program by their English teachers. Realizing the importance of English language competence in the workplace, the students agreed to the suggestion.

Prior to the intervention, the participants were interviewed regarding their approach to English reading. Analysis of the interview data showed that students possessed passive style of learning: they studied, as required by the teacher, mainly for the tests. They were not fond of L2 reading because reading in their assigned textbook tended to be difficult for them. They rarely read English books or magazines for pleasure in their free time and considered L2 reading as an unpleasant and laborious process. The participants had not received broad exposure to strategic reading instruction except for the use of a dictionary. In their English classes they read word by word and read relatively slowly, pausing at times to consult a dictionary. Sometimes students would look up all the new words before reading, indicating that they lacked reading skills.

Intervention

This study conducted an eight-week intervention of explicit instruction of metacognitive reading strategies combined with an ER approach to develop students' metacognitive reading skills. It took place during the summer vacation, and they all worked regular office hours.* Various English online learning resources such as the university e-learning resources and public online resources (e.g., a BBC learning website) were provided. Online reading materials included graded readers and different types of magazines. Students were also encouraged to borrow books from the library.

The class met once a week for 2 hours. Students were taught how to choose suitable reading materials according to their interests and English language competence. The reading strategies were also explicitly instructed and practiced, including pre-reading skills (e.g., checking the title and author, formulating an hypothesis about the context by using titles, illustrations, and headings), while-reading skills (e.g., skimming/scanning, guessing the meaning of a new word, identifying key words, getting the main point, summarizing), and post-reading skills (e.g., reflecting on

what has been learned, drawing inferences, associating new information with old, writing in a reflective journal) (for an example of the reading strategy activities, see Appendix 1). The teacher explained the strategies both in English and Chinese to ensure that all students understood how to use them. Since ER aims for reading for pleasure, students were instructed to get the overall idea of the text without using a dictionary during the reading process. Regarding the amount of reading, it is necessary for students to read at least one book or one magazine article per week in order to establish a reading habit (Day & Bamford, 2002). Furthermore, to hold participants accountable for the reading, they were required to write a reflective journal (Appendix 2) either in English or Chinese every week for eight weeks. It is worth noting that the questions listed in reflective journal were designed based on the characteristics of skilled readers (Pressley & Afflerbach, 1995) to promote good reading habits, such as being aware of what they are reading, knowing why they are reading, having strategies for handling potential problems, and monitoring their comprehension of textual information.

Data Collection

Eight students participated in this study, and two of them dropped out during the intervention due to time constraints. This study was conducted through semi-structured one-to-one interviews with the six students (2 males & 4 females) after the post-test to find out how individual students viewed the extensive reading. Interview questions (Appendix 3) mainly related to participants' attitudes towards, and perceptions of, the impact of extensive reading on their learning, including whether they liked the intervention, how it impacted on their learning behavior, and whether they encountered any difficulties and perceived reading improvement. The interviews were conducted in Chinese and audio recorded. Reflective journals in which students recorded their reading information were also gathered. Some students missed submitting their reflective journals for a particular week, and therefore only forty-two journal entries in total were collected from the six students who completed the program over the eight-week training period.

Data Analysis

The transcripts of the interview data were read, re-read, and then analyzed using "open coding" (Merriam, 2009). I discussed the coding remarks with a trained researcher using a sample of the interview data, and then we individually marked the data. The coding units were tallied and met a satisfactory interrater reliability at 91.8% agreement. The discrepancies in the coding remarks were discussed with a mutual agreement

reached. We then looked through the remarks, attempting to identify the themes through an iterative process to recognize commonalities and disparities in the coding remarks. Having identified the themes, we then individually classified the remarks into the themes. There were at least three coding remarks from three different individuals for each theme, and themes with less than three coding remarks were deleted. The interrater reliability for the theme categorization reached a satisfactory agreement of 98.5%. The same processes were utilized for analyzing student journals with a satisfactory interrater reliability.

Results

Positive Attitudes

The majority of students had positive attitudes towards explicit instruction of metacognitive reading strategies combined with an extensive reading (ER) approach. They felt happy to learn metacognitive reading strategies, enjoyed ER, and considered it helpful to L2 learning. Students favored this reading approach also because they learned English in an easy and simple way. Sample comments are as follows:

- "It is the first time that I enjoy reading. I had never had the pleasure of reading in reading class."
- "I can learn English in an easier way. I gradually accumulate new English words and sentence patterns through reading. I learn better this way."
- "It [reading] is not for gaining higher score, but a matter of true learning, learning for my own sake."

Motivation

Students commented that ER made them feel like reading and that it motivated them to read. They used to see L2 reading as a laborious and unpleasant task that was largely a decoding process involving extensive use of dictionary resources. Through this intervention, they had experienced the joy of reading. One student wrote the following:

Reading used to be as a job looking up words in the dictionary to me, and I didn't like it at all. Now, I am motivated to read and read happily because I can understand what it means without looking up every new word.

Keeping a reflective journal is another reason to motivate students to read. Students claimed that they considered themselves lazy and needed to have a

clear purpose such as submitting a reflective journal, which helped motivate them to take more responsibility for their own reading and learning. The following is a sample response: “One of my weaknesses is laziness, and I need to be pushed to learn. The reading approach required reflective journals, and this is why I kept reading. I can better organize my reading because I know it is something that I must complete and I can do it.”

An Increase in Confidence

Unlike the normal English reading class, students gained more confidence with reading through ER. Though they experienced pressure when reading English articles or stories, they were better able to handle the pressure after the intervention. The following is a sample comment: “I have less learning anxiety. I used to set the reading article aside and avoid reading it. Now I could overcome the resistance.”

Self-regulation

All the participants learned to plan their reading schedule to fit their own learning agenda based on their work time. They claimed that they set their own schedule for reading with the result that they had no excuse for not completing their reading assignments. In the normal English reading class the material tends to be far more difficult for less proficient learners, leading to reduced motivation to complete reading assignments. In contrast, extensive reading allows them to arrange their own learning, including choosing the material, and to set up their own schedule. Thus, they are responsible for their own learning schedule. Sample responses are as follows.

- “I felt that I forgot to do something. Then suddenly I remembered it was Wednesday, and it is my English day. I should read.”
- “After a long day at work, I don’t have much time left for study. But I would rest for a while, and then I read.”

Reading Skills Developed

Students learned to guess the meaning of a new word or a sentence through the context clues and pictures provided without immediately turning to their dictionary in the first place. After reading, they used a dictionary to confirm the meaning of the new words, and this reinforced acquisition of new lexis. The following asserts this learning:

I used to use dictionary whenever I encountered a new word. Now I first guess the meaning based on the context. Sometimes I got it wrong. But gradually I

improved. It also helps guess the meaning if I have the background knowledge of the text.

Students perceived that they are better at getting the main idea. They checked the topic and grasped the key words to get the big picture; they realized that it is not necessary to know every new word to understand the text. One student remarked, “I checked the topic and the key words to get the main idea of the article. If I don’t do this and just read, I am not able to understand what I’m reading.”

Students also claimed that they gained the skill of skimming. The purpose of ER is to read for pleasure. They learned that while getting the gist of a paragraph, they could skip the rest of the paragraph and read the next one. Sometimes they would skip the parts they did not understand and keep reading to comprehend the overall meaning. A sample comment is as follows: “I used to read word by word in reading class. Now I learned to skip some parts after getting the main idea of the story.”

Inferring meaning is another skill developed. Students were able to understand the underlying morality of a story and the implied meaning of an article. They were motivated and enjoyed learning about family relationships, teamwork, and life skills from reading, as the following comment shows: “It was really inspiring and I also learned that when dealing with difficulties in life, I should also keep a clear mind.”

Persistence

An additional characteristic of reading, persistence, is developed. Reading L2 stories can be frustrating for less proficient students before comprehending the text, thus they might give up reading easily. Students claimed that they developed the ability to persevere with their reading. Even though they were not able to understand very well at the beginning, they would keep reading till the end and finally were able to comprehend the meaning of the text. As a student made this observation: “I need to be patient even though I don’t get the main idea during reading. I just kept reading, and the words that I didn’t know repeated several times in the text. At the end I could manage to understand what the story meant.”

Perceived Improvement

Participants perceived that, through explicit instruction of reading strategies combined with the ER approach, their reading comprehension improved. They were able to gain a better understanding of the reading material. Sample comments are as follows.

- “I felt really happy when I understood the meaning of a metaphor used in the story

and realized why it was funny.”

- “I used to read and get the superficial meaning of the words without thinking deeply about the text. Also, I might not understand the irony the author expressed. Now I can gradually understand the implications of the text.”

An increase in vocabulary knowledge was also perceived by the majority of students. One main reason for the improvement of lexical knowledge was that students encountered the new words several times throughout reading the story, and this helped them to memorize the new words. They not only learned more vocabulary, but also had a better understanding of the language use, as illustrated by the following comment:

I learned that a word can carry different meanings in different contexts. I used to recite one Chinese meaning for one English word before reading. While reading, I sometimes couldn't fit the meaning into the context. Then I got confused. Now I understand what happened. I also learned that some words I already knew can be used in different contexts.

Some students claimed that they could read faster than before. That means they could comprehend the meaning of the text or get the gist of the text more easily. A sample comment is as follows:

I used to read slowly because I read word by word. Now I can read faster by skimming and comprehend the main point of the story.

Students' reflective journals also revealed that they learned to choose an appropriate reading material for themselves based on their interests and language proficiency, from easy to complicated and short to long stories or magazine articles. In terms of choosing fictional works, one main reason for choosing a particular story was that they had heard of the story before, which facilitated reading comprehension. L2 reading for less proficient learners can be frustrating, yet with help of their background knowledge they felt less pressure. Furthermore, all students chose the reading articles from the learning website provided, except with the one student who borrowed books from her friend. Having read the books or articles, students reported that the information they gained could be applied to their work, shared with friends, and served as motivation in their lives. The time spent on reading varied, from thirty minutes to five hours per week. Inspiringly, they maintained the habit of reading during the eight weeks.

Discussion

The first sub-question seeks to investigate L2 less proficient adult students' attitudes towards explicit instruction of metacognitive reading strategies combined with an ER approach. L2 less proficient learners encounter difficulties when reading due to poor strategy use and a lack of lexical knowledge. The success of metacognitive reading strategy training in encouraging L2 reading was demonstrated by the interview results: students reported having an increase in their confidence and motivation and having a positive attitude towards ER. Students' positive attitudes enhanced their willingness to participate in extensive reading and facilitated building reading habits and made reading become a routine activity (Lee & Schallert, 2014). These findings lend support to previous research by Kaniuka (2010), in which the teaching of reading strategies enhances learner attitudes towards reading, and by Yamashita (2013), in which the ER approach increased students' feelings of comfort and reduced anxiety towards L2 reading, as well as gained intellectual values. The resulting positive attitudes led to the decision to continue reading. Thus, constant involvement in reading not only strengthens these positive attitudes, but improves reading skills and abilities, as discussed below.

The second sub-question investigated how explicit instruction of metacognitive reading strategies combined with an ER approach affects L2 less proficient adult students' metacognitive reading strategies. The success of metacognitive reading strategy training in enhancing a use of L2 metacognitive reading strategies was demonstrated by the student interviews and reflective journals which revealed the use of a variety of metacognitive strategies, including planning a reading schedule, selecting proper reading material, using strategies like guessing, identifying key words and the main idea, skimming, inferring, monitoring reading comprehension, and evaluating what to do with the information gained. The results of this study which show that students use more of global strategies (e.g., skimming for main ideas) and less local strategies (e.g., using a dictionary, focusing on grammar or word meaning) is in agreement with Salataci and Akyel's (2002) finding which showed students receiving metacognitive strategies instruction employed more global strategies instead of local strategies. The results of the present study also lend support to the previous research by Fung, Wilkinson, and Moore (2003) where students receiving metacognitive strategy training developed appropriate use of the strategies. The behavior of using global metacognitive strategies was defined as skilled reading by Pressley and Afflerbach (1995). That means L2 less proficient adult readers in

the present study became skilled readers who were able to orchestrate their cognitive resources by conducting global metacognitive reading strategies, and this answers the main research question.

One main difference between before and after receiving metacognitive reading strategies instruction is that students have changed their L2 reading behavior from being overwhelmingly concerned with decoding to focusing more on an overall understanding of the text. That is, students placed greater emphasis on text-level issues rather than lexical- or sentence-level issues. This is a clear evidence of change in student reading behavior and is considered a characteristic of skilled readers, as was found by Wagner and Sternberg (1987), in that skilled readers consider reading as a meaning-getting process rather than a decoding process.

It is worth noting that it is a long-term process to cultivate the characteristics of skilled readers (El-Dinary, Pressley, & Schuder, 1992). The development of metacognitive reading strategies in the present study is mainly attributed to the instruction in metacognitive strategies conducted. However, a development of L2 reading strategies within eight weeks is also possibly due to a transfer of L1 reading strategies, and this needs further empirical research.

Keeping a reflective journal encourages L2 less proficient adult learners to keep reading with more metacognitive awareness towards L2 reading. Students claimed that keeping the journal was one main motivation for them to read. Through keeping a reflective journal, students were also more aware of what they were reading, knowing why they are reading, and reflecting on strategies for dealing with problems and for monitoring their comprehension. This developed characteristics of skilled readers (Pressley & Afflerbach, 1995).

The participants also perceived an improvement in reading comprehension, vocabulary, and reading speed. These findings support previous researches by Yamashita (2008), in which extensive reading enhanced readers' reading comprehension; by Wang (2013), in which students' vocabulary knowledge increases from an extensive reading program, and by Huffman (2014), in which students' reading speed improved with extensive reading. The perceived improvement arguably further enhances students' confidence in L2 reading.

Background knowledge helped with reading comprehension, and it lessened the pressure of L2 reading. During the eight weeks, most L2 less proficient adult learners selected, at least once, the reading material which they had heard of in L1 because they were familiar with the story and felt more comfortable while reading it in L2. The result supports the previous research by Anderson and Pearson (1984) that background knowledge influences readers' comprehension performances.

It is also important to note that self-regulation competence attained in the present study is essential for developing skilled readers. Self-regulation competence is closely related to L2 students' reading competence (Nejabati, 2015). The finding of the present study revealed that less proficient learners can be successfully trained and become able to self-regulate their L2 reading. Less proficient learners who have the ability to regulate their cognition, behavior, actions, and motivation strategically and autonomously arguably have greater potential to attain their learning goals. Students with self-regulation competence are able to make their own learning easier, faster, more enjoyable, and more effective (Oxford, 2011). Therefore, L2 reading pedagogy needs to take self-regulation competence into account when training students to become skilled readers.

Conclusion

This study sought to explore whether L2 less proficient adult learners can become skilled readers by examining the impact of explicit instruction of metacognitive reading strategies combined with ER on student attitudes towards L2 reading and use of L2 metacognitive reading strategies. It was found that they developed the characteristics of skilled readers: they had a positive attitude towards reading strategies which in turn lead to the development of global metacognitive reading strategies. Self-regulation competence is obviously essential for training less proficient students to become skilled readers.

The current study was limited in several ways. First, a small sample size was used with convenience sampling. Thus, caution must be applied, as the findings might not be generalized to a larger population. However, the study revealed a contemporary phenomenon within a real-life context (Yin, 2003). Though the sampling is small, the results of this study indicate that when L2 less proficient adult learners are equipped with metacognitive reading strategies, they can become skilled readers. Second, the present study was limited by using students' reports. Future study can apply think-aloud protocols to gain more in-depth insights into learners' metacognitive awareness of reading. Also, further work needs to be done to establish whether explicit instruction of metacognitive reading strategies combined with ER impacts on L2 less proficient adult learners' reading comprehension by using quantitative methods with a larger sampling.

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Appendix 1

A reading strategy activity

Using context to guess meaning:

- (A) My father is a *sagacious* man. He always makes good decisions, and I try to follow the advice he gives me. What kind of person makes good decisions and gives good advice? Which of the following words would probably describe the writer's father?
- stupid
 - cheerful
 - wise
- (B) My grandmother taught me how to be *frugal* when I didn't have much money. For example, she told me to buy things on sale, cook my meals at home, and not to drink pearl milk tea every day. The word "frugal" is closest in meaning to
- kind
 - thrifty
 - helpful

Appendix 2

Reflective Journal

- What is the title?
- Where did you get your reading material?
- How much time did it take you to read the book?
- Why did you decide on reading this book?
- Write down a summary of the book/story.
- Do you like it? Why or why not?
- What do you like best about the book?
- Are there any problems occurred in the process of comprehending the textual information? How did you deal with the problem?
- Would you recommend this book to your friends?

Appendix 3

Interview Questions

- Do you like this reading approach? Why or why not?
- How does the reading approach impact on your attitudes towards L2 reading?
- Do you perceive any impact of the reading approach on your L2 reading?
- Are there any difficulties occurred during reading? If yes, how did you deal with the difficulty?

Peer-supported Writing in Graduate Research Courses: A Mixed Methods Assessment

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Peer review enhances student knowledge acquisition and the ability to meaningfully apply that knowledge. Formative assessment is the source of much of the positive effect of the peer review process. This evaluation investigated the affective experiences of graduate students as they navigated the writing of their research proposals. The authors created a mixed-methods, quasi-experimental, pre-test/posttest, comparison and control group evaluation of a peer review process in a graduate research methods class. Students writing a research proposal reviewed each other's proposals while receiving both formative and summative feedback from their professor. Pretest/posttest findings showed that students experiencing the peer review process reported reduced anxiety and improved scores on an assessment of their experience of the research process. Qualitative findings suggest that the peer review process helped with content mastery and created peer support that reduced assignment-related anxiety. Peer review is recommended as a tool that reduces research anxiety and helps students feel more confident in their abilities, even if they are not enthusiastic about research methods as a topic or a skill.

Perhaps unsurprisingly, many graduate students experience considerable stress when required to produce essential pieces of writing to be evaluated in their university coursework (Stewart, Seifert, & Rolheiser, 2015), particularly in a research methods course. This stress has been observed to be experienced unevenly across gender, socio-economic, and racial groups, with groups identified as diverse, female, and with a low socio-economic status reporting higher levels of stress than other groups (Davis, 2003). At the same time, suggesting a more sustainable approach to providing feedback, Boud and Molloy (2013) recommended the utilization of peer review that not only provides more feedback, but also enhances a student's ability to critically review his or her own writing and thus lessening the need for constant feedback from professors. To better support students, increase equity among different student populations, to improve writing, and to alleviate the stress students experience in research writing, we have developed a peer review writing approach in research courses in both a Master of Social Work program and a Reading Master's program. The purpose of this paper is to examine the implementation of a peer review writing approach in terms of student stress and student focus on the essential concepts underlying the research process.

In this study, we have adopted a definition of peer review that describes it as "an arrangement in which individuals consider the amount, level, value, worth, quality, or success of the products or outcomes of learning of peers of similar status" (Topping, 1998, p. 250). This means that, for the purposes of this study, the learning outcome (the research paper) is valued among all participating students who are invested in creating strong papers. It also means that the peers generally see each other as equals in status.

While the value of providing students with experiences in designing and conducting research has been established in the constructivist traditions of Dewey (Cobb & Kallus, 2011), this work stems from the social constructivist theory of Vygotsky (1978) and the social cognitive theory described by Bandura (1986). These theories suggest that learning is ultimately a social experience and that the influence of peers scaffolds greater learning than learning done in isolation. In particular, the notion that peer support can increase a learner's perception of self-efficacy (Bandura, 1997) as researcher-practitioners underlies the approach taken in this study.

There are many established benefits for using peer review to support students as writers. Initially, students typically feel reluctant to have their writing reviewed or to review the work of others. They cite discomfort in having someone other than the instructor evaluate their work, particularly in respect to receiving grades. Yet, after experiencing the peer review process, students regard the process as satisfactory and positive (Planas Llado et al. 2014; Vu & Dall'Alba, 2007). Interestingly, this satisfaction is stronger for students who have had work experience in their field of study (Gatfield, 1999).

Considering the differences between feedback offered by a professor versus feedback offered by a peer, Falchikov and Goldfinch (2000) found evidence suggesting that for the more global measures of writing, peer feedback is mostly in agreement with professor feedback. However, when feedback is more focused on practice or professionalism such as in a practicum setting, there are greater differences between peers and professors. In measuring the reliability and validity between peer assessments and instructor assessments, it has been found that there is a high degree of both reliability and validity. That is to say, when given clear

assessment parameters and protocols, peers have been observed to assess a paper similarly to the professor (Cho, Schunn, & Wilson, 2006; Topping, Smith, Swanson, & Elliot 2000) even when the assessment is facilitated through a software program (Paré & Joordens, 2008).

A number of studies provide evidence that peer review can positively affect both the knowledge gained in the learning experience and the ability to meaningfully apply that knowledge. One important source of these positive impacts appears to be the formative assessment that is inherent in the peer review process: a type of assessment that, while becoming more popular, is lacking or misunderstood in many higher education settings (Torrance, 2012; Vu & Dall'Alba, 2007). Students reported that formative peer review helped them to deepen their understandings of the content being taught, in addition to enhancing their understanding of the varied topics being investigated by their peers (Paré & Joordens, 2008). It also helped students gain confidence in both their independent learning as well as in group discussions held in class. Specifically, students reported that peer assessment helped them to read journal articles more successfully as well as to understand how to reference those articles (Vickerman, 2009). Additionally, peer review helps to "inform the learner's judgments for learning beyond the immediate task" (Boud, 2009, p. 704), suggesting benefits that extend beyond the writing assignment. Boud and Molloy (2013) suggested the peer review process helped students learn to avail themselves of available resources and to create products that better approximate both the process and product expected in their fields of study. Topping (1998) reported that peer assessment promotes active over passive learning. It also promoted the development of verbal skills such as negotiation and diplomacy (Riley, 1995). Peer assessment can also help students learn to give and to receive criticism and constructive suggestions, and it appears to promote skills that are transferable to employment (Marcoulidis & Simkin, 1991) and to real-world scientific discourse (Hanrahan & Isaacs, 2001; Paré & Joordens, 2008; Prins, Sluijsmans, Kirschner, & Strijbos, 2005). On a very pragmatic level, peer review provides both quantitative and qualitative feedback in a timelier manner than the typical turn-around of graded papers (Paré & Joordens, 2008).

Previous research has also found many benefits from peer review in helping students develop as writers, especially as they experience the stress of writing research proposals (Onwuegbuzie, 1997). Although students reported that the peer review process was time consuming and unwieldy, ultimately students felt that it improved their writing (Topping et al., 2000). Topping (1998) notes that peer review helped writers to have a better sense of what constitutes quality writing. Vu & Dall'Alba (2007) found that peer review helped students

understand the writing process itself. Along those lines, students engaged in peer assessment were able to self-evaluate their own writing in relation to the writing of their peers (Vickerman, 2009). This means that they are able to evaluate their own writing and to avoid overestimation and underestimation of the quality of their work. Topping (1998) notes that peer assessment has been shown to provide more feedback to students in a timelier manner, allowing greater opportunity to improve writing. In measuring the quality of papers written by students who experienced peer review, Richer (1992) found that such papers were better than the papers of students who did not have peer review.

Research Question

Evidence suggests that a student's attitudes, beliefs, and emotional response can effect a student's experience in writing (Daly & Wilson, 1983; Onwuegbuzie, 1997). Recognizing the intense writing demands on graduate students, we seek to understand the particular affective experiences as they navigate writing their research proposals. Put simply, how does peer review impact the writing experiences in a research class for graduate-level students? Does peer review reduce the negative affective responses to writing?

Methodology

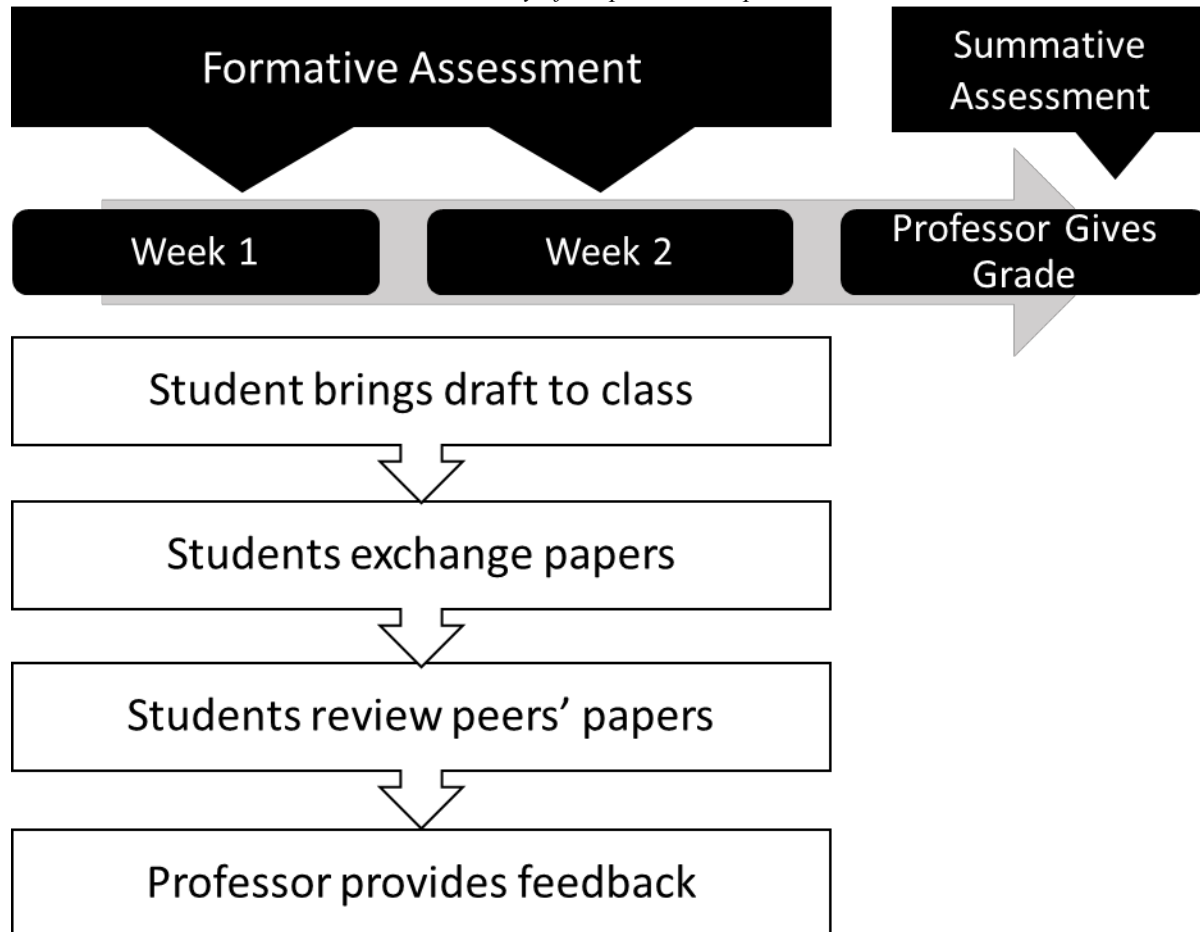
Sample

The sample for this research included full-time and part-time students enrolled in a full 60-credit Master of Social Work (MSW) degree program at two small state-funded universities in the eastern United States. Students in this program are required to take a 15-week course, meeting once a week for nearly three hours, that teaches research methodology and culminates in writing a research proposal. These two universities share the program and faculty, and they often share the same students, thus the academic abilities of the two groups were assumed to be somewhat similar. The experimental group at one university and consisted of 21 students, with three males and 18 females. Two students were African Americans, one was Latino, and another was Native American, while the rest were White. The control group at the other university consisted of 22 students, three of whom were males and 19 were females. One student identified as Latino, and one identified as Native American, while the rest were White. Thus, based on these few demographic characteristics, both groups appear to be fairly similar.

Intervention

Students in the experimental group participated in a small group peer review process that was supplemented by

Figure 1
Summary of the peer-review process



formative assessment from the professor. During the first class sessions of the 15-week semester, small groups of two to four students were formed to collaborate on the activities related to developing research questions and hypotheses, developing and assessing measurement instruments, assessing the research literature; and evaluating prospective research designs. This laid the foundation for the culminating assignment in the class: a formal research proposal complete with an introduction, literature review, and methodology. Both the peer review and formative feedback from the professor came into play in this research proposal assignment.

The last eight weeks of the course were divided into four two-week sections focused on the three “chapters” of the research proposal and the final draft of the completed proposal. During these weeks, the first half of the two-hour class was spent in traditional lecture or small group activities focused on research-specific content, such as sampling, data analysis, and single-case evaluation. The second half of the class

was devoted entirely to peer review and formative evaluation, where the small peer groups met to read and provide feedback on each other's' drafts (see Figure 1.).

During this time the professor also circulated through the class and attempted to read each student's paper and provide formative feedback. During the peer review exercise students were encouraged to not only focus on grammar, formatting, and writing skills, but to look more deeply at their peers' proposal in terms of research design and appropriate application of research concepts. After two sessions of peer review and formative assessment each proposal section was submitted to the professor for a grade (summative evaluation). At no point in this peer review process did students provide a summative evaluation such as a grade; rather, they simply provided formative feedback to their peers with the goal of improving the completed written assignment.

The two-week peer review process was repeated for each of the three sections or chapters of the

proposal: Introduction, Literature Review, and Methodology. Once the entire proposal was put together the student's peers also assessed the full proposal, and the professor provided formative evaluation of the full proposal. In other words, by the time the final proposal was turned in, each individual chapter had been read twice by the student's peers and three times by the professor, plus the complete proposal had been read twice by the student's peers and twice by the professor. The comparison group experienced similar pedagogical instructional methods and research paper expectations to those of the experimental group, without the opportunity for peer review or formative assessment from the professor.

Research Design

The general design of this research is the classic pretest-posttest quasi-experimental design with nonequivalent groups. The two groups involved in the research were students in graduate level, first-year Master in Social Work (MSW) introductory research courses. Students in both courses were part of the same MSW program, used the same introductory research text, and completed similar assignments. The primary difference between the two groups (other than the difference in instructors) was that students in the comparison group ($n=22$) completed the research course without the peer review exercises while those in the experimental group ($n=21$) completed the research course with peer review exercises. These peer review exercises were primarily used to guide the students through the process of writing a traditional research proposal, complete with an introduction, literature review, and methodology section; however, there was significant peer involvement in all aspects of the teaching, including instruction on searching, reading and referencing research literature. At each step of the proposal writing process- introduction, literature review, and methodology- students received formative feedback on two subsequent drafts of their papers from both the professor and from their peers.

Measurement Instrument

The measurement instrument used in this study was a two-part paper survey consisting of the Research Process Survey (RPS) (Kracker, 2000; Kracker & Wang, 2002) and the short-form of the Spielberger State-Trait Anxiety Inventory (STAI) (Marteau & Bekker, 1992). The first part of the RPS was based on the work of Jacqueline Kracker (Kracker, 2002; Kracker & Wang, 2002), which was inspired by the earlier work of Carol Kuhlthau, the developer of the Information Search Process Model, which describes the thoughts, feelings, tasks, and actions that are associated

with the typical student's progression through the six stages of research (Kuhlthau, 2004). Kuhlthau's work (e.g., Kuhlthau, 1988; Kuhlthau, 1991; Kuhlthau, 2004) recognized that emotions such as confusion, uncertainty, anxiety, and doubt naturally play a role in the research process. The resulting instrument is called the Research Process Survey (RPS), which Kracker used (Kracker, 2002; Kracker & Wang, 2002) to investigate the cognitive and affective aspects of the research process together with the anxiety and satisfaction experienced with the research process.

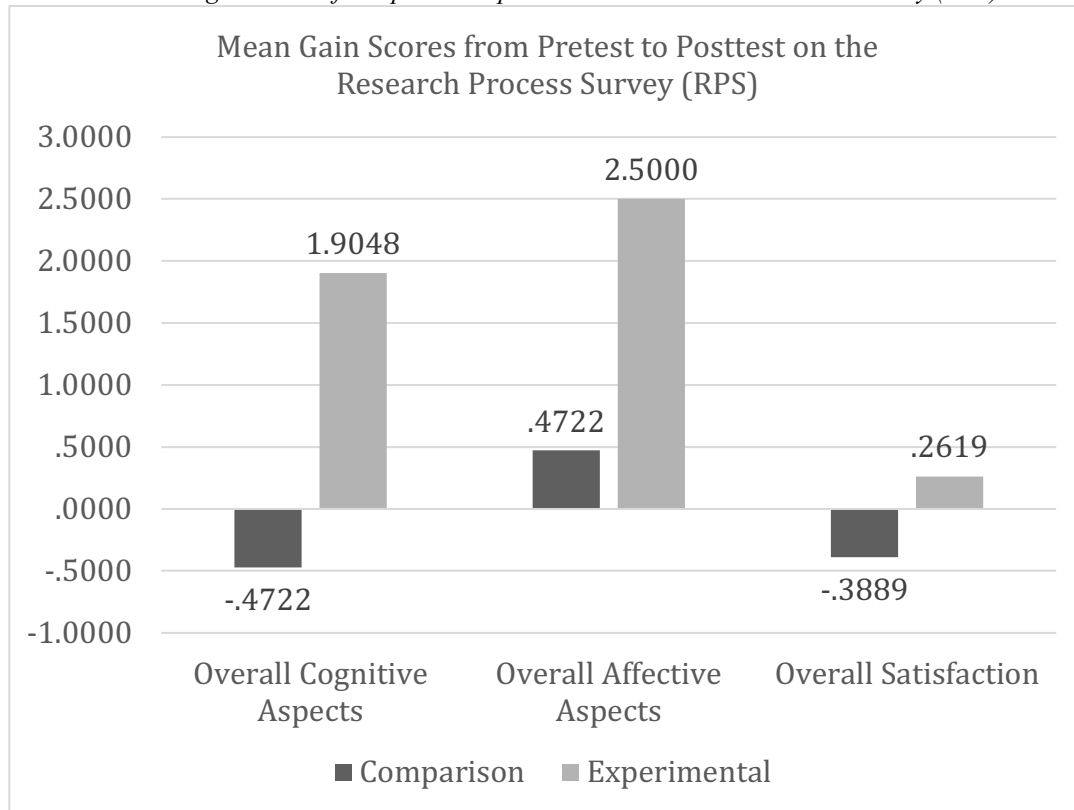
The RPS is a two-part survey with quantitative and qualitative sections. The quantitative sections consist of 18 pairs of statements which participants respond to using a five-point Likert-type scale ranging from "Strongly Disagree" to "Strongly Agree" with a midpoint of "Sometimes". One statement in each pair is written so that high scores (i.e., Strongly Agree) are an indicator of high awareness or a high satisfaction level, while the second is worded to reflect the inverse or reverse of the other statement in the pair. During the data coding process the reverse/inverse items are recoded so that the subjects' indication of a high level of awareness or satisfaction results in a high score. Scores from each pair of statements are averaged to obtain subvariable scores, and subvariable scores are summed to obtain a measure for each variable. The subvariables include eight measures of awareness of the cognitive aspect of the research process and eight measures of the affective aspects of the research process. There are also two subvariables dealing with the perceived satisfaction with the research process. Kracker (2002) demonstrated a high degree of reliability and validity for the RPS.

The qualitative section of the RPS asks subjects to recall a recent research assignment and describe their thoughts and feelings as they worked through that project. In the pretest version, students consider their most recent research experience prior to completing the survey; the posttest asks them to look back on the research proposal writing from the current semester. To gather additional qualitative data, we added a question to the post-test asking participants to list the pros and cons of participating in peer review.

The second part of the research instrument is a brief anxiety scale developed by Marteau and Bekker (1992).

This scale is a six-item short-form of the Spielberger State-Trait Anxiety Inventory (STAI-6) which is a 40-item scale originally developed in various forms during the 1970s and 1980s. The STAI-6 is a reliable and sensitive measure of anxiety that is frequently used in applied psychology research. The abbreviated version used in this research has "acceptable reliability" and produces results similar to the full form of the STAI (p. 305). This shorter version also has the advantage of maximizing response rates and reducing response errors, including unanswered items. Obviously, a shorter survey also reduces the time to take the survey and score the results.

Figure 2
Mean gain scores from pretest to posttest on the Research Process Survey (RPS)



Data Collection

Prior to collecting data from the students involved in this research, all research protocols and documentation were approved by the Institutional Review Board at the authors' institution. During the week before the initiation of the peer review exercises—around the mid-term of the course—students in both the comparison and experimental groups were given the pretest version of the RPS and short-form STAI. Paper versions of the surveys were distributed in class by the instructor. Before completing the surveys students were asked to sign an informed consent form, which was removed from the survey prior to data entry and analysis. The posttest procedures followed the same process in both classrooms during the last week of the semester when all of the peer-review exercises had been completed. The resulting data set included both the pretest and posttest surveys from both the comparison and experimental groups.

Data Analysis

The quantitative data collected using the RPS and short-form STAI produces four distinct variables for analysis that relate to the research process: Overall

Cognitive Aspects, Overall Affective Aspects, Overall Satisfaction, and Anxiety. For each of these four variables, pretest to posttest gain scores were calculated by subtracting the pretest values from the posttest values. These gain scores of the comparison and experimental groups were then compared using an independent samples t-test to test for a statistically significance difference. Because of the small sample size, lack of random sampling, and the fact that the population variances for the two groups on one of the subscales was not equal, a non-parametric analysis of the non-parametric Independent-Samples Mann-Whitney *U* test was also calculated.

Qualitative data from the open-ended questions on the surveys was coded and analyzed following the constant comparative method (Strauss & Corbin, 1998). Pre-test responses were open coded while post-test responses were comparatively coded between the comparison and experimental groups. In order to affirm or reject the findings from this initial coding, we used a system of axial coding that looked for relationships between the codes found in the participant responses to the pros and cons of peer review and the coded results from the posttests.

Results

Quantitative Findings

For every subscale of the RPS (Overall Cognitive Aspects, Overall Affective Aspects, Overall Satisfaction) the experimental group of graduate students who participated in the peer review experience showed higher mean gain scores (see Figure 2).

Similarly, based on the gain scores, students in the peer review group reported much less anxiety at the end of the semester than the comparison group as measured by the STAI (see Figure 3).

The peer review group showed higher mean gain scores in the Overall Cognitive Aspects scale (-2.38), the Overall Affective Aspects scale (-2.03), and the Overall Satisfaction Scale (-0.65). The mean difference on the anxiety test (2.91) was quite large because the comparison group's anxiety scores actually increased from pretest at the beginning of the semester to posttest at the end of the semester, whereas the peer review group's anxiety scores decreased across the semester. These findings related to the means are summarized in Table 1.

An independent-samples *t*-test analysis of these findings showed that none of these differences in gain scores between groups were significant at the $p < .05$ level. However, the difference in mean gain scores between groups showed significance at the $p < .10$ level

for the Overall Cognitive Aspects scale on the RPS ($p = .094$) and for the anxiety scores ($p = .096$).

A non-parametric analysis using the Independent-Samples Mann-Whitney *U* test was also conducted ($p = .053$). Just as with the parametric analysis, none of the previously mentioned subscales showed a significant difference at the $p < .05$ level. However, the Overall Cognitive Aspects subscale showed a significant difference between the groups at the $p < .10$ level. On this scale, the average rank for the comparison group was 16.17, and the average rank for the peer review group was 23.29. The difference between the groups on the other two scales in the RPS—Overall Affective Aspects and Overall Satisfaction—did not show significant difference in this non-parametric analysis at the $p < .10$ level. The same non-significant findings were present for the anxiety scores as well, which may be impacted by the small sample sizes involved in these analyses.

In a further effort to assess the magnitude of differences between the comparison and experimental groups we calculated an effect size for each of the four scales listed previously (see Table 1). The effect sizes generally indicate that on average on all four of these scales students in the experimental group show between a third and a half of a standard deviation improvement from pretest to posttest compared to the improvement of the average person in the comparison group.

Figure 3
Mean gain scores from pretest to posttest on the Spielberger State-Trait Anxiety Inventory (STAI)

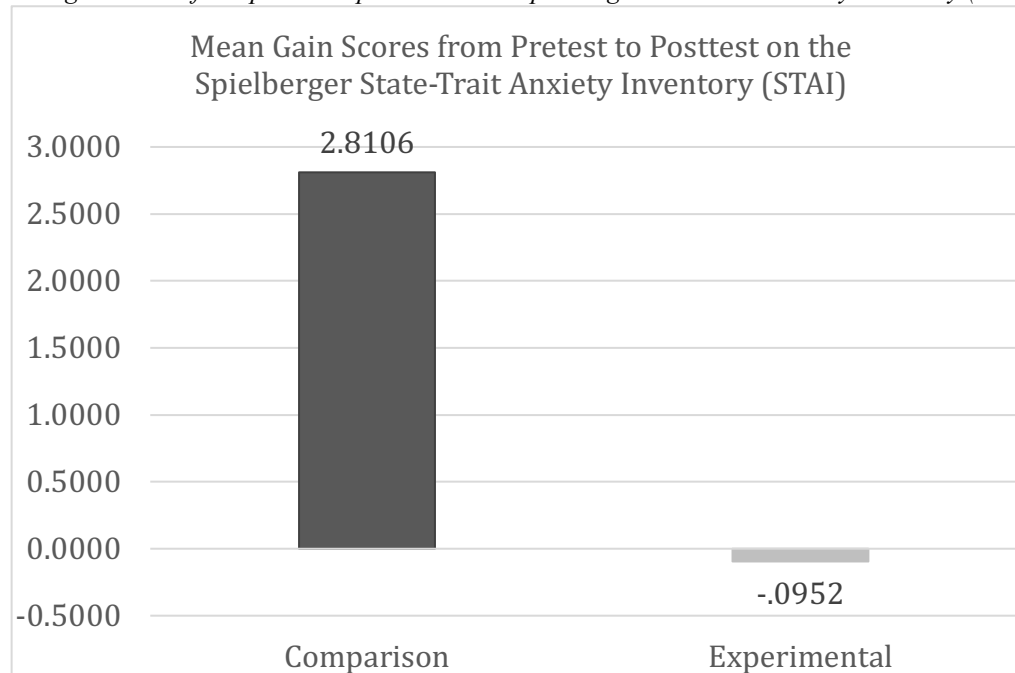


Table 1.
Comparison of Gain Scores (Pretest to Posttest) for RPS Subscales (Overall Cognitive, Overall Affective, Overall Satisfaction) and the Short-Form STAI (Overall Anxiety).

	Class	N	Mean	Std. Deviation	Mean Difference	Ind. Samples t-test	Mann-Whitney U test
Overall Cognitive Aspects	Comparison	18	-0.47	5.30	-2.38	t(23.35) = -1.75 p = .094	.051
	Experimental	21	1.90	2.49			
Overall Affective Aspects	Comparison	18	0.47	6.84	-2.03	t(35.32) = -.95 p = .35	.234
	Experimental	21	2.50	6.45			
Overall Satisfaction	Comparison	18	-0.39	1.81	-0.65	t(30.88) = -1.26 p = .218	.133
	Experimental	21	0.26	1.34			
Overall Anxiety*	Comparison	18	2.81	6.76	2.91	t(37) = 1.71 p = .096	.148
	Experimental	21	-0.10	3.62			

* Negative Overall Anxiety scores reflect a decrease in anxiety from pretest to posttest.

Qualitative Findings

In the analysis of the qualitative data, we observed several themes that echo both the quantitative findings as well as findings from other researchers. For example, students reported concern with the grading aspect of peer review, and they felt that the feedback from the professor would be more significant. Although many students reported that the process was time consuming, they also appreciated the feedback provided by their peers, and they felt that the process helped them produce a better final paper.

While these qualitative findings may be found in other studies (e.g. Topping et al., 2000; Vickerman, 2009; Vu & Dall'Alba, 2007), two themes were observed in the data that provide a depth of understanding that substantiates this body of literature. These themes include an understanding in how the process impacted their learning of course content and in how the process created a system of support for the students that alleviated much of the anxiety students experienced at the onset.

In their post-surveys, students consistently reported that engaging in the peer review process expanded their opportunity to learn relevant course content. While it would not be surprising that writing a research paper increases student understanding of the focus of their paper, peer review created a space for students to learn the content that was the focus of their peers. In a step further, students reported that they were also learning about both being research-minded and constructing a

cohesive paper. In referring to the research process, one student "appreciated reading about how others were going through things," and it helped "improve comprehension of acceptable formats." Students benefited from "increased comprehension of needs for my paper through evaluating others" and were "taking notice *how* others have written their assignment." One student observed, "[I]t was reassuring to know that class was on the same page of how to complete the assignment." In addition to helping students learn from their peers, this window into the writing of their peers helped create a supportive learning environment.

While improving the content learning of participating students, they also reported that peer review created a more supportive learning environment. This supportive learning environment created a shift for participating students in that a very stressful assignment (the research paper) became less stressful, even "refreshing and rejuvenating" through the peer review process. Students noted that their "peers provide good comments" and that they wanted more such opportunities in the class. One student noted, "[B]ecause we were such a close knit group, the lack of anonymity was not a cause of stress for me." This belies the assumption that peer review would create a more stressful environment as students are expected to share their writing. The research writing process was not easy for students, for example: "I began with a lot of anxiety and confusion; the peer assessment and class information helped with that," but the peer review process helped the paper "become less terrifying." One

participant wrote, “As the sections went on and the peer review process began, the anxiety lessened. I became more comfortable with the process.” On the contrary, this environment built relationships that students reported helped them to write a better paper. Another student observed that, “through peer assessment I get to know my peers better and utilized assistance even outside the weekly assignment.” Indeed, peer review created an environment that was supportive even beyond the expectations for writing the paper.

Discussion

Students in any professional field where research and statistics are a required part of the graduate curriculum typically feel at least minor anxiety as they face the prospect of a research course (Davis, 2003; Kracker, 2002; Kracker & Wang, 2002). In fact, this anxiety is likely at the root of the extremely negative perception that students have toward research courses (Onwuegbuzie, 1997). Thus, any intervention—pedagogical or otherwise—that might reduce this anxiety could enhance student performance in research courses.

The following unsolicited email was sent by a student regarding the research methods course and illustrates the anxiety and stress described above which was assuaged by the peer assessment methods used in this course:

“Going into a research methods class was a bit scary, to say the least, so the fact that it became my favorite class in the program, and earning an A, was a happy surprise for me. I appreciate how you took a difficult subject and made it truly understandable and enjoyable. Giving us the ability to work in groups was an extremely helpful learning tool, as I was able to learn from the feedback of my peers, as well as having the opportunity to analyze their work and offer them feedback. I feel that you have provided me with a great foundation in research that I will be able to carry with me in future classes and in the social work field” (personal communication, June 15, 2016).

From this simple anecdote it is clear that peer assessment can reduce the anxiety of students in research courses and even significantly provide learning and skills that apply both in academic and professional settings.

The findings in this study suggest that the reduction of anxiety in students taking research courses plays a key role in making students comfortable with research content. In the quantitative analysis, average anxiety scores actually increased across the semester for the comparison group, which is to be expected in the typical arc of course expectations during a semester-long research methods class. Students would be expected to be experiencing more stress during finals week than they did in the first

weeks of the semester. With this context in mind, it is noteworthy that the anxiety scores for the peer review group decreased at the end of the semester. In other words, students who experienced peer assessment actually reported less stress at the end of their research class than the comparison group who reported slightly more stress, though admittedly these differences between groups were not statistically significant. At the same time, the qualitative data suggests that the intervention creates an environment that provides a strong system of support both socially and academically to help students. In this environment, students monitor and evaluate their own work through the work of their peers, providing both assurance and guidance regarding their progress through their research paper. It is important to recognize that peers were not doing all of the evaluation; the professors also provided substantial feedback, yet students recognized the added value and the low-risk environment that peer feedback provided. These results therefore suggest that that reduction in anxiety is one of the more promising aspects of the group-based, peer review approach evaluated in this paper.

In addition to providing a supportive learning environment, the intervention created an environment that supported the cognitive aspects to writing the research paper. This is seen in students’ remarks concerning both their learning of the research process and in their learning not only the social work content of their paper, but also in the content of the papers of their peers. The best performer among the three RPS subscales was the Overall Cognitive Aspects scale. Examples of questions from this subscale include, “I know how to approach a research assignment,” and, “When first given a research assignment, I know how to begin.” When taken together with the anxiety scores and the qualitative data, these findings suggest that engaging in group-based peer assessment activities in a research course may help students understand research concepts better and decrease their anxiety about research, while leaving them generally not excited with research as a skill. While student comments in the qualitative section of the survey showed a clear and unsurprising value placed on the formative feedback provided by the professors in these courses, students also remarked on the benefits of receiving this feedback specifically from their peers. As this intervention scaffolds both the social and the cognitive aspects of learning to write a research paper, students develop a greater sense of self-efficacy in relationship to this difficult task.

Implications for Research Instructors

The peer review and group learning process evaluated in this article did not convert every student into an avid researcher, but it appears to be helping students understand research concepts in an innovative way. As such, peer review should not be seen as a

panacea to stressed graduate students, but as a tool that can lessen anxiety and help students focus on both content and process in writing research proposals. For professors of courses in which graduate students write research, using peer review can cause two shifts. The first shift occurs in the instructional ethos of the classroom from being teacher-focused to a more collaborative and communal process. The second shift occurs as students focus less on the conventions (grammar, syntax, style, etc.) of research writing and more on the essential concepts of research that center on making claims based on the systematic collection and analysis of data.

Limitations

All of the qualitative and quantitative data collected in this study came from a total sample of 39 graduate students in two sister schools in communities in the northeastern United States. The sample was a convenience sample of two classes that were not chosen at random. Obviously, all of these factors limited the possibility of significant statistical findings at the traditional .05 level and speak to the limited generalizability of the findings presented here. Certainly there are innumerable variables that impact the experience of stress while writing, and not all such variables are accounted for in this paper.

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Making the Most of Online Discussion: A Retrospective Analysis

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Discussion forums are often a primary tool used for teaching and learning in asynchronous online courses. In this article, the author shares her experiences using discussion forums to promote learning, teacher presence, and community. In a retrospective microanalysis of discussion forums posts and interactions, the author identified five major purposes for discussion forums. Here, she details the rationale, mechanics, and interactions yielded for each type. Specific language of forum prompts, as well as teacher and student posts and interactions, are provided so that readers can, if interested, apply and/or modify the forum types.

I was a reluctant online teacher. I knew how to teach in brick and mortar classrooms, with movable furniture, white boards, handouts, projectors, and occasionally, shared snacks. I used technology to enhance my teaching, not replace it. Online teaching was a new frontier for me. I was skeptical about being able to build and facilitate rich relationships, meaningful interactions, and a sense of community in an online classroom. In my teaching, I depended on students' reactions, body language, nuanced cues, and sentient facial expressions to determine my own course of action as their teacher.

In this article, I discuss my reflections and analysis of my teaching and interactions with my students in the discussion forums of an online graduate course. Online discussion forums are a rich source of information about a course, as suggested by Meyer (2004): "the written record of online discussions is a boon to researchers and faculty who wish to better understand the dynamics of online course work" (p. 102). My goal in sharing my experience is to reflect constructively on my own teaching to improve my effectiveness while also offering support and advice to colleagues who are pondering or pursuing online teaching. Teaching, after all, is always a journey of becoming.

The popularity of social media demonstrates how conversations can develop and flourish in virtual spaces. Communities of people rally for causes, debate political viewpoints, share recipes and parenting advice, insert worldviews, and fund innovative projects and relief efforts. How can higher education institutions and instructors leverage the power of online conversations to enhance student learning, community, and satisfaction?

As more higher education courses are taught online, faculty are challenged to create virtual learning environments that use discussion to support student learning and success in online spaces. While many faculty may feel reticent about facilitating discussion online, the virtual environment brings many benefits to bear on discussion: asynchronous learning provides students time for reflection, research, contemplation, and careful articulation of thought before contributing an idea. In threaded discussions, students can return to

ideas and concepts and continue to revise their thinking throughout the course. Many faculty who have taught online have noted that the online environment facilitates more substantive discussion than is likely or possible in the face-to-face classroom (Baglione & Nastanski, 2007). Other characteristics of asynchronous online learning include opportunities to research; share substantiated ideas; recognize well-developed ideas and abilities (e.g., writing persuasively) demonstrated by peers; prepare thoroughly; and reflect, synthesize, and identify patterns. Online learning can also effectively accommodate the needs of diverse learners (Brewer & Brewer, 2015; Keller & Mangan, 2010; Milliron, 2010).

Mandernach, Forrest, Babutzke, and Manker (2009) examined student learning in face-to-face, asynchronous online, and synchronous online classes and determined that discussion alone, regardless of delivery, does not significantly impact student learning. Instead, they found that instructor interactivity was most critical, regardless of where or when the discussion took place. Online instructors often act as planners, role models, coaches, facilitators, and communicators, with the communicator role being the most critical to the success of online discussion (Heuer & King, 2004). Two decades ago, Berge (1995) identified four different roles that instructors play in facilitating computer-mediated discussions: pedagogical, social, managerial, and technical. So, how do online teachers apply these findings and practice multiple roles when teaching their courses and facilitating discussions?

Course Context

The course I taught and analyzed is a graduate course for students pursuing an initial teaching credential. Students enrolled in the course had undergraduate degrees in content fields (e.g., English, history, business) related to the teaching license they were seeking. The course, *Successful Schools for Young Adolescents*, provides a comprehensive study of middle level education (MLE), including its history and ideology. Additionally, it focuses on the developmental

Table 1
Number of Discussion Forums and Posts by Purpose

Purpose	Number of forums of this type in course	Total number of discussions and replies
Substantive Content Discussions	14	1,169
Virtual Coffee Shop	1 (persistent link)	214
Voluntary Product Sharing	4	64
Team Collaboration Forums	2	496
Skill/Question (Scaffolding)	2	83
Totals	23	2026

characteristics of young adolescents and the implications of those characteristics for middle-level schooling. I have taught this course four times, and this was the second time I taught it online.

I have studied and written about the importance of cultivating community in the online environment (Smith & Maiden, 2015) and therefore spend a great deal of time establishing a welcoming environment for learning. I use my university's learning management system (LMS) to deliver an asynchronous course designed for my students, primarily working adults who need flexibility in their study schedules.

Within the LMS, I use discussion forums as my primary method for interacting with students and ask that students use them extensively to interact with each other. In general, I use discussion forums to help students discuss course concepts and build a professional community. In my retrospective analysis of the discussion forums, I discovered that I use discussion forums for five different purposes, which are presented in Table 1. In the following sections, I discuss the purpose, method, and outcomes of each of the five types.

Substantive Content Discussion Forums

Purpose. Most research about discussion forums has examined content-focused discussions, such as those that focus on a text, lecture, or major course topic (Baker, 2011). Content discussion forums provide opportunities for students to demonstrate, share, and build their understanding of course concepts and to integrate an idea from earlier in the term with new ideas introduced in subsequent weeks. While content-focused discussions are key to the asynchronous online course, they are not sufficient for optimal online learning.

In my course, most of the consideration and examination of course content happens within the discussion forums. As a result, I spend significant time reading students' postings and providing both a quick rating and content-specific feedback that reacts to, and expands on, their ideas. For example, I might introduce another idea or resource, explain a practical application of a concept the

students are considering, or ask them to justify their positions using evidence from the text or other research.

Method. The expectations for the discussion forum are that students post mid-week and respond to multiple classmates on multiple days. I encourage them to think about our university's guidelines for face-to-face classes, that for each hour spent in class, three to four hours are spent outside of class. Applied to our online course, this means that students should plan to spend approximately 12-15 hours per week on the course. I ask them to think about how they might distribute this time in their schedules, and I explain that I generally spend time in the course each morning and each night. I emphasize that effective posts exhibit relevance to topic, personal opinions and comments, contribution to learning community, and interactions within the learning community, and these expectations are shared with students through a rubric. In addition, students are expected to write professionally. Finally, I ask students to end their posts with "something worth responding to" to invite additional conversation. If they have stated a point, they might invite others to disagree or change their perspective. If they still have questions, they might ask those questions so that others can respond. I explain that the discussion seems more natural and less forced if they invite responses rather than summarize their ideas or thoughts at the end of a post. Though I review these expectations with students in the syllabus and an introductory course video, I communicate with students that the "spirit of this law" is more important than the "letter of this law." In other words, I emphasize that my goal is for them to be in the course often, interacting with course concepts and with each other (see Brown, Roediger, & McDaniel, 2014).

Assessment. The content forums are the only forums that are graded. I use formative assessment to provide feedback to students about the quality of their weekly posts. Within the post, I use a drop-down menu and a custom scale to assign student posts a rating: goal, meets standard, needs improvement, or missing/absent. If, for example, they receive a rating of "goal," they know that if they continue to post at that level, they will receive the highest rating when I assign

Table 2
Number of Discussions, Responses, and Highest Exchanges by Week and Topic for Content Discussions

Placement in course	Topic	# of discussions	# of responses	Highest number of posts within a single thread
Week 1	Defining Middle School/Middle School Philosophy and Organization	33	72	9
Week 2	Middle School Concept: Historical Perspectives and Rationale	27	114	11
Week 3	Founders of the Middle School Movement	26	84	11
Week 4	Middle School Manifesto	26	64	9
Week 6a	An Exemplary Middle School Case Study	26	69	6
Week 6b	Prominent Middle School Leaders, Part II	31	31	4
Week 7	Prominent Middle School Leaders, Part III	26	29	4
Week 8	Middle School Curriculum	31	76	7
Week 11	Middle School Advisory	22	72	9
Week 12a	Intramural and Interscholastic Sports in MS	24	41	6
Week 12b	Gender Differences in MS Sports	23	37	5
Week 14	MS and opposing world views	24	58	8
Week 15	Specialized Middle Level Teacher Preparation	24	15	4
Week 16	Lessons Learned: The MS Expedition	23	41	7

a summative grade for their “Commitment to the Community of Practice.” The weekly formative ratings are not calculated as part of the grade but are used when I assign the summative grade. Students are directed to review the rubric and ask for additional feedback as needed.

Sample discussion prompts. Effective and appropriate discussion prompts are an important part of course planning and design and influence the depth of students’ learning. Meyer (2004) applied four content analysis frameworks to a set of discussion forum posts for a course and determined that the nature of the question (or prompt) influenced the depth of learning exhibited in student responses. Here is an example of a content-focused prompt for my course:

Middle level education has a deep and rich history related to curriculum. Four of the five founders were national leaders in curriculum. Many of the leaders interviewed in the Legacy Project cite the greatest disappointment of the Middle School Movement as its inability to influence the implementation of an appropriate curriculum for young adolescents. This week, we’ll discuss perspectives on the ideal middle school curriculum

as described by the founders and prominent leaders. It would be appropriate for you to further research the authors so you can understand their perspectives. Most of them eventually became professors and academics. It is also interesting to note the dates of publication and timeline of this kind of innovative curriculum thinking.

This week, all of you will read three selections that are alike and then you will choose additional texts to inform your own perspective and our collective discussion. In your initial post, please identify the individual reading you did and then make 4-5 statements of ideal middle school curriculum principles. Provide citations for your stated principles. These statements (yours and those of others) may be used in your upcoming DRMS Project and philosophy statement. Hang on to your own principle statements and feel free to borrow the great work of your colleagues as they offer it to the conversation.

In your responses, remember to push the conversation forward so that we all continue to learn and challenge each other. In your own teaching, you will need to advocate for sound practices, particularly related to curriculum. You will need to be able to state and support a position.

Other types of prompts I use include asking students to pose their own question, providing a list of discussion questions and asking students to choose one to answer, asking students to distill an authority's viewpoint to a series of short statements, and articulating a scholarly view on a publicly-debated topic.

My role. In the content discussions, I serve in the roles described by Heuer and King (2004): planner, role model, coach, facilitator, and communicator. As planner, I write prompts that are aligned to course goals and that guide students to deeper understandings of course concepts as they analyze, synthesize, and articulate, in the case of the example, curriculum principles. To manage the discussion forums, I set aside time each day to provide content-specific feedback. In this way, I also serve as a role model to students as we work alongside each other giving substantive feedback. I coach students with my questions, asking them to expand their ideas, consider an alternative viewpoint, or consult another resource. I am particularly attentive to these roles near the beginning of the course, when I serve as the primary facilitator of the discussions. As the course continues, other students assume functions as role models and coaches. The social function enters the discussions as students seek to build connections with each other's knowledge and experiences and as they identify those who are like-minded, as well as those who have differing perspectives or experiences.

Analysis of content discussion forums. We had 14 substantive content discussions over 16 weeks in this course. Each discussion yielded an average of 26 initial posts from students in the course. Table 2 provides summary data for the substantive content posts.

Documenting and analyzing these data have helped me to determine which prompts yield better discussions and increased student interactions. While the number of posts students make has been linked to higher exam scores and overall course performance (Carstens, Wright, Coles, McCleary, & Williams, 2013), increasing the quantity of posts is not my only teaching goal. In Weeks 6b and 7, for example, the number of replies is low by comparison to many other weeks and topics. Though students contributed fewer posts, I can see in course reports that students viewed the writings of "early posters," perhaps to guide their own thinking. This analysis helps me to see where the function of "role model" is beginning to be distributed among students in the course. I also further examined those discussions with the highest number of interactions to see if I was one of the responders in those exchanges in order to analyze the possibility that students are more likely to join a conversation when I contributed. Overall, in about 67% of the highest exchanges, I was one of the respondents. However, the trend changed over the course of the semester. In the first half of the course, I was a responder in 100% of the exchanges with the highest number of

replies, but in the second half of the course, I was a respondent in only 29% of those cases.

Students whose initial posts yielded a higher number of exchanges had a higher average final course grade and were less likely to drop the course. At the end of this course, the mean grade average for the set of students was 92.31, while the average grade for students whose initial post yielded one of the highest exchanges was 95.18. It is also important to note that approximately 28% of the original 32 students dropped or did not complete this course. However, none of the posters whose discussions yielded the highest exchanges dropped the course.

One of my colleagues calls content discussions the "bread and butter" of her online course. Indeed, content discussions are the essential, sustaining element of the course. They are the place where students and I generate and revise our understandings of course concepts, integrating readings and others' perspectives into our emerging and deepening understandings. Students can rehearse their articulation of ideas in ways that help them to be more confident in those ideas when they transition into their profession. As their teacher, I can monitor their writing and introduce ideas to "complicate" their understandings. I am both expert and co-learner, and am often inspired by the content of their posts. As the semester progressed, students became advocates, activists, and authorities in middle level education. The content-focused forums provided the basic forward rhythm for the content learning in the course.

Virtual Coffee Shop Discussion Forum

Purpose and method. The Virtual Coffee Shop forum provides a continuous communication channel between me and my students and among students, and it is a place for us to connect. These connections may come in the form of student or teacher questions, announcements, resource sharing, or support seeking. In the forum settings, I used the "forced" setting which automates an email for each Coffee Shop post and response. I use the Coffee Shop for all announcements, and I invite students to participate with this single, persistent prompt:

In my courses, I usually include a virtual coffee shop as an interactive space for us to share ideas, thoughts, questions, and wonderings. The coffee shop is open 24/7. Click on the Virtual Coffee Shop forum above or the coffee shop photo below to start or join the conversation. Welcome!

I used the Virtual Coffee Shop to make beginning-of-the-semester announcements, welcoming students to the course, asking them to complete a questionnaire so that I could personalize course content based on their

experiences, orienting students to the course and LMS, and providing information about library resources. Throughout the course, I used the Coffee Shop to announce synchronous meetings, offer popular media articles and resources related to course topics, share examples of exemplary schools in the news, and announce to the students that one of the individuals we had studied passed away. At the end of the course I made announcements and offered support related to the final exam and other culminating assignments.

Analysis of Virtual Coffee Shop forum. There were 81 discussions in the Coffee Shop and 133 replies. Of the 81 discussions, 37 were professor-initiated, and 44 were student-initiated. Fourteen different students started discussions in the Virtual Coffee Shop.

I was more likely than students to initiate postings at the beginning and end of the semester. I was the initial poster in about 59% of the first twenty and last twenty posts. In the middle, I was the initial poster about 30% of the time. This trend suggests that students may need more guidance from me as they were getting started and completing the course.

Students initiated Coffee Shop discussions related to political actions introduced and/or taken related to education in our state, requests for guidance about how to be an effective substitute teacher, and questions about assignments. They shared screen-casting and citation building tools they had found and provided advice about the state licensure exam. One student, often the first to access course materials each week, let us know if a resource was not opening correctly or a quiz link did not work. I encouraged him to post in the Coffee Shop, which he was reticent to do at first. He did not want to point out my "errors." I encouraged him to post so that when I fixed the problem, I could respond to the entire class, letting them know that the issue had been resolved. When students emailed me with questions about assignments, I asked them to post them in the Coffee Shop to ensure that everyone could receive the information. I use the Coffee Shop in the same way that I might use announcements or discussions of assignments in a face-to-face class. Students appreciate the transparency of this approach.

Here is an example of a student post in the Coffee Shop. She titled the post "Not So Graceful Exit":

Someone shared this blog post on my Facebook feed. It moved me. And (to be honest) makes me anxious about entering the profession. I know as a parent I get frustrated at parent-teacher conferences because all they seem to do is show me results from all these tests (so many acronyms!) that at one point I finally just have to ask, "But how do YOU think my daughter is doing?" It is my sincere hope that testing mandates and NCLB regulations are changed within our teaching tenure.

In my response to this student, I referred to postings from other students in the class to invite conversation and community, and I cited authorities we had read:

Hi, Mary...This is definitely a difficult article to read, but the reaction of this teacher's colleagues and supervisors also made me really sad. They didn't beg her to stay; instead, they wished they could go with her.

I just have to believe that the ground is swelling with wonderful, courageous thinkers and activists who are going to join forces and say, 'No more!' Perhaps the article that Sarah posted speaks to the promise of hope?

I saw a bumper sticker the other day that also made me sad. Richard Melton, are you reading this? Instead of First in Flight as the NC motto (challenged by states like Ohio, by the way), it said North Carolina: First in Teacher Flight. Ouch.

Howard Johnston [a prominent leader we studied] once talked to me about the movie, *Monuments Men*. I still haven't seen it, sadly. Here is a summary of who the Monuments Men were: The Monuments Men were a group of men and women from thirteen nations, most of whom volunteered for service in the newly created Monuments, Fine Arts, and Archives section, or MFAA. Most had expertise as museum directors, curators, art scholars and educators, artists, architects, and archivists. Their job description was simple: to save as much of the culture of Europe as they could during combat. These men not only had the vision to understand the grave threat to the greatest cultural and artistic achievements of civilization, but then joined the front lines to do something about it. Howard said the movie made him also think about education...middle level education, progressive education, education as a Common Good, as a human enterprise. Like the Monuments Men, we have to ask ourselves, "What is worth saving?," and, "What are we going to do about it?" I wish the answers and action were simpler.

In another exchange, a student posted about her "bafflement" with the complexity of an assignment, stating that she was having difficulty thinking about all the pieces at once and planning how to get started. She also expressed some frustration about working in a group. After answering each of her questions, I added this note at the end of my response:

Thank you again, Tammy, for your questions, and for posting them here so that our communication is open and transparent - and everyone sees the

responses. Let me know if I can do something to make this information more centralized for you. Some groups have made great progress, and I invite them to respond with suggestions of what has worked well.

A student in a different group offered Tammy supportive information about how her group had started their project, divided the tasks, collaborated using Google Hangouts and Docs, and outlined their white paper.

The Coffee Shop serves a social function and invites students to be self-directed learners and community members. Theories of student motivation influenced my development of the Coffee Shop. Citing a constellation of new thinking about the human condition, Daniel Pink (2009) writes: “Human beings have an innate inner drive to be autonomous, self-determined, and connected to one another. And when that drive is liberated, people achieve more and live richer lives” (p. 73). I do not coerce students to participate in the Coffee Shop discussions. Rather, I *invite* them to participate. I don’t choose the topics, especially once the course is underway. The Coffee Shop allows students autonomy to post and to share and relate to each other and to the course. The Coffee Shop is effective because it is *not* graded or required.

Voluntary Product Sharing Forum (VPSF)

Purpose and method. I also use discussion forums to invite students to share drafts of their work in a Voluntary Product Sharing Forum (VPSF). I use this forum as a means to provide formative feedback to specific students who volunteer their drafts, as well as a resource for students who view the work that is submitted and then returned with feedback. I explain that students are not required to share drafts, but those who do by a certain deadline are guaranteed specific feedback from me. I use track changes and comments functions in the word processor, as well as the rubric, to

provide feedback. The “catch” to volunteering is that the feedback I provide will be posted to the forum and viewable by the entire class. Students who do not wish to post their drafts to the VPSF can use virtual office hours to discuss a paper or assignment.

Hattie (2009; 2012) extensively studied influences on student achievement for K-12 and post-secondary students and found that the method of delivery (e.g., f2f, online) is not a significant factor in student achievement. Rather, what is most important are the ways that teachers “make their success criteria clear, the degree of challenge and feedback, and the quality of the interactions among students and the teacher” (p. 86). The VPSF can expand students’ understanding of criteria for success on assignments and offer criterion-specific feedback.

One benefit of the VPSF is that all students receive additional information about the rubric or grading criteria. I focus most of my feedback on grading criteria in the rubric and provide explanations of how students’ writing is related to the assessment criteria. Once my feedback is available, students continue to share and give feedback to each other. I also provide feedback to help students strengthen technical aspects of their writing. Because students view this feedback, this forum becomes a teaching tool. For example, I often comment on students’ application of APA (American Psychological Association, 2010) Style Guidelines. In my feedback, I provide specific instruction and offer a resource that further explains the guidelines. In this way, other students can see my expectations related to APA Style Guidelines and can access additional information to compose or correct their own work. Compared to my older methods of giving feedback on individual papers, errors and misunderstandings are greatly reduced.

Analysis of VPSF forum. I set up three voluntary product sharing forums for each of the three major assignments. The number of shares, views, exchanges, and feedback for each assignment are provided in Table 3.

Table 3
Number of Shares, Views, Exchanges and Feedback for Voluntary Product Sharing Forums

Assignment	Products			Teacher Feedback	Student Feedback or Comment
	Shared	Views	Exchanges		
Publication presentation	12	985	52	7	19
Philosophy paper	10	605	28	5 (some 2x)	7
Developmentally-Responsive Middle School Project	3	95	0	0	0

The data in Table 3 are presented in the order in which the assignments were due. Not surprisingly, the first assignment, the Publication Presentation, yielded the most shares, views, feedback, and comments. The forum for the second assignment, the Philosophy paper, received 605 views, with many students looking at the sample papers and my feedback. The final project only had three shares. For this project, students worked in groups, so three shares represents nearly half of the students. Because students were in groups, they likely used the samples as a resource, but they invested their energy in their own group's project.

The first student who posted in the VPSF shared her screencast publication presentation and received the following feedback and questions, mostly about the technical aspects of the presentation, from a peer:

I've watched your video twice now (one time to see the order in which you presented your ideas and articles, for inspiration!), and I really like your presentation. Your narration is clear and slow (I will have to slow down!) and works as a great guide to your video. The slides are clear, well organized, and not overcrowded... I was able to both download the video and watch it embedded in the browser. Did you upload the video to your google drive or just post the video in the uploads box? How large was your initial file if you remember?

She also received this feedback from me:

"Thank you so much for sharing your project and video with us. It is great to have an example posted with video and audio for our consideration. In your video, your voice is great. Mitch is right. The pacing was perfect, and your inflection was great. It is clear that you wrote a careful script for your video that is closely aligned to the evaluation criteria I provided. The narration supports the visuals nicely. I am wondering if the 15-slide limit was difficult for you. I wonder if I need to modify the assignment when it's a video to focus on time rather than slides? I'd love your perspective on that.

"In terms of the criterion related to 'provided an authentic, meaningful learning experience for colleagues,' I think your video really hits the mark. I could see asking faculty to view the video prior to a faculty meeting and then discussing the application of some of the ideas you raise - or then asking faculty to read one of the articles you highlight and discuss it in small groups. They could discuss how their school is meeting the four types of needs mentioned in the article you highlighted - and how they could improve their programming. There are many possibilities for

follow-up, and this video could be a great prompt and preparation for that.

You provided the right level of specifics and overview for each publication, and you demonstrated an ability to link the publications to concepts in the course. I like how you made the publications relevant by discussing specific elements that "stood out to you."

You also provided a nice discussion of how the work included in the publications might be extended and what curiosities you might pursue as a result of reading the publications.

One slight improvement that isn't really in the rubric but that would improve the video would be to provide some type of conclusion or summary statement... The video ended a bit abruptly with the conclusion of the final slide.

Well done, Kelly - and thanks again for your contribution. When you are ready, you can upload your video in the assignment area."

This was the first constructed-response assignment due in the course, and while the VPSF is completely voluntary, it had 985 views. Fourteen students shared a draft of this project with the class. The five who shared drafts prior to my deadline for early review received criterion-specific feedback from me. Two more received brief feedback from me. All students who shared drafts before the project deadline received feedback from at least one peer. In all, there were 52 voluntary exchanges about this project. Two unexpected outcomes resulted from this forum. First, one student who is particularly skilled with the creation of video and audio media making started a discussion in this forum, providing technical suggestions and support for this project - more support than I could provide (see, for example, Razak & Yee, 2010; Willis, Davis, & Chaplin, 2013 for more benefits of online peer learning). His suggestions helped other students experience more success, and he became our expert on screen-casting and audio capture. In addition, having students share early drafts allowed us to troubleshoot technical issues with this assignment. For example, some students had files that were not "shared" in a way that their peers could access. Others received feedback that helped them improve visual and/or audio quality. The students worked together to help each other improve their work and achieve success. Admittedly, some of the students focused their feedback more on the technical aspects of the project than the content aspects. However, this allowed me to focus my attention on the content of the projects and provide feedback specific to the criteria.

The second forum in this category was provided for students to post a paper in which they were to

articulate their emerging philosophy of education. Though it was to be a scholarly work, it was also a personal reflection. I was the first person to post in this forum. Functioning as coach and role model (Heuer & King 2004), I wanted to provide an expanded view of what this assignment might look like and encourage a creative but scholarly approach. I also wanted to share my process for distilling beliefs and ideas. I attached my draft to this post:

Hi, everyone. I thought I might share a draft of a philosophy paper I've been writing. It's certainly not aligned to your assignment or draft, but I think it does demonstrate a bit about "voice" in a philosophy statement. I hope that your philosophy statement will be uniquely yours though, like mine, it will draw from many wonderful ideas of others. In my work as a public school teacher and administrator - and in my current work on search committees and as a mentor of faculty, I read quite a few philosophy statements. Sometimes, they are so vanilla, so common and generic, that they could be true of anyone. I certainly don't mean to add extra pressure. I actually want to give you some freedom to express yourself uniquely.

I am currently a participant in a Leadership Academy, and last week, I had to do an exercise identifying my core values. Somehow it was very slow, painful work - and yet a week later, I find that I keep returning to the hand-wringing I was doing to get that wording right. I think philosophies and core values matter because they ground us in beliefs that we can return to when we find ourselves trying to make decisions.

Anyway, mine is definitely still a draft. I've written many of these in my career actually, but as I work through these with other faculty and with you, I want to keep revisiting what I'm saying, what I'm believing.

Philosophically and pedagogically yours,
TWS

One student responded to my post:

Thank you for sharing. I have a lot of quotes and ideas that I wanted to incorporate but was not sure how to do it. I love that your inspirations are so varied (from a children's book to a president). I was starting to get a bit bogged down in trying to write my philosophy paper and I think this and some of my readings from this week in both your class and my diversity class have been the "kick in the pants" I needed.

In my view, the VPSF improves students' success on assignments and may reduce their anxiety by providing

additional interpretations of the criteria for success. As a teacher, I want to make success criteria clear, provide substantive and specific feedback, and foster positive interactions among my students (Hattie, 2015).

Team Collaboration Forums

Purpose and method. The team collaboration forum provides a space in the course for students to communicate about group projects. Both of the collaboration forums that I set up were for the culminating project for the course. Though college students tend to dislike group projects, many professors (including me) see the value in collaboration. In their careers as teachers, my students will need to work with other professionals to accomplish goals. In online classes, there can be even more challenges to group projects. A simple web search about "group work in college" yields many articles and blogposts advising students how they can "survive" group work. A frequent suggestion is to establish clear methods of communication in the group.

The Team Collaboration forum serves this purpose in my course. I ask my students to put all their communication into the team collaboration forum. This way, I can monitor participation of group members, seeing who is and is not contributing. I can prompt students who aren't contributing, noting their lack of visibility in the collaboration space. Students who fear that others might shirk group responsibilities are willing to move their communication to this forum because they know that the transparency means increased accountability of group members who are silent or absent in the collaboration.

Analysis of Team Collaboration forums. This forum yielded more views than any other discussion forum or resource in the course. There were 3365 views, 89 discussions, and 307 contributions or exchanges in this forum. The next highest number of views was the Virtual Coffee Shop with 2,454 and the syllabus with 1,554.

I found that some students and groups were beginning to email each other outside the course, and it was causing some confusion. Some group members weren't sure where they needed to find materials when they were using email, cloud storage, and the course LMS. I suggested that even if they used outside collaboration tools (e.g., Google docs), they should use the team collaboration forum for their primary communication. In that way, it became a one-stop shop. Links to other sources could be posted in the forum. Here is an excerpt of a student post in the collaboration forum:

Updates—Here's a summary:

- Brittany is working on the overall mission statement

- Sam is working on the philosophy statements for each individual component, except physical activity and wellness.
- Mark is working on a philosophy statement about physical activity and wellness.

We still need to flesh out Grouping Practices and Contribution to Overall Success of School.

Though I did not participate as much in this forum, I could watch the conversations and “see” the projects emerging. Since I set the posts to come to my email, I could monitor them throughout the day or at a designated time each day, offering resources or suggestions as needed to particular groups. If multiple groups needed guidance, I could start a discussion in the Virtual Coffee Shop.

Overall, students reported a more positive view of the group assignment than I have experienced in previous instances, even in face-to-face courses. They stretched their collaboration muscles in ways that, I believe, are healthy to their professional development. This forum served as an effective communication and collaboration hub for this final project.

Skills Forum

Purpose and method. The final discussion forum that I used involved asking students to develop and demonstrate a skill in a low-stakes way before they were to practice that skill on a graded assignment. This was an effort to scaffold the first assignment as well as the final, culminating assignment and to troubleshoot potential problems that might prevent students from being successful. To help students provide effective feedback, I posted examples and modeled providing specific, criterion-based and best practice feedback.

Analysis of Skills forum. In the first skills forum, I asked students to create three presentation slides and offer peer feedback. In this example, one student offers his expertise as a graphic design teacher:

If I can give a word of advice, as a teacher of graphic design; be wary of using images as a background. While it might seem like a good idea, often times the words in a presentation become hard to distinguish from the background, especially with light on light and dark on dark color schemes. This is why a lot of graphic design is done on a solid color background. Readability should be the primary goal.

This student let her classmate know that she couldn’t access his presentation but also told him how to fix the problem:

Steve, the link seems to work, but I had to request access. Under the part where you had the option to share the slides, I think there was an option to share with anyone who has an Appalachian email address. You may have to adjust that and then repost the link.

In several cases, students commented on what made the slides technically effective and visually appealing:

Great slides, I like the use of the black and white photos. This keeps it simple and clean. I also like how you chose to only include one quote on each slide. This makes for a great talking point for each slide and keeps your audience from focusing too much on the slide and not on what you have to say.

Students also sought feedback regarding the technical aspects of their slides:

Allison: Could someone comment and tell me if they can see my slides or not? I've never used this software before so I want to make sure I've done it correctly!

Reagan: I can see your slides! They look great.

In all of these cases, the peer feedback and advice improved the quality of students’ assignments and established group norms and expectations about effective presentations. Students also learned how to share documents using cloud storage and hyperlinks. This made later collaborative work run more smoothly. What I really appreciate is that the suggestions and advice did not always come from me. I set up the space for students to develop their skills, and as an added bonus, students could also serve as mentors to their classmates, sharing their expertise to help each other.

Findings and Conclusions

Using discussion forums for these five purposes yielded positive outcomes for students and for me. In the content discussions, students demonstrated depth of understanding of course concepts. They exercised their abilities to voice informed opinions in diplomatic ways, a skill that I believe will be increasingly important to teachers in our state and nation. In the Virtual Coffee Shop students became a community of learners and professionals. By sharing and responding to each other’s work in the Voluntary Product Sharing Forums, students gave and received feedback, and they had the chance to understand more clearly the criteria for success on assignments. In the Collaboration Forums, they worked in teams to apply course concepts and communicate about their work. The Skills Forum allowed students to develop skills that would be

essential to success later in the course. Students supported each other in building these skills.

I was active in all the forums and in a variety of ways. This is perhaps (and admittedly) the luxury of teaching a small, graduate course. I found that the community I feared giving up when moving my course online could be cultivated in virtual spaces as well. My time invested in the discussion forums seemed to make a positive difference in my students' experiences, as is evidenced in these two sample comments from my end-of-course student evaluations:

Student 1: Dr. Smith is truly inspiring. Her enthusiasm and engagement in the subject inspired the same enthusiasm from her students. Having her participate in our discussion forum made me feel that what I had to say really mattered to her, and it was great to hear feedback in this way. Her take on discussion forums was very mentor oriented, and I really appreciated that.

Student 2: I feel that the discussion forums were a great source of learning and sharing. Even though I have never met my classmates in person, I really think we got to know and understand each other. The discussions were lively and informative, and Dr. Smith participated and facilitated in a way that kept everyone interested.

My story would be incomplete if I did not also acknowledge some of the challenges the students and I experienced. First, teaching with attention to these discussion forums takes a lot of time. I spent time nearly every night and on weekends checking the forums and giving students feedback and direction. Sometimes they were stuck and needed my help to push through an assignment at night or on the weekends when they were not working at their jobs. Also, there were definitely a few students who did not engage. As I mentioned previously, 27% of these students withdrew from the course. Some of this attrition was due to the nature of the program: a graduate program for teachers pursuing initial licensure. It was challenging to balance the rigor and expectations of a graduate course with the needs of working adults at the beginning of their profession. Some students also felt that there were too many discussion forums. The students were gracious in providing some specific suggestions for changing some of the discussion forums. Now that I have analyzed the course materials, I will analyze students' suggestions and begin making improvements in the course.

I am not sure that online teaching and learning is the answer for every institution, program, or teacher. However, I have seen firsthand its power to bring together and raise up communities of learners from geographic and demographic expanses. I have observed prospective and novice practitioners become advocates

and activists as they have shared and co-constructed ideas and meaning in online discussion.

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Differentiated Impact of Flipped Instruction: When Would Flipped Instruction Work or Falter?

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This study assessed the impact of flipped instruction on study effort, exam performance, motivation, and perceived class quality in two sections of an introductory chemistry course. Giving frequent assignments and quizzes provided enough incentive to ensure pre-class study compliance, and flipped instruction did not appreciably increase overall study time. However, technology failures early in the class show an important lesson of what can occur when a teaching modality dependent on technology is used. Unlike in our previous study, flipped students underperformed their control counterparts in the final exam. Differentiated treatment effects were identified, as sophomores and females benefited more from flipped instruction. Similar trends were also observed with student letter grades from a subsequent chemistry course. Flipped instruction did not increase student general motivation. Flipped females, however, exhibited stronger end-of-quarter motivation than flipped males. Flipped students perceived the class to be of lower quality and expressed discontent with in-class technology failures and active learning techniques. We reflect upon the resilience of the traditional lecture format and suggest that new pedagogical methods be implemented at a conservative rate to preserve student learning outcomes in the face of implementation issues.

Flipped instruction is a phenomenon that has rapidly gained momentum since 2008, partly owing to its popularization by two high school teachers (Bergmann & Sams, 2008) and by institutions such as Khan Academy (Bishop & Verleger, 2013). The rise of flipped instruction is a reaction to the discontent with the traditional lectures that have been criticized for perpetuating passive knowledge transfer (Prince, 2004). To encourage productive use of knowledge, a variety of teaching techniques have been invented and are collectively known as active learning techniques, e.g., think-pair-share, peer instruction, in-class demonstration, writing-to-learn, problem-based learning, project-based learning etc. By changing an instructor's role from a "sage on the stage" to a "guide on the side," the goal of active learning is to foster conceptual understanding, analytical skill, creativity, and collaboration. Despite growing evidence showing that active learning works (Michael, 2006; Prince, 2004), many researchers have pointed out that adoption of active learning techniques in practice is hindered by the limited class time to deploy them (Bishop & Verleger, 2013; Moravec, Williams, Aguilar-Roca, & O'Dowd, 2010). Flipped instruction solves this dilemma by offloading the instruction of some new material before class to free up class time for active learning with more practice and problem-solving activities. Unlike hybrid or blended learning, this seat time is not reduced, but simply altered to include more active learning components. This can include completing material that would traditionally be thought of as homework, though generally, the students are still assigned some homework assignments. These post-class homework assignments are often decreased in quantity to account for the work done in class. For these reasons,

flipped instruction has attracted immense interests from teachers and researchers alike in recent years.

Treatment Effect on Exam Performance

Although only a handful of empirical studies assessing treatment effect (flipped instruction) on student exam performance were published before 2012, recent years have seen a surge in the number of such studies. Focusing solely on higher education, we have found 35 studies (see Supplemental Material A) that have reported enough information for computing effect sizes as measured by Cohen's d . Among them, eight studies showed negative or null impact, eleven showed small effect ($0 < d < 0.3$), eleven showed moderate to large effect ($0.3 \leq d < 1.0$), and five showed surprisingly large effect ($d \geq 1.0$). For the eight studies showing negative or null impact, all results were statistically non-significant with the largest negative effect size of -0.114. In other words, one in four flipped classrooms was about as effective as traditional classrooms, and three in four of them would outperform their traditional counterparts.

While most empirical studies have focused on measuring overall impact, fewer have examined the potential heterogeneity of the treatment effect. Three studies thus far have reported differentiated treatment effect on performance by question type. With an overall main effect of 0.75, Mason, Shuman, and Cook (2013) reported that their flipped instruction was about twice as effective in improving student performance with design-based problems ($ES = 1.19$) relative to non-design based ones ($ES = 0.58$).

Touchton (2015) showed that flipped students performed particularly well in more challenging components of the final applied statistics research paper regarding methodology, diagnostics, and research implications. Quint (2015) found that flipped instruction had a stronger impact on conceptual questions ($ES = 0.47$) as compared to procedural ones ($ES = -0.10$). Thus far, few studies have explored the effects of student demographics. Our prior study (He, Holton, Farkas, & Warschauer, 2016) looked into this issue but did not find any interactions between treatment condition and student demographics. Beyond our study, we have failed to identify other studies investigating this issue.

In large lecture halls, flipped classrooms generally require significant use of technology. During adoption, this can put great stress on the institution's infrastructure. Because implementation issues arise when dramatically changing technologies and course design, the effects of these changes on student learning should be considered. We have not found any published study reporting statistical data collected under these circumstances.

Research Questions

The current study is a follow-up to our previous work. Our prior study showed a small but statistically significant, treatment effect ($ES = 0.192$, $p = .008$). Student survey responses revealed non-compliance to pre-class study as a major implementation issue that we believe led to the small treatment effect and lack of interaction. The primary goal of this study is to continue our quest to measure overall treatment impact and explore moderation effects. It is of interest to see whether including pre-class for-credit quizzes would provide enough incentive to ensure compliance. Moreover, we are also attentive to students' perceptions of the flipped classroom and to any further implementation issues. Finally, our prior study indicated that flipped instruction caused a shift in student workload from post-class to pre-class without appreciably changing the overall out-of-class time working on course material (study time). This study would check if the result is reproducible.

The instructor had previously taught the course in a flipped format, and the major components of the course were unchanged from the previous implementation (He et al., 2016). However, the change in response system from Iclicker to Learning Catalytics introduced an unexpected opportunity to study the effects of common implementation issues that occur when relying on technology to flip courses.

Hence our current study intends to answer the following research questions for the course:

- (1) Did flipped students comply with pre-class study requirement, and did they spend more or less time studying outside the classroom?
- (2) Did flipped instruction increase student exam performance and motivation? If so, did students of diverse background benefit equally? Did flipped instruction have sustained impact on students' overall performance in a subsequent course?
- (3) Did flipped instruction impact perceived overall class quality?

Method

Course Description

The present study was conducted in Fall 2014 in two sections of a first-year general chemistry course taught by the same instructor at a large public university in the western United States. Previously, the instructor has taught the course seven times in three consecutive years using a traditional lecture format. Flipped instruction was implemented and studied for the first time in Fall 2013. In Fall 2014, a new cohort of 607 students was enrolled into two sections. Both sections met three times a week on Mondays, Wednesdays, and Fridays for ten weeks. The control class was scheduled from 1:00 to 1:50 pm, and the treatment class from 2:00 to 2:50 pm. To avoid students taking alternative sections, class attendance was mandatory and was recorded via Learning Catalytics, a cloud-based learning analytics and assessment system, which accounted for 5% of the final grade.

The control courses were taught in a traditional lecture format. Book reading was recommended, though not "assigned" or tightly correlated with the lectures. No accountability measures were taken to ensure that students did read as recommended. In class the instructor lectured for the full class time. The bulk of the lecture was delivered with PowerPoint slides, with more complex problems being worked out on the document camera. A mixture of definitions, introductory concepts, conceptual discussions, and problem-based discussions was used. While the lectures did occasionally pause for reflections and simple questions were given to the students, time was not set aside to allow them to properly solve or think through a problem on their own. No free work time was given for problem solving. Learning Catalytics was used once per class for a simple knowledge-based question. It was typically given halfway through the class period and was used to control for required attendance in the control section.

For each 50-minute class meeting, the treatment students were required to watch about two online videos before class. The videos created for the previous

flipped class were reused. From student feedback, five videos were recreated to increase audio quality, and three long videos were split into short ones. The combined length of the videos remained practically unchanged, totaling 53 videos and 514 minutes with most videos within the range of 5–15 minutes ($M = 9.70$, $SD = 5.01$). To ensure compliance, each video was accompanied by an assignment, and each class would begin with a quiz with straightforward questions to test on video material. The assignments focused on questions at the level of remembering and understanding information. Students were expected to spend 60 to 90 minutes per week studying before class. The quizzes accounted for 5% of the total grade.

In the flipped section, a typical meeting was divided into three segments. First, the instructor would briefly review pre-class material and go through the pre-class assignment for 5 to 15 minutes. This portion of the course was still “flipped,” given that it included a brief two-minute open-note “quiz” to check for understanding and to increase accountability for watching videos. The quiz questions, much like the assignments, were focused at the level of understanding and remembering. The review itself did not solely repeat factual information but aimed to foster conceptual understanding. The instructor would spend another 10 to 15 minutes with two relatively simple problems. These problems asked the students to understand and apply conceptual and procedural problems. Students worked on the problems in small ad hoc groups (typically 2–4 students) and submitted their answers via Learning Catalytics. Finally, the rest of class time would feature two to three increasingly difficult worksheet problems. These ranged over the full breadth of difficulty and complexity depending on the topic being taught and based on the results of the homework and quiz. Speed and difficulty were adjusted based on class needs. The instructor and teaching assistants would roam over the classroom and offer help whenever needed. Students could submit and change answers at any time, and the results were dynamically displayed to the instructor. The collective responses from the class were shown to the students, and the students were given time to discuss within their groups and change their answers if needed. If the majority of the class faltered, the instructor would either provide more hints or adjourn current activities to address common mistakes. Challenge problems were included, but not discussed, to engage student groups who finished problems before the class was ready to move on. Students were required to complete homework after class, which constituted 10% of the total grade.

For both control and treatment sections, homework was given after class, which constituted 10% of the total grade. The assignments in the treatment course were reduced in volume to approximately 90% to account for

the work completed before and in class. Homework was delivered via Mastering Chemistry, which has multiple functionalities but was used in this course primarily for homework. Homework was a mixture of conceptual, definition, and problem solving questions, varying in difficulty from simple one-step questions to complex multi-topic and multi-stepped problems.

Participants

In total, 657 students were initially enrolled in the control ($N = 313$) and treatment ($N = 344$) sections. During the first class meeting students were informed of the study and were invited to participate. After excluding students who either dropped the class or did not participate in any exams, the effective sample size was 287 students in the control and 320 in the treatment section, among whom most agreed to participate in the study (i.e., 97.56% or $N = 280$ and 95.94% or $N = 307$ respectively). Participants' demographics information was collected from the University's Registrar.

Student demographics were similar between sections, and a detailed comparison is shown in Table 1. Students came from 36 different majors and 12 ethnic groups. For simplicity, majors were regrouped into Biology/Chemistry, STEM (i.e. all STEM majors except for Biology and Chemistry), Non-STEM, and Undeclared. Similarly, ethnicity was regrouped into White, Black/Latino, South Asia, East Asia, and Unstated. High school GPA was collected, since the majority were freshmen who took this course as one of their first college-level courses.

Measures

A number of measures, including exam performance, out-of-class study time, motivation, and perceived class quality, were collected from exams and surveys.

Examinations. Three non-cumulative exams in weeks 3, 6, and 9 and one cumulative final exam in week 11 were administered, accounting for 15%, 20%, 20%, and 25% of the total grade respectively. All exams were similar in form and were administered back to back. To avoid cheating, different forms of the exams were used with isomorphic questions. Raw scores were converted into percentages. Students' letter grades were collected from a subsequent chemistry course, where our course is the first one in the sequence. The letter grades were converted into numeric values in such a way that an A+ corresponds to 13 and an F to 1.

Surveys. Five surveys, a pre-survey and four post-surveys (see Supplemental Material B), were delivered to measure students' study effort, motivation, and perceptions. The pre-survey was given after the first meeting. Each of the identical post-surveys was

Table 1
Descriptive Statistics of Demographics, Pre-Survey Results, and Exam Outcomes by Group

Measure	Control (<i>N</i> = 280)	Treatment (<i>N</i> = 307)	<i>t</i> (<i>p</i>) or χ^2 (<i>p</i>)	Cohen's <i>d</i>
	<i>M</i> (<i>SD</i>) or Percentage (<i>N</i>)	<i>M</i> (<i>SD</i>) or Percentage (<i>N</i>)		
SAT Math	604.37 (72.03)	600.19 (76.19)	-0.67 (0.506)	-0.056
High School GPA	2.87 (0.62)	2.78 (0.60)	-1.78 (0.076)	-0.148
Chemistry/Biology	51.97% (145)	63.40% (194)	11.15 (0.011)	
STEM	11.83% (33)	9.48% (29)		
Non-STEM	7.53% (21)	2.94% (9)		
Undeclared	28.67% (80)	24.18% (74)		
Freshman	88.53% (247)	92.81% (284)	3.38 (0.184)	
Sophomore	8.24% (23)	5.56% (17)		
Junior/Senior	3.23% (9)	1.63% (5)		
Male	43.84% (121)	42.81% (131)	0.06 (0.802)	
Female	56.16% (155)	57.19% (175)		
White	11.11% (31)	16.67% (51)	4.28 (0.370)	
Black/Latino	31.54% (88)	28.43% (87)		
South Asia	27.96% (78)	28.76% (88)		
East Asia	26.52% (74)	23.53% (72)		
Unstated	2.87% (8)	2.61% (8)		
Interest	4.21 (0.93)	4.18 (0.96)	-0.28 (0.779)	-0.032
Utility	5.25 (0.84)	5.22 (0.80)	-0.32 (0.750)	-0.037
Importance	4.79 (0.92)	4.77 (0.94)	-0.31 (0.760)	-0.022
Self-efficacy	4.23 (0.87)	4.24 (0.87)	0.13 (0.893)	0.011
Motivation	4.80 (0.61)	4.79 (0.58)	-0.32 (0.749)	-0.017
Pre-class Study Time	5.27 (4.72)	5.35 (4.40)	0.21 (0.834)	0.018
Post-class Study Time	7.44 (5.50)	6.61 (5.94)	-1.61 (0.108)	-0.145
Midterm1	52.69 (17.54)	51.65 (16.86)	-0.73 (0.468)	-0.060
Midterm2	68.85 (15.14)	70.15 (14.85)	1.05 (0.294)	0.087
Midterm3	61.75 (19.23)	61.61 (17.97)	-0.09 (0.926)	-0.008
Final	67.98 (16.28)	64.70 (15.96)	-2.45 (0.014)	-0.204
Post-course Grade	7.01 (2.84)	6.32 (2.92)	-2.49 (0.013)	-0.239

Note. All estimates are standardized beta coefficients. Standard errors are in parentheses.

⁺ *p* < .10, * *p* < .05, ** *p* < .01, *** *p* < .001

administered three days before the corresponding exam to isolate the results from exam performance. To encourage participation, 0.4 extra credits were rewarded for completing each survey, leading up to two extra credits in total. All survey responses were kept separate from the instructor and not processed until after the quarter. Students were advised by a study information sheet that

the instructor would receive a list of participants and would not see any results of the survey until after the final grade deadline, and that all results would be reported only in aggregate. Survey items were framed on a 6-point scale with one being the most negatively keyed and six the most positively keyed responses. The survey response rate was higher (over 85%) in the beginning and lower (slightly

below 80%) towards the end, averaging 82.64% ($SD = 4.44\%$) in the control and 80.91% ($SD = 3.93\%$) in the treatment sections.

Our survey motivation items were adapted from the Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich, Smith, Garcia, & McKeachie, 1993). Compliant to the expectancy-value theory (Wigfield & Eccles, 2000), items on interest, utility, achievement values, and self-efficacy from MSLQ were used in our study. Three items measured each construct, whose reliability was assessed by Cronbach's alpha. In all surveys, the averaged alpha was over 0.80 for all constructs. A general motivation measure was hence constructed by averaging the twelve items with an average alpha of 0.89 (range: 0.85–0.92) over the surveys.

To measure study effort, the pre-survey asked students to provide numeric estimates of the average number of hours per week they spent studying before and after class for a typical science or mathematics class. Post-surveys asked for estimated average pre- and post-class study time per week during the intervening weeks between the previous exam and the incoming one.

Four post-surveys asked about students' perceived effectiveness of different instructional avenues. Student ratings on lecture quality and class quality were averaged to construct a measure of the overall class quality with a Cronbach's alpha averaging 0.81 ($SD = 0.03$). Post-surveys also included two items asking about the extent flipped students completed all pre-class videos and assignments. Students' narrative comments were collected from the university-wide end-of-quarter optional instructor evaluation.

Note on compliance measures chosen. While video analytics are often suggested as a compliance measure, we opted against using these types of analytics. Students forced to watch videos can allow them to play in the background while not engaging with the material. Additionally, the assignments were written in a manner that allowed students to use the text book or other resources to answer them. It is also expected that many students may work in groups and get help from fellow students to complete the assignments. Because the questions highlighted all important topics in the video, even completing the assignment with the help of a fellow student would ensure a degree of preparedness for class. Students were encouraged to use the modality that best fit their particular preferences and needs.

Results

Preliminary Comparisons

Group equivalence. Descriptive statistics by section are presented in Table 1. Student demographics and pre-survey results suggest reasonable group equivalence on all measures except for high school

GPA and majors. Specifically, the flipped students on average had lower GPA by -0.09 points out of 4.00, which is a small effect in size ($ES = -0.148$, $p = .076$). The treatment section, however, had notably 11.43% more Chemistry/Biology majors, and less STEM, undeclared, and non-STEM majors (i.e., 4.59%, 4.49%, and 2.35% respectively); and the chi-squared test showed statistically significant ($p = .021$) difference in majors. In subsequent ordinary least squares (OLS) regression analyses, student demographics were included to address minor group imbalances.

Outcome comparisons. From Table 1, two-sample t -tests showed no significant impact of flipped instruction on all three non-cumulative midterms, as the magnitude of the effect sizes was consistently smaller than 0.10 standard deviations. In the cumulative final exam, flipped students on average underperformed their control counterparts by 3.28% ($ES = -0.204$, $p = .014$), which is close to a half-letter grade difference. Furthermore, in the post-chemistry course, the flipped students also underperformed their control counterparts ($ES = -0.239$, $p = .013$).

Compliance and Study Time

(1) Did flipped students comply with pre-class study requirement and did they spend more or less time studying outside the class?

Compliance. To ensure compliance, each class meeting started with a quiz. Flipped students generally did quite well in the quizzes, indicating a high degree of pre-class study compliance. Survey results corroborated this claim. On average, 83.71% ($SD = 5.13\%$) of the flipped students indicated that they often finished all the videos before class, among which 36.11% ($SD = 2.06\%$) reported to have always finished them. On the contrary, 16.29% ($SD = 5.13\%$) claimed that they were often unable to watch all the videos, among which 2.51% ($SD = 1.79\%$) claimed that they never watched videos.

Study time. Table 2 shows the self-reported estimates of pre- and post-class study time for each section. Three midterms and one final exam naturally delimited the class into four periods. Flipped students consistently spent more time before class (ten-week average: $ES = 0.165$, $p = .055$) and less time thereafter ($ES = -0.194$, $p = .024$). As a result, the overall out-of-class study time was roughly the same ($ES = -0.024$, $p = .768$). These results confirmed what we had shown in the previous study that flipped instruction did not put extra burden on students, as increase in pre-class study time was offset by decrease in post-class study effort.

Exam Performance and Motivation

(2) Did flipped instruction increase student exam performance and motivation? If so, did students of

Table 2
Self-reported Out-of-class Study Time in Hours by Section

	Week	Control Mean (SD)	Treatment Mean (SD)	<i>t</i> -statistic (<i>p</i>)	Cohen's <i>d</i>
Before-class	Weeks 1-3	4.641 (3.714)	5.298 (3.363)	2.087 (0.037)	0.186
	Weeks 4-6	5.347 (4.078)	5.822 (3.707)	1.326 (0.185)	0.122
	Weeks 7-8	5.241 (4.005)	6.191 (3.915)	2.563 (0.011)	0.240
	Weeks 9-10	6.039 (4.548)	6.86 (4.293)	1.762 (0.079)	0.186
	Weeks 1-10	5.444 (3.834)	6.043 (3.427)	1.927 (0.055)	0.165
After-class	Weeks 1-3	9.67 (5.595)	8.463 (5.378)	-2.482 (0.013)	-0.220
	Weeks 4-6	9.772 (5.63)	8.694 (5.777)	-2.056 (0.040)	-0.189
	Weeks 7-8	9.381 (5.635)	9.032 (5.637)	-0.662 (0.508)	-0.062
	Weeks 9-10	10.29 (6.709)	9.279 (6.263)	-1.477 (0.141)	-0.156
	Weeks 1-10	9.834 (5.472)	8.805 (5.168)	-2.26 (0.024)	-0.194
Out-of-class	Weeks 1-3	12.566 (9.331)	12.124 (8.839)	-0.588 (0.557)	-0.049
	Weeks 4-6	12.688 (9.763)	11.671 (10.212)	-1.233 (0.218)	-0.102
	Weeks 7-8	11.658 (9.656)	11.979 (10.589)	0.385 (0.701)	0.032
	Weeks 9-10	9.896 (11.646)	10.546 (11.373)	0.682 (0.495)	0.057
	Weeks 1-10	11.943 (8.613)	11.73 (8.795)	-0.295 (0.768)	-0.024

Note. All estimates are standardized beta coefficients. Standard errors are in parentheses.

⁺ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

diverse background benefit equally? Did flipped instruction have sustained impact on student overall performance in a subsequent course?

Exam performance. To account for minor imbalances over GPA and majors, OLS regression was employed, and the results are shown in Table 3. They are explained in brief here and in more detail in the following paragraphs. The first three models used final exam scores as the dependent variable. In our study, the cumulative final exam was valued more than non-cumulative midterms because it revealed the overall long-term impact of flipped instruction. Moreover, 70.36% ($N = 197$) control and 75.89% ($N = 233$) treatment students were enrolled into a subsequent chemistry course in the following quarter. Their letter grades were used as the dependent variable for models 3.4–3.6 in Table 3. In all six models, continuous variables were standardized, and the estimates are hence standardized beta coefficients that can be interpreted as effect sizes.

Model 1.1 is the main effect model that included student demographics and prior motivation as covariates without adding any interaction terms; non-significant terms were not included in the model. High school GPA and majors were statistically significantly associated with the final exam scores, and the treatment effect was somewhat negative ($ES = -0.107$, $p = .091$). Potential interaction effects were studiously explored, and Model 1.2 suggests that females and sophomores benefited from flipped instruction more than males and freshmen. Specifically, while first-year males in the flipped section did significantly worse than their control

counterparts ($ES = -0.276$, $p = .008$), first-year females did better than first-year males ($ES = 0.249$, $p = .055$), and sophomores did remarkably better than freshmen ($ES = 0.545$, $p = .047$) in the treatment condition. By implication, it is second-year females who benefited most from flipped instruction. In fact, by changing the reference groups, the OLS model revealed that second-year females in treatment condition outperformed their control counterparts ($ES = 0.517$, $p = .060$). It is worth mentioning that due to the small presence of sophomores (i.e., 6.84% or $N = 40$), statistical significance as indicated by p values should be considered together with the size of the effect that signifies practical importance. Model 1.3 included the interaction between treatment and majors. Although none of the terms were statistically significant, the size of the coefficients suggests the possibility that non-Biology/Chemistry majors did worse in the flipped condition than their Biology/Chemistry counterparts.

Model 1.4 is the main effect model with post-course chemistry grade, as the dependent variable, where flipped students on average did worse than control students ($ES = -0.129$, $p = .034$). Post-course grade, defined as the grade students got in the following course, Chemistry 1B, was determined by registrar data. The same treatment-gender interaction of comparable magnitude ($ES = 0.233$, $p = .057$) reappeared in Model 1.5. The treatment-year interaction was not statistically significant (shown in Model 1.6), most likely due to further reduced sample size, as only 20 sophomores and no juniors or seniors enrolled into the subsequent course. The size of the coefficients, however, echoed the same trend revealed by Model 1.2.

Table 3
Effect of Flipped Instruction on Exam Performance with OLS Models

	Final Exam Score			Post-course Grade		
	Model1.1	Model1.2	Model1.3	Model1.4	Model1.5	Model1.6
(Intercept)	0.086 (0.055)	0.189* (0.081)	0.156+ (0.086)	0.040 (0.064)	0.115 (0.075)	0.134+ (0.077)
Treatment	-0.107+ (0.063)	-0.276** (0.104)	-0.207+ (0.118)	-0.129* (0.061)	-0.269** (0.095)	-0.301** (0.098)
Motivation (pre-survey)	0.066* (0.033)	0.061+ (0.033)	0.060+ (0.033)			
High School GPA	0.688*** (0.035)	0.685*** (0.036)	0.683*** (0.036)	0.835*** (0.036)	0.834*** (0.036)	0.838*** (0.036)
SATmath	0.140*** (0.035)	0.146*** (0.036)	0.148*** (0.036)	0.093** (0.035)	0.094** (0.035)	0.095** (0.035)
Female		-0.162+ (0.094)	-0.168+ (0.094)	-0.175** (0.063)	-0.302** (0.091)	-0.315*** (0.093)
Treatment:Female		0.249+ (0.129)	0.246+ (0.131)		0.233+ (0.122)	0.252* (0.123)
Sophomore		-0.161 (0.196)	-0.236 (0.205)			-0.180 (0.209)
Junior/Senior		0.412 (0.275)	0.288 (0.29)			-0.332 (0.312)
Treatment:Sophomore		0.545* (0.274)	0.725* (0.300)			0.323 (0.288)
Treatment:Junior/Senior		-0.381 (0.394)	-0.049 (0.466)			NA NA
STEM	0.130 (0.122)	0.085 (0.126)	0.185 (0.168)	0.192+ (0.109)	0.189+ (0.109)	0.197+ (0.114)
Non-STEM	-0.348* (0.159)	-0.460* (0.194)	-0.242 (0.242)	-0.572** (0.217)	-0.609** (0.217)	-0.469+ (0.255)
Undeclared	-0.092 (0.074)	-0.094 (0.075)	-0.014 (0.103)	0.015 (0.078)	0.02 (0.078)	0.024 (0.078)
Treatment:STEM			-0.204 (0.243)			
Treatment:Non-STEM			-0.586 (0.407)			
Treatment:Undeclared			-0.165 (0.146)			
Cases	470	469	469	406	406	406
Adj. R-squared	0.541	0.543	0.543	0.649	0.651	0.650
AIC	980.70	980.12	982.84	744.73	743.02	746.68

Note. All estimates are standardized beta coefficients. Standard errors are in parentheses.

+ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

Motivation. Shown in Table 4, Model 2.1 is the main effect model with motivation measured by the fourth post-survey as the dependent variable; non-significant demographic covariates were not shown. On average, flipped instruction did not change student motivation to any meaningful extent ($ES = -0.031$, $p = .705$). Model 2.2 shows significant treatment-female interaction ($ES = 0.338$, $p = .047$) and marginally significant GPA-SAT interaction ($ES = 0.084$, $p =$

.050). However, the treatment-female interaction was not observed in the second ($ES = 0.012$, $p = .940$ from Model 2.3) and third ($ES = 0.096$, $p = .544$ from Model 2.4) post-surveys.

Perception and Implementation Issues

(3) Did flipped instruction impact perceived overall class quality? Were there further implementation issues?

Table 4
Effect of Flipped Instruction on Motivation with OLS Models

	Model2.1	Model2.2	Model2.3	Model2.4
	Motivation4	Motivation4	Motivation2	Motivation3
(Intercept)	0.065 (0.072)	0.158 (0.106)	0.138 (0.099)	0.191 ⁺ (0.099)
Motivation (pre-survey)	0.548*** (0.043)	0.524*** (0.044)	0.558*** (0.041)	0.530*** (0.041)
Treatment	-0.053 (0.082)	-0.245 ⁺ (0.134)	-0.147 (0.125)	-0.175 (0.125)
High School GPA	0.101* (0.045)	0.140** (0.050)	0.101* (0.046)	0.166*** (0.045)
Female		-0.187 (0.122)	-0.091 (0.113)	-0.130 (0.113)
SATmath		-0.080 ⁺ (0.047)	-0.046 (0.043)	0.024 (0.044)
Treatment:Female		0.338* (0.169)	0.012 (0.158)	0.096 (0.158)
GPA:SATmath		0.084 ⁺ (0.043)	0.088* (0.039)	0.071 ⁺ (0.040)
STEM	0.161 (0.153)	0.175 (0.164)	-0.198 (0.154)	-0.096 (0.152)
Non-STEM	-0.436* (0.216)	-0.530* (0.220)	-0.096 (0.196)	-0.857*** (0.205)
Undeclared	-0.248* (0.096)	-0.286** (0.099)	-0.111 (0.093)	-0.227* (0.092)
Cases	422	403	411	396
Adj. R-squared	0.320	0.330	0.370	0.391
AIC	1048.80	994.31	966.31	913.98

Note. All estimates are standardized beta coefficients. Standard errors are in parentheses. ⁺ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

Perception. Regardless of the introductory nature of this course, 51.55% and 38.92% of the students from the combined sample rated this course as “very” and “adequately” challenging, where the two sections differed little. Students’ ratings agreed with exam outcomes, where the average raw scores were consistently less than 70% for both sections across exams. Moreover, in all four periods, flipped students rated the class to be of lower quality (*ES* range: -0.245 – -0.357, *p* value range: 0.009–0.0001).

From post-survey responses, we compared flipped students’ ratings of the perceived effectiveness of different instructional avenues. Across periods, in-class problem solving was ranked as the most effective means of learning, followed in order by learning before class, online videos, and in-class group discussion. The textbook and in-class lectures were rated as the least and second least effective means, which is not surprising considering that the textbook was not frequently used and lectures often took only a fraction of class time.

Implementation issues. Student comments from the standard campus-wide instructor evaluation provide additional insight. The positive comments echoed the benefits reported in our previous study, including (a) flexibility for learning at one’s own pace, (b) availability of online videos for review before exams, (c) better preparation for class meetings, (d) more opportunities for demonstration and problem solving in class, and (e) more instructor-student interaction. Most importantly, we classified students’ negative comments to identify weaknesses in our instruction. Two main sources of criticism emerged from the flipped classroom.

First, flipped students expressed strong frustration with the technology failures in class:

- “Once Learning Catalytics stopped working, we started covering some material.”
- “I found the whole Learning Catalytics program to be really distracting. I feel like a lot of lecture time was wasted trying to get it running.”

In addition, some flipped students criticized the active learning techniques involved, notably group discussion and peer instruction. The frequency of these comments indicates that perhaps a softer style of active learning might be better suited for the student population studied.

- “The instructor can have more examples of problems in class that she solves with the students before letting them solve other problems themselves. It’s hard to apply what we don’t know to try to answer the questions.”
- “Going through more problems together rather than allowing excess time for group discussion might be better because time is wasted and only a few problems are finished in 50 minutes where as more could be fit in. The idea of giving students time together to try a problem is a nice idea but doesn’t always execute the way intended.”
- “For a student with a very weak background in Chemistry, being asked questions that I don’t know the answer to when seeking help only embarrassed me and makes me not want to ask questions.”

Discussion

Compliance and Study Time

Giving assignments associated with each video and low-stakes for-credit quizzes with each class effectively reduced pre-class study non-compliance. This finding agreed with reports from other studies (Foertsch, Moses, Strikwerda, & Litzkow, 2002; Mason et al., 2013; Narloch, Garbin, & Turnage, 2006). On the other hand, although only 16.29% students claimed that they often could not watch all the videos, this small fraction still translates into 50 students. In large undergraduate classes, non-compliance would affect a non-negligible number of students, even though the fraction of students affected might be small. Flipped instructors, therefore, should consider monitoring non-compliance closely, particularly when teaching a class comprised primarily of freshmen whose self-discipline and time-management skills are yet to be developed.

With regard to study effort, our current study reproduced what was observed in our prior study (He et al., 2016): flipped instruction caused a shift in study time from post-class to pre-class without appreciably increasing students’ overall workload. By implication, flipped students might benefit from spaced learning (Donovan & Radosevich, 1999). Given some students’ opposition to the flipped pedagogy, it is advisable that flipped instructors should communicate this result to the students to dispel the concern that pre-class study would impose extra burden on them.

Exam Performance and Motivation

The presence of interaction effect regarding final exam outcome and post-course grade is an important finding. We believe interaction effect would most likely occur when the treatment conditions agree with the characteristics (e.g., motivation, intellectual capacity, and study habits) of a specific subgroup; others with characters departing from this niche group in varying degrees would thus benefit to lesser extents accordingly. In our case, second year females seemed to be the niche group. Treatment females consistently outperformed their control counterparts in both the final exam ($ES = 0.249$, $p = .055$) and post-course grade ($ES = 0.252$, $p = .041$), and they showed higher end-of-course motivation ($ES = 0.338$, $p = .047$). These three related results provide increased support that this sub-group analysis is of practical importance. In addition, females on average seem to spend more time outside the classroom ($ES = 0.149$, $p = .074$) than males did, and flipped females relative to control females spent more time before class ($ES = 0.319$, $p = .069$) than flipped males did relative to control males. Similarly, second year students did particularly well in the treatment condition. It is conceivable that sophomores were generally less reliant on instructor-initiated instruction and had stronger self-study, self-discipline, and time management skills. They were hence more receptive to flipped instruction and less hurt by implementation issues, as sophomores rated the class to be of higher quality particularly in the third ($ES = 0.577$, $p = .001$) and fourth ($ES = 0.400$, $p = .068$) post-surveys.

These results support the conjecture that flipped instruction might be more appropriate for students with strong drive, maturity, and skills. Our prior study suggests that without assignments and quizzes, it would take considerable drive, self-discipline, and self-directed learning skills for students to study before class. Although giving assignments and quizzes spurred students to complete pre-class learning assignments, the same set of attributes is still needed to ensure learning quality. Moreover, these attributes are also crucial for students to actively engage during class. When technology goes awry in a flipped classroom, students with these qualities are arguably less vulnerable to suffer the consequences. Sophomores in our study, for example, might be more mentally mature, self-disciplined, active in self-directed learning, and emotionally less resistant to deviance from traditional lectures, which gave them an edge at every corner over the freshmen who were only high school seniors until recently. As implementation issues with the adoption of new technologies are expected, it is important that instructors implement changes slowly to prevent poor

outcomes in the flipped classroom. Our data shows that such conservative adoption is markedly more important in freshmen courses.

Student Perception and Implementation Issues

In this study, flipped students rated the class to be of lower quality. We looked at students' comments for indications regarding implementation issues versus their perception of a flipped classroom.

We believe massive technology failures in the flipped classroom were an important reason for the lower ratings for flipped instruction, even as students singled out flipped class components as most effective for their learning. Evidence for this include the difference in comments and ratings between this course and our previous implementation (He et al., 2016), as well as the implementation that occurred after this study (currently sent out for review). Comments in this implementation singled out technology and the in-class room response system as a hindrance to their learning, while these comments were not present in 2013 and 2015 implementations. Both sections in this study used Learning Catalytics instead of IClickers to facilitate peer instruction and real-time feedback. Each student was assigned a unique IP address and connected to the class via a smartphone or tablet. The control students took the class first and had little issue in this regard. In the treatment section, however, some students (random each day) could not get connected because the control class had used up most of the IP addresses. This situation was not fully resolved until the sixth week. By that time, students were already weary of using the technology. While maintaining the use of Learning Catalytics allowed for complete diagnosis and campus wide adoption of appropriate IT standards, the failure of the class response system instilled negative feelings leading to undesirable consequences.

Second, some flipped students voiced criticisms against certain active learning techniques, notably group discussion and peer instruction. Supported by the ideas of constructivism and zone of proximal development, group work is highly valued by educational researchers and has become a key component in many active learning techniques. Our results suggest, however, that having students work in groups might not be as effective as one would expect, as students often ranked group discussion in the bottom of the list of preferred teaching practices, a finding reported by others as well (Enfield, 2013). Some students expressed frustration with their own limited skills for problem solving and regarded group discussion and peer instruction as ineffective use of class time. Some demanded the instructor to elaborate more on complex concepts and demonstrate solving some problems first before diving into group-based

problem solving. These echoed the student reflections in the previous study where technology implementation issues did not occur.

These results prompt us to reflect upon the benefits of flipped instruction and the associated active learning techniques as compared to traditional lectures. Although passive lecturing has its shortcomings, it is likely still the most widely used instructional technique regardless of the variety of novel instructional techniques invented over the past decades to supplant it. We believe the resilience of lecturing owes primarily to its simplicity. In comparison, flipped instruction is a promising, but rather complex, instructional technique that entails making multiple decisions on pre-class and in-class components. In a flipped classroom, for example, an instructor needs to consider the number and length of videos, accompanying practice questions, pre-class quizzes, percentage of lectures retained in class, and the number and types of in-class active learning activities. The more decisions to make, the more it is likely that some step might incur an implementation issue. As a result, we highly recommend that instructors new to the flipped pedagogy should choose fewer and simpler technologies to start with. In addition, it is important to note that many active learning techniques frequently require students to work in groups. Staging group activities also entails making multiple decisions, e.g., the difficulty of the problems, group size, group forming tactic (e.g., getting proper group heterogeneity in skills), and time allotment (i.e., enough time for thorough discussion, but not too much to induce boredom and elicit off-topic conversation). While it is possible for instructors to monitor group work closely in small classes, in large classrooms where complete oversight is possible, student could sit out class time pointlessly, and/or unwittingly reinforce each other's biases and have their prior misconceptions strengthened.

Conclusion

Giving assignments associated with each video and for-credit quizzes with each class effectively reduced pre-class study non-compliance. However, non-compliance could still affect a non-negligible number of students, even though the proportion of students affected might be small. Flipped instructors should therefore consider monitoring non-compliance closely, particularly in large introductory undergraduate classes.

Our current study reproduced what was observed in our prior study that flipped instruction did not appreciably increase the overall study time but only caused a shift in workload, which implies that flipped students might benefit from spaced learning. Flipped instructors could communicate this result to students to dispel the concern that flipped instruction exerts an extra burden on them. Moreover, flipped researchers do

not need to reduce class meetings to control for increase in required pre-class study time.

While flipped students on average underperformed their control counterparts in the cumulative final exam ($ES = -0.204$, $p = .014$ by two-sample t -test and $ES = -0.107$, $p = .091$ by OLS Model 1.1), strong interaction effects existed between treatment condition and gender as well as year level. Females and sophomores benefited more in the flipped section. Similar trends were also observed with student letter grades in a subsequent chemistry course. The differentiated treatment effect lends support to the conjecture that flipped instruction is more appropriate for students with strong drive, maturity, and learning skills.

Flipped instruction did not increase student motivation throughout the course. The same treatment-gender interaction was observed with the final survey, where flipped females showed much stronger motivation ($ES = 0.338$, $p = .047$) compared to flipped males. However, this interaction effect was not shown with previous surveys. Therefore, the interaction effect might be either appearing gradually or due to random statistical noise. We are currently conducting more analysis on motivation to clarify this issue.

Throughout the course, flipped students rated the class to be of lower quality, as they raised complaints about technology failures in class and about the lack of efficiency with in-class group discussion and peer instruction. The variety of issues associated with our flipped classroom prompted us to reflect upon the resilience of traditional lectures, where its simplicity might be its greatest virtue. We caution against overreliance on complex technologies, suggesting simpler implementation may be best. Institutions are advised that it would be advantageous to trouble-shoot technology in advanced classes where students are not likely to be disadvantaged by technology failures. It is suggested that flipped instructors in first-year introductory courses should start with smaller amounts of active learning, building in complexity until reaching a maximum efficacy for the classroom. For example, instead of diving directly into problem solving, some review and elaboration of difficult concepts is necessary as a gentle warm-up. Rather than using open-ended questions with groups of several students, pairs of students working on a clear problem with timely formative feedback are much more tractable. In fact, for the first several lectures, a partially flipped classroom that retains some portions of lectures is highly recommended and will be adopted and studied in future iterations of this course. Surveys can be delivered early in the second week to gauge student attitudes and identify problems. Once students have displayed favorable attitudes towards the flipped pedagogy, instructors could consider gradually adopting a fully flipped classroom, using more complex technologies or teaching techniques in class, and working with increasingly challenging and open-ended problems. For any novel technology or technique employed,

the promise to improve teaching is invariably accompanied by challenges. The most effective methods will depend on the instructor, the students, and the institutional climate: special consideration to each must be given.

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Appendix A

First Author, Year	Course	Grade Level	Number of Cohorts	Treatment (Sample Size)	Control (Sample Size)	Effect Size (Cohen's <i>d</i>)
Day, 2006	UI Design	Upper Level	1	28	18	0.69
Moravec, 2010	Biology	Lower Level	2	752	430	1.42
Papadopoulos, 2010	Statics	Unknown	1	43	11	0.20
Stelzer, 2010	Physics	Lower Level	8	750	750	0.20
Deslauriers, 2011a	Physics	Freshman	1	211	171	2.50
Deslauriers, 2011b	Physics	Upper Level	2	62	48	1.14
Pierce, 2012	Therapeutics	Upper Level		71	missing	0.86
Bishop, 2013	Numerical Methods	Sophomore	1	55	63	0
Choi, 2013	Software	Upper Level	1	38	35	0.11
Guerrero, 2013	Mathematics	Unknown	1	15	29	0.20
Lemley, 2013	Thermodynamics	Upper Level	2	15	23	1.02
Mason, 2013	Control Systems	Senior	2	20	20	0.75
McLaughlin, 2013	Pharmaceutics	Professional	2	162	153	-0.13
Morin, 2013	Engineering	Freshman	2	255	237	0
Wilson, 2013	Statistics	Lower Level	2	45	45	0.54
Albert, 2014	Management	Upper Level	2	321	596	0.19
Baepler, 2014	Chemistry	Lower Level	3	375 / 375	350	0.14 & -0.07
Findlay-Thompson, 2014	Introductory	Unknown	1	30	42	0
Fraga, 2014	English	Unknown	1	25	26	0.36
Ghadiri, 2014	Electronics	Unknown	1	78	50 & 75	0.57 & 0.87
Overmyer, 2014	Algebra	Lower Level	1	136	165	0.22
Rais-rohani, 2014	Statics	Unknown	1	53	57	0.17
Street, 2014	Physiology	Professional	2	177	180	0.29
Willis, 2014	Pre-calculus	Lower Level	2	22	22	-0.03
Winqvist, 2014	Statistics	Lower Level	11	53	58	0.36
Wong, 2014	Pharmacology	Professional	2	101	103	0.38
Yelamarthi, 2014	Digital Circuits	Lower Level	2	17	24	0.46
Flynn, 2015	Chemistry	Lower Level	2	398	724	0.11
Hung, 2015	English	Lower Level	1	25	24	1.54
Kennedy, 2015	Calculus	Lower Level	1	77	76	-0.11
Quint, 2015	Calculus III	Upper Level	1	39	41	0.19
Quint, 2015	Calculus III	Upper Level	1	35	36	0.51
Schroeder, 2015	Calculus	Lower Level	1	63	49	0.32
Eichler, 2016	Chemistry	Lower Level	1	452	294	-0.07
He, 2016	Chemistry	Lower Level	1	334	343	0.19

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Appendix B

Pre-survey (for Both Sections)

1. Please rate how frequently did the following situations happen to you.

	Never
I would study course material in advance to prepare for a class.	Very Rarely
I was under-prepared for a class and hence did not get much from it.	Sometimes
I was over-prepared for a class and hence did not get much from it.	Frequently
I had no clue during group discussions and had to sit the time through pointlessly.	Very Frequently
I finished all pre-assigned readings before attending class.	Always

2. For a typical 4-unit science or math course in a ten-week quarter, please estimate the amount of time you usually spend outside the classroom.

I usually spend _____ hours per week studying in advance to prepare for the class.

I usually spend _____ hours per week studying after class.

3. How much do you agree with the following statements regarding your motivation?

	Strongly Disagree			Strongly Agree		
I am very interested in the content area of this course.	1	2	3	4	5	6
Beyond this quarter, contents from this course will still be useful to me.	1	2	3	4	5	6
For me, being good at chemistry is important.	1	2	3	4	5	6
This course is taking more time than what I would like to put into it.	1	2	3	4	5	6
I am confident that I will do well in this course.	1	2	3	4	5	6
I find studying the course material enjoyable.	1	2	3	4	5	6
This course is taking too much time for others things I would prefer to do.	1	2	3	4	5	6
It's important for me to do well in this course.	1	2	3	4	5	6
I am going to need what I learn from this course in subsequent courses.	1	2	3	4	5	6
Given my current situation, I am confident of getting a good grade.	1	2	3	4	5	6
Compared to other subjects, being good at chemistry is important for me.	1	2	3	4	5	6
The time I am putting into this course is worth my while.	1	2	3	4	5	6
If I am willing, I can get a high grade in this course.	1	2	3	4	5	6

4. How do you rate the effectiveness of the following approaches to learning?

	Highly Ineffective			Highly Effective		
read the textbooks	1	2	3	4	5	6
attend lectures in class	1	2	3	4	5	6
watch videotaped lectures online	1	2	3	4	5	6
learn from doing homework and assigned problems	1	2	3	4	5	6
learn with other students outside the classroom	1	2	3	4	5	6

Post-survey (for Treatment Section)

Please answer the following questions based on your learning experience during the *fourth class period* from the *third midterm* to the *present*.

1. Please rate how frequently did the following things happen to you.

	Never Happened
I could not finish all the pre-assigned videos/readings in time before class.	Very Rarely Happened
I was under-prepared for class meetings and did not get much from it.	Sometimes Happened
I was over-prepared for class meetings and did not get much from it.	Frequently Happened
I had no clue during group discussions and had to sit the time through pointlessly.	Very Frequently Happened
I finished all pre-assigned videos/readings before attending class.	Always Happened

2. In recent weeks, for each 50-minute class meeting, I spent on average _____ *minutes* learning course material (e.g. reading textbook or watching videos) in advance *before attending class*.

3. In recent weeks, I spent on average _____ *hours per week* in total, studying course material and doing homework *after attending class*.

4. Please rate your agreement with the following statements.

	Strongly Disagree			Strongly Agree		
I am very interested in the content area of this course.	1	2	3	4	5	6
I find studying the course material enjoyable.	1	2	3	4	5	6
Beyond this quarter, contents from this course will still be useful to me.	1	2	3	4	5	6
I am confident that I will do well in this course.	1	2	3	4	5	6
Given my current situation, I am confident of getting a good grade.	1	2	3	4	5	6
If I am willing, I can get a high grade in this course.	1	2	3	4	5	6
This course is taking more time than what I would like to put into it.	1	2	3	4	5	6
The time I am putting into this course is worth my while.	1	2	3	4	5	6
This course is taking too much time for others things I would prefer to be	1	2	3	4	5	6
For me, being good at chemistry is important.	1	2	3	4	5	6
Compared to other subjects, being good at chemistry is important for me.	1	2	3	4	5	6
It's important for me to do well in this course.	1	2	3	4	5	6
I prefer this inverted class format to a traditional "lecture" format.	1	2	3	4	5	6
I would prefer to take more science classes using this type of class format.	1	2	3	4	5	6

<i>Please rate the overall quality of the following items</i>	Poor			Excellent		
Read the textbooks	1	2	3	4	5	6
Attend lectures in class	1	2	3	4	5	6
Watch video lectures online	1	2	3	4	5	6
Learning before class	1	2	3	4	5	6
In-class discussion	1	2	3	4	5	6
In-class problem solving	1	2	3	4	5	6
Overall rating of the course.	1	2	3	4	5	6

5. Open-ended questions (optional)

5.1 What are your major complaints about this course?

5.2 How do you recommend us to improve this course?

Post-survey (for Control Section)

This is the final survey of Chem 1A. You will receive 0.4% extra credits in addition to your overall grade for completing this survey. Your responses to the surveys are strictly confidential and will not be analyzed until after all grades are finalized.

1. Based on your recent learning experience from the third midterm to the present, please rate how frequently did the following situations happen to you..

	Never Happened
I attended the alternate section of the class.	Very Rarely Happened
I prepared for the class in advanced.	Sometimes Happened
I was under-prepared for class meetings and did not get much from it.	Frequently Happened
I was over-prepared for class meetings and did not get much from it.	Very Frequently Happened
I did not prepare for the class in advanced.	Always Happened

2. In recent weeks, for each 50-minute class meeting, I spent on average _____ minutes learning course material (e.g. reading textbook or watching videos) in advance before attending class.
3. In recent weeks, I spent on average _____ hours per week in total, studying course material and doing homework after attending class.

4. Please rate your agreement with the following statements.

	Strongly Disagree						Strongly Agree					
I am very interested in the content area of this course.	1	2	3	4	5	6	1	2	3	4	5	6
I find studying the course material enjoyable.	1	2	3	4	5	6	1	2	3	4	5	6
Beyond this quarter, contents from this course will still be useful to me.	1	2	3	4	5	6	1	2	3	4	5	6
I am confident that I will do well in this course.	1	2	3	4	5	6	1	2	3	4	5	6
Given my current situation, I am confident of getting a good grade.	1	2	3	4	5	6	1	2	3	4	5	6
If I am willing, I can get a high grade in this course.	1	2	3	4	5	6	1	2	3	4	5	6
This course is taking more time than what I would like to put into it.	1	2	3	4	5	6	1	2	3	4	5	6
The time I am putting into this course is worth my while.	1	2	3	4	5	6	1	2	3	4	5	6
This course is taking too much time for others things I would prefer to be	1	2	3	4	5	6	1	2	3	4	5	6
For me, being good at chemistry is important.	1	2	3	4	5	6	1	2	3	4	5	6
Compared to other subjects, being good at chemistry is important for me.	1	2	3	4	5	6	1	2	3	4	5	6
It's important for me to do well in this course.	1	2	3	4	5	6	1	2	3	4	5	6
I am going to need what I learn from this course in subsequent courses	1	2	3	4	5	6	1	2	3	4	5	6
<i>Please rate the overall quality of the following items</i>	Poor						Excellent					

Student Perceptions of the Influence of Choice, Ownership, and Voice in Learning and the Learning Environment

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This study used grounded theory analysis to examine and analyze student perceptions of the influence of choice, ownership, and voice on learning and the learning environment in an online M. Ed. program in the southeastern region of the United States. Choice, ownership, and voice make up three of the four components of the learner-centered approach called the COVA learning approach developed by Harapnuik, Thibodeaux, and Cummings. Literature related to constructivism, metacognition, and reflection confirms through years of research that choice, ownership, and voice through authentic learning opportunities have the potential to positively influence learning. Seventy-three graduate students in the M. Ed. program completed a survey indicating their agreement with statements that gave them choice, ownership, and voice in learning and the learning environment. The study further examined graduate students' candid perceptions for the purpose of identifying themes that related to choice, ownership, and voice in learning and the learning environment. Results showed that all three components positively influenced the learners' experience and that metacognitive practices and opportunities for reflection assisted students as they developed their voice as learners.

To provide the context for this study, we will briefly relay the research results that preceded this investigation. In 2015, our research team explored why students stopped using their ePortfolios beyond the program of study. That study revealed that a perceived lack of choice and control over ePortfolio platform selection and tools, absence of personal interest, and the inability to use their own voice in sharing and restructuring ideas contributed to the decrease of ownership in learning. As a result, 82% of learners stopped using their ePortfolio after the program of study (Thibodeaux, Harapnuik, & Cummings, 2017a). These findings confirmed that students desired choice in the activities in which they engaged, ownership and agency over learning, and an authentic avenue to express their voice. These findings also confirmed that by consistently giving Digital Learning and Leading (DLL) M. Ed. students choice, ownership, and voice through authentic learning opportunities, we were creating a learning environment for our students that they could draw upon and apply to their own organizational settings. Based on our own research and a thorough review of the literature, it was clear that learners were not making the necessary connections with their learning experiences as evidenced by lack of retention and a reocognized disengagement using the information transfer model (Mazur, 2014). Our research led us to understand that learners needed to own the learning to bridge a deeper connection; as educators, we should create learning conditions (Dewey, 1916) that allow our learners these opportunities. We formalized the name "COVA" which stands for choice, ownership, and voice through authentic learning opportunities, and the approach is grounded in constructivism, social learning, and active learning. Giving our learners

choice, ownership, and voice through authentic learning opportunities has also become the core proposition for the DLL program.

To confirm the impact of the COVA approach, we investigated whether learners perceived the COVA learning approach as a positive influence on their learning experience. The initial results of the investigation into the influence of the COVA learning approach revealed that all the components were highly interrelated and had significant influence. The influence of ownership and authenticity were identified as having the most influence on learning in an earlier study; therefore, we decided to focus more closely on the influence of choice, ownership, and voice.

The Digital Learning and Leading (DLL) Program

The DLL program is a 36-hour master's degree program in the College of Education and Human Development at a southeastern regional institution. There are twelve 3-credit hour courses in the DLL program. At the time this study was conducted, there were eighty-five students enrolled full-time in the program. All courses in the DLL program require students to use a personal ePortfolios to display their ideas, interact with their peers, build collaborative learning networks, and share their projects and ideas with a global audience. Stated learning objectives for the DLL program include: a) learners will learn to use technology innovation as a catalyst for change, b) learners will learn to lead organizational change in their own institutional settings, and c) learners will create significant learning environments that set up effective conditions for maximizing learning. The ePortfolio is one of many authentic learning experiences woven into

each of the courses and the entire program in which learners experience choice, ownership of learning, and learner voice while developing metacognitive strategies. Students are required to compile and share a final reflection and analysis of their learning as part of the Capstone course.

The program was designed to equip graduate students to be digital leaders who would be able to create their own significant learning environments that use technology innovations as a catalyst for change within their organizational settings (Thibodeaux, Harapnuik, Cummings, & Wooten, 2017b). In addition to requiring learners to research, plan, and create authentic innovation plans, learners develop implementation strategies, organizational change plans, professional development plans, and measurement strategies, and they create an ePortfolio which is used to help organize, share, and promote their innovation strategies with their organizations.

Review of the Literature

Since the COVA learning approach is a synergy of well-established constructivist principles, the related literature—such as interactive learning and constructivism, the connection between learner choice and ownership in learning, and the link between voice, metacognition, and reflective practice in learning—was explored. The research points to numerous studies that give learners choice, ownership, and voice in learning.

Interactive Learning and Constructivism

Innovative technologies and teaching practices are causing a shift in teaching and learning in higher education (Ashford-Rowe, Herrington, and Brown, 2014; Batson, 2012). Buchem, Tur, and Hölterhof (2014) suggest that a driving force behind this change is a recognized shift in ownership and control over learning that is being given to the learner. According to Buchem et al. (2014), research shows that socio-constructivist paradigms are rooted in learner control and agency (autonomous learning). Learners gain a sense of control and agency in social constructivist environments because these social environments promote purposeful and meaningful social interactions which can promote learner values, goals, and beliefs (Vygotsky, 1978). Vygotsky's ideas provide a solid foundation for Rhodes' (2011) proposition that it is necessary for learners to build social competency skills through interactive learning experiences. Interactive learning requires students to engage with one another to solve problems or discuss issues and solutions and to

share with one another (Mazur, 2014). The COVA approach, in part, as a socially pragmatic pedagogy, lends itself naturally to interactive learning. Additionally, the term integrative learning experiences encompasses innovative pedagogies and co-curricular learning experiences to enhance the learning environment (Association of American Colleges & Universities, 2018) and is embedded in the COVA learning approach. While both approaches are used, interactive learning is important to examine as part of the review of the literature as it pertains to this study.

Interactive learning experiences are integral to the constructivist perspective which emphasizes making meaningful connections, constructing new knowledge, and learning how to learn (Hattie, 2009; Jonassen, 1999; Labaree, 2005). Similarly, McWilliams (2016) suggested that constructivists create knowledge that is subject to multiple iterations and revisions based on interpretive experience and that constructivism supports choices, meaning-making, and consideration of multiple viewpoints, and therefore, learning is not fixed. Combining social learning and constructivism does not come without challenges though. Labaree (2005) acknowledged that social constructivist methods of instruction tend to be "short-lived," in part, because traditional practices are content-driven and less difficult to conduct (p. 278). However, researchers found that through the instructional design of the learning experience, learner choice and control can be organic to the learning process (Buchem et al., 2014) as it is in most constructivist learning approaches.

Social competence and interactive learning through ePortfolios have become the "most pervasive framework" in higher education today (Watson, Kuh, Rhodes, Light, and Chen, 2016). ePortfolio learning allows learners to provide interpretive meaning and reflection to their own work while sharing with a global community (Thibodeaux et al., 2017a). O'Keeffe and Donnelly (2013) acknowledged that ePortfolios promote student learning, demonstrate connected learning opportunities, and provide a means to connect the learner with a broader audience. Bandura (1977) warned that "people can gain competence through authentic means but, because of faulty appraisals of the circumstances in which they improve, will credit their achievements to external factors rather than to their own capabilities" (p. 201). This idea suggests that learners could attribute success to something external to their own abilities. However, when learners have choice, ownership, and voice through authentic learning opportunities, they can benefit from Batson's (2016) proposition that ePortfolio learning aligns with how people actually learn, thus providing authentic and real-world opportunities for learners and giving them opportunities to make

decisions regarding the learning environment. Giving learners opportunities to choose what and how they will learn takes significant effort, time, preparation, and organization, but this is necessary if learners are to assume the role of responsibility for their learning (Aiken, Heinze, Meuter, & Chapman, 2016; Thibodeaux et al., 2017b).

The Connection Between Learner Choice and Ownership in Learning

Research confirms that choice empowers the learner, fosters engagement, and promotes a vested interest in the learning experience (Aiken et al., 2016). Giving learners choice and ownership requires that control must be shared with the learner (Thibodeaux et al., 2017a). Choice increases learner motivation and autonomy, which can positively impact a learners' self-efficacy and motivation (Bandura, 1997). Critical reflection allows learners the opportunity to reflect on their own choices and become readily aware of the reasons behind why those choices were made (Mezirow, 1998). Further, Garrett (2011) found that social learning opportunities, control, and ownership contributed to, and were an integral part of, learning with ePortfolios. Shroff, Deneen, and Lim (2014) confirm these ideas but stress that further research should explore freedom and choice in the learning environment.

According to Pierce (2001), ownership of learning makes up five dimensions: sense of responsibility, self-identity, accountability, self-efficacy, and belonging. Each dimension brings with it a learners' perceived degree of control of tangible and intangible elements, expectations of self and others, perceived ability to reach goals, and feelings of belonging. Piaget's research confirms that learners are "more apt to modify their cognitive structures in a constructive way when they control their own learning than when methods of social transmission (in this case, teaching) are employed" (Ginsburg & Oppen, 1968, p. 224). Brookhart, Moss, and Long (2009) found that learners who felt they had control over their learning resulted in having "deeper motivation" (p. 65) and increased perception of autonomy (Ozogul, Johnson, Atkinson, & Reisslein, 2013). Buchem et al. (2014) argued that a shift in ownership and control in the learning environment is similar to modifying objects without instructor consent and stated that this shift is necessary for learner control to occur. Likewise, Garrett (2011) noted that social presence is linked to ownership where the learner has control of the space in which communication exists. As cited in Buchem et al. (2014), learners that truly engage with the learning process and use their own ideas regain power over their learning (Aiken et al., 2016). Bruner (1991) argued that "growth of knowledge.....is neither unilinear or strictly

derivational in a logical sense" (p. 2). Therefore, students need guidance and support regarding the learning expectations (Janosik & Frank, 2013). Based on the literature, choice and ownership have potential to empower learners to take control of their learning, develop cognitive structures, and benefit from the opportunity to reflect on those choices and decisions.

Exploring the Link Between Learner Voice, Metacognition, and Reflective Practice in Learning

The literature confirms that learner voice, metacognition, and reflection positively influence learning. For example, findings by Landis, Scott, and Kahn (2015) reveal that value through reflection helped learners establish a habit of mind that ultimately deepened learning, helped learners take ownership of learning, and established their identity as learners. Mezirow (1991) argued that people need to understand who they are before connecting with the world. From these ideas, it could be assumed that learner voice is developed through the manifestation of choices the learner has made along his or her learning journey; ultimately this can benefit the learner if carefully situated in a significant learning environment (Harapnuik, 2017). Further, Bass and Elmendorf (n. d.) declared that learners construct knowledge by means of connecting their work with an authentic and global audience, and it is recognized that learners must be an "autonomous agent in a collaborative context" (Mezirow, 1997, p. 8). Similarly, Rodgers (2006) suggests that giving students a voice in their learning has the potential to improve or change teaching and learning.

Researchers agree that metacognitive processing occurs when learners regulate their own mental processes; this process also impacts motivation, memory, and learning (MacIntyre, Igou, Campbell, Moran, & Matthews, 2014). Ericsson (2008, 2014) suggests that mental processing plays a key role in opportunities for deliberate practice, which is a method to increase target performance. Deliberate practice is much more powerful than traditional practice because it focuses first on the cognitive domain to control the psychomotor and affective domain participation. Ericsson (2008, 2014) argues that deliberate practice is the key variable that can positively impact student performance when (a) learners have a clearly defined learning goal, (b) learners are motivated to increase and improve, (c) learners are provided feedback to help them improve their learning, and (d) learners are given opportunities to revisit their work. Over time everyday skills can be transformed into expert performance through reflecting on feedback and revising iterations of one's own work. Ericsson cautions that expert performance alone is not going to reach the target learning goal; acquisition of many interrelated skills

will impact learners' overall skills, thus affecting learning goals. If learners make a "deliberate effort targeted to improve performance" (van Gog, Ericsson, Rikers, & Paas, 2005, p. 75), they have the potential to inherently own their learning. By conducting regular self-assessment of one's own skills and reflective practices through choice, ownership, and voice, learners can take advantage of the benefits of reflective practice and metacognitive learning. One such example is through the use of ePortfolios. Garrett (2011) suggested that ePortfolios were originally designed to promote metacognitive practices.

Our Research Focus and Question

The purpose of this study was to examine the perceptions of the influence of learner choice, ownership, and voice as they currently exist in learning and the learning environment within the DLL program. Since we have created a significant learning environment in the DLL program that gives our learners choice, ownership, and voice through authentic learning opportunities, it is important to analyze how DLL students believe they are influenced by these factors. It is also important to validate how our learners perceive opportunities to experience choice, ownership, and voice in their learning and in the learning environment. This investigation aligns with other research that examines the connection between choice and ownership, and it explores the link and significance between voice, reflection, and metacognitive practices. The research question below guided this study:

What are student perceptions of choice, ownership, and voice on learning and the learning environment?

Methodology

For this study, the team chose to specifically analyze perceptions of learner choice, ownership in learning, and learner voice with the purpose of understanding the learners' perspectives of the influence of each factor in their learning and the learning environment. Quantitative research allows the researcher to determine "trends or a need for an explanation of the relationship among variables (Creswell, 2012, p. 13). Qualitative research allows the researcher to analyze data using text analysis to determine themes that help interpret the findings on a large scale. The study used both quantitative and qualitative research methods because one set of data might have been insufficient to address the research question fully. Both sets of data provided a more detailed and complete picture of the students' perceptions of choice, ownership, and voice on learning and the learning environment (Creswell, 2012).

Participants

After obtaining approval from the Institutional Review Board to collect data for this study, the research team, composed of two principal investigators and a co-principal investigator, used the theory sampling method (Creswell, 2012). The theory sampling method enabled us to consider student perceptions of choice, ownership, and voice as part of the larger COVA learning approach. Eighty-five graduate students enrolled in the online DLL M. Ed. program were invited to be part of this study. Seventy-three students responded anonymously to the online survey and student interactions in the course discussion boards were analyzed anonymously. All students were employed in educational institutions (such as a K-12 school), corporate training settings, or non-profit organizations. Participants' occupations included classroom teachers, learning coordinators, instructional coaches, school administrators, corporate trainers, and non-profit volunteers/leaders and were located throughout the United States. Fifty females represented 68.49%, and 23 males represented 31.51% of the responding population, making a total of 73 participants. Twenty-seven respondents, or 37%, indicated they were currently in their first course block (first, second, third, or fourth course). Twenty-eight respondents, or 38.4%, indicated they were in their second course block (fifth, sixth, seventh, or eighth course). Eighteen respondents, or 24.7%, indicated they were in their third course block (ninth, tenth, eleventh, or twelfth course).

Instrument

The first questions on the online survey asked basic demographic information such as gender and course block. For this study, actual age, race, and ethnicity were not relevant in looking for larger group themes. Students were then asked to indicate on a Likert scale ranging from *strongly disagree* to *strongly agree* to *not applicable* the extent of choice, ownership, voice, and authentic learning (COVA) that they had experienced in the DLL program. The final group of items asked students to rank the extent of choice, ownership, voice, and authentic learning (COVA) on the learning environment in the program:

- (a) I feel that the COVA learning approach deepened my learning;
- (b) The COVA learning approach helped me to personalize my learning experience;
- (c) The COVA learning approach improved my learning experience;
- (d) The COVA learning approach helped me to self-regulate my own learning in the DLL learning environment;

- (e) The COVA learning approach improved my ability to openly collaborate with my peers;
- (f) The COVA learning approach increased my desire to engage in authentic learning opportunities;
- (g) The COVA learning approach increased my desire to use the ePortfolio;
- (h) The COVA learning approach helped shift my attitude from a teacher-centered to a learner-centered focus; and
- (i) The COVA learning approach enabled me to make a difference in my own learning environment.

The survey included an open comments section for students to share any additional comments.

Quantitative Data Collection

In this study, quantitative data was obtained using a web-based Likert scale survey. The survey was sent through email to all current students in the Digital Learning and Leading program. The survey was sent a total of three times to collect as many responses as possible that would represent the population of students surveyed. Participation was voluntary and did not seek specific identifying information.

Qualitative Data Collection

Several qualitative data collection methods were employed in this study. First, data was obtained by sifting through hundreds of candid discussion board comments in several DLL courses. Second, the open-ended comments available at the end of the web-based survey were reviewed and collected. Third, search queries were used to identify instances where the words “choice,” “ownership,” and “voice” occurred in discussion threads. Student identification was removed from the narratives and open-ended commenting and organized by current courses in which they were enrolled.

Quantitative and Qualitative Data Analysis

The quantitative survey data were coded using weighted averages (means) indicating students’ agreement or strong agreement with the given indicator. Data were also coded using overall percentages of students’ agreement or strong agreement with the given indicator. Both sets of data were included to provide a snapshot of responses as they relate to the larger population of respondents. Data was checked for accuracy by the research team and compared and analyzed with the qualitative research to recognize emerging themes.

Grounded theory analysis was used to collect and analyze qualitative data to explore student perceptions

of the influence of learner choice, ownership of learning, and learner voice in learning and in the learning environment. Grounded theory (Glaser & Strauss, 1967) allows a theory to organically develop about the influence of such variables based on student perceptions about their learning experiences. The constructivist design approach was used to analyze learner narratives to explore the views, beliefs, and assumptions that learners within a similar group have experienced (Charmaz, 2006). These methods allowed us to identify themes that naturally emerged from the learner’s perspective (Mann, 1993). Student narrative discussions were analyzed in over 300 discussion boards pulled from six courses in the program, spanning several sections of students. Conventional content analysis was used to develop categories specifically from the narratives. Emerging categories were coded into themes developed to understand student perceptions of the learning environment. Themes were clustered (Charmaz, 1994) and interpreted using the constructivist design approach to explain learner experience with choice, ownership, and voice to analyze their experience with these elements of the COVA learning approach.

The search mining was used to analyze as many narratives from the target population as possible to determine significant and recurring emerging themes. Narrative discussions and blog posts from the Capstone course were also used to aggregate student responses concerning learner voice, metacognition, and reflection. All discussions that explicitly mentioned the use of choice, ownership, and voice and their influence on learning were charted and analyzed to generate themes that helped the team to determine the perceived influence of learner choice, ownership of learning, and learner voice had on learning and the learning environment.

Finally, the constant comparison technique was used to compare the data sets (Creswell, 2012). The constant comparison technique uses both sets of data to determine if the data converges or diverges (Creswell, 2012). Both data sets helped the researchers identify emerging themes.

Validity, Reliability, and Trustworthiness

First, the survey instrument was reviewed by experts in the field to confirm that the questions were appropriate and that the answers would solicit the information the researchers hoped to collect. Next, the survey instrument was piloted to a group of individuals to test that the survey questions were clear and articulate. All of these steps established validity of the survey instrument questions. Individuals that represented the target population were asked to confirm the consistency of the survey instrument. The data from the pilot survey was reviewed for issues and

Table 1
Rankings of the Influence of Choice, Ownership, and Voice on Learning and the Learning Environment

Element	<i>M</i>	
	Weighted Average	Agree/Strongly Agree %
CHOICE		
The COVA learning approach helped me to personalize my learning experience.	4.54	91.67
The COVA learning approach increased my desire to engage in authentic learning opportunities [of my choosing].	4.17	77.78
OWNERSHIP		
The COVA learning approach enabled me to make a difference in my own learning environment.	4.53	88.89
The COVA learning approach helped shift my attitude from a teacher-centered to a learner-centered focus.	4.44	88.89
VOICE		
The COVA learning approach improved my ability to openly collaborate with my peers.	4.17	79.16
The COVA learning approach increased my desire to use my ePortfolio.	4.17	77.78
METACOGNITION/REFLECTION		
I feel that the COVA approach deepened my learning.	4.54	94.45
The COVA learning approach improved my learning experience.	4.49	94.45
The COVA learning approach helped me to self-regulate my own learning in the DLL environment.	4.35	88.89

Note. $n = 72$. Likert scale items ranged from 1 (*strongly disagree*) to 5 (*strongly agree*), with 0 (*not applicable*). All numbers are rounded to the nearest hundredth.

discrepancies. Any additions or changes that were suggested by the pilot study participants were taken into consideration by the research team and adjustments made as necessary. These steps established the reliability of the instrument.

Provisions of trustworthiness were established through measures that involved each researcher independently conducting conventional content analysis to identify emerging themes (Creswell, 2012). The team discussed divergent and convergent themes and agreed upon three broad themes that are shared and discussed in the findings and discussion sections of the study. The discussion section also provides interpretive meaning to the learners' shared experiences.

Results

Seventy-three graduate students in the online M. Ed. program completed the survey (85% response rate), indicating their agreement with statements that gave learners freedom of choice, ownership, and voice in the learning process. First, it was essential to determine whether students believed they had choice, ownership, and voice in the program prior to investigating their

perceptions whether those elements positively influenced their learning experience. In total, 88.89% of students indicated that they were given choice in their learning; 98.57% indicated they were given ownership, and 95.77% of students indicated they had a voice in their learning. From these results, it was apparent that students felt they experienced choice, ownership, and voice in the program. Second, students were asked to rank their agreement with statements in Table 1 that alluded to the broader categories of choice, ownership, and voice. As such, each element in Table 1 was classified according to the literature around Choice, Ownership, and Voice. Personalized learning and authentic learning opportunities were grouped to form the Choice category. Learning that makes a difference and shift of power to a learner-centered focus were grouped to form the Ownership category. Collaboration and desire to use the ePortfolio were grouped to form the Voice category. Perceptions of self-directed learning, the deepened experience, and improved learning were grouped to form the Reflective/Metacognitive category. Table 1 shows that each category was ranked above a 4.0 on a 5.0 scale and made up a range of scores between 77.78% to 91.67%. The range of scores grouped together, agree and

strongly agree, showed that learners perceived they had experienced learner choice, ownership in learning, and learner voice on learning and the learning environment. The results in Table 1 confirmed that students experienced all three elements within the larger COVA learning approach framework.

While the quantitative data confirms that students fully experienced all three elements of the COVA approach, the influence and perceptions of choice, ownership, and voice in learning and the learning environment must be explicated from the candid student comments in the discussion boards and from the Capstone posts. Student quotes included in the subsequent sections represent our cumulative understanding of how emerging themes related to perceptions of the influence of choice, ownership, and voice in the DLL program.

Learner Choice and Ownership of Learning

In the DLL program, personalized learning experiences and authentic learning opportunities encompass student choice in a variety of ways. For example, students in the DLL program personalize their learning experience by developing authentic innovation plans, such as blended learning, online learning, or ePortfolio initiatives, that they implement in their organizational settings. Students make revisions when they revisit their plans in every course of the program. Students conduct literature reviews, design implementation outlines, and create media pitches to support their ideas, and they are able to choose any digital tool to develop these areas. The discussion boards are used in the DLL program as the place where students collaborate and help each other out with their authentic projects, so their discussions often deal with how they perceive their learning experience. Comments related to learner choice include:

- “When we have a choice in what we do, we feel more empowered and in control.”
- “Once I choose what I want to do, then I really feel that having my voice is important.”
- “When given a choice, most people don’t know and if pressed, struggle to come up with something.”
- “As an educator, my job is not to tell my learners what to think or believe, I can only inspire, educate, and foster. Then, [my learner] can consciously and consistently make choices according to her own values.”
- “The CHOICE aspect is what jumped out at me considering if the learner chooses it, it gives VOICE a sense of AUTHENTIC OWNERSHIP!”

These comments corroborate the quantitative findings that choice in learning is important to learners.

Learning that makes a difference and learner-centered instruction requires a shift in ownership to occur. As part of their innovation plans, learners have to own all aspects of their plan, from challenges and obstacles to influencing others to follow through with their ideas. Learners design every aspect of their innovation plans which take on new meaning as they learn to implement their plans in their organizational settings. They build significant learning environments and use Fink’s (2003) Taxonomy to develop outcomes, activities, and assessment to guide their students learning. Comments related to ownership in learning include:

- “The COVA learning approach will be impactful for me because it will be MY learning made by MY choices and with MY full ownership.”
- “Personally, the ‘ownership’ phase is my biggest concern since normally students assume that it is the teachers’ responsibility for your education rather than your own.”
- “I had to adjust myself not to worry so much about what everyone else was doing and focus on myself.....one of the greatest challenges in the process was organizing myself and my thoughts into something that made sense to someone besides myself.”
- “I wasn’t comfortable with the assignments being so open to interpretation. However, looking back, I was able to make those necessary connections between concepts because the projects were authentic and unique to me.”
- “Teaching students to face challenges with the mindset that they are in control of their own learning and can make choices that either promote that learning or hinder it, gives students the choice and ownership of their personal educational outcome.”

The importance of choice and ownership in learning is confirmed by these comments, but the comments also indicate that ownership of learning did not come without challenges.

Learner Voice, Metacognition, and Reflection

In the DLL program, students are not given explicit prescriptions on how to build, innovate, and execute their authentic plans. Instead, they are given a voice and freedom to be creative to meet the needs of their organization and are also guided to meet the specific learning objectives within each course. Integral to the design of the DLL program is the

collaborative component where students turn to the class discussion boards, help each other out in developing and implementing their plans, and seek and provide feedback on key decisions in the progress of their innovation strategies. Since students are required to implement their innovation plans in their own organization, it is imperative that they find their own voice and learn how to influence others on importance of the plan and the impact it will make. Comments related to learner voice and finding that voice include:

- “I felt my voice as I thought deeply about my thinking and the thinking of others.”
- “People are naturally social, so in my mind, it makes sense that student voices would be part of a significant learning environment.”
- “Focusing on my organization was easy, but taking control of and finding my voice was not. I had to decide which voice I wanted to portray and that was depending on which hat I was going to wear throughout this process.”
- “.....Focusing on my voice as a change-agent for my organization rather than a voice for my own self-reflection.”

These comments confirmed the importance of voice but also indicated that some students struggled with finding their voice or that their self-reflective voice was difficult to identify.

The DLL Capstone course asked students to reflect on their entire experience in the M. Ed. Program. It was necessary for us to gauge the learners' experience through the lens of choice, ownership, and voice, but also to allow learners to capture their experience and synthesize their learning in a reflective blog post that includes opportunities to share the work the students have developed along their journey. We have found when learners become vested in their innovation plan, self-regulated learning and metacognitive processes naturally occur as students develop ownership of their own learning. It was important to have learners reflect in the Capstone so we could give learners the opportunity to engage meta-cognitively through this reflection on their learning experience. Comments from students Capstone posts include:

- “Self-directed learning: It was up to me to determine what information applied to my own situation in order to synthesize authentic products.”
- “Innovation plan: I have to strategically develop digital significant learning environments that breed and model innovation to bring a culture shift among educators and

learners in my educational corner of the world.”

- “Because of the ownership that ePortfolios provide, every piece of work was filtered through the lens of my current experiences in the educational world, and gave me the chance to publish a variety of works that I expect to drive innovation and change.”
- “I’ve learned that part of planning entails researching and learning from others, locally and globally. We should look at their implementation process to find out what worked, what could have been done better and how to apply the lessons learned.”
- “Just as our professors were giving us freedom to show our understanding, I had to give myself freedom to think outside the box of my own creativity to grow....but through these courses, I have come to develop a deeper understanding of my constructivist philosophy.”

Most of the comments for voice, metacognition, and reflection came from the Capstone course post because this assignment was designed to encourage learners to reflect and think back to their learning journey in the program. Finally, it was important for students to have professors model what they were expected to do, so the students could learn to do this within their own organizational settings.

Discussion

The survey and narrative discussion data results confirm that learner choice, ownership in learning, and learner voice positively influenced learning and the learning environment. The findings suggest that when learners are given choice and the ability to develop their voice as a manifestation of these choices, learners become vested in the experience and take ownership of the learning. Further, learners acknowledged that metacognitive practices built into the program helped them realize their learning was deepened, improved their learning experience, and helped them take ownership of their learning at different stages in the programs. The reasons are variable and may hinge upon the point at which students make genuine choices and recognize they have a voice in the learning. Whether learners recognize and embrace one or more elements at a time which consequently might lead to embracing another, has yet to be determined.

This study also revealed that a constructivist-designed, learner-centered pedagogy does not come without its challenges. Learners in all course blocks, ranging from the beginning of the program to the Capstone, identified challenges with making choices that would impact their learning experience. Learners reported feeling discomfort with taking ownership of their learning

and uneasiness making choices that would affect their organization. However, students noted that making choices and developing ownership of their learning allowed them to be in control of their learning and empowered them as learners. It could be argued that until learners embrace their own choices and take ownership of their learning, they will continue to struggle with decisions that may impact their lives in a genuine way. However, if the COVA learning approach is modeled carefully within a significant learning environment in any course of study, students could benefit greatly from learner choice, ownership in learning, and learner voice. Doing so allows learners to experiment, learn, grow, and making meaningful connections with the learning and their own ideas (constructivism).

Some learners acknowledged that control and ownership promoted self-directed learning. When given choice, ownership, and voice through authentic learning opportunities, learners had to figure out how to effectively implement their authentic innovation plans in their organizations, which posed authentic challenges. Through metacognitive thinking, reflection, and peer confirmation of those choices, learners acquired the ability to lead organizational change. Many students found that the constructivist learning environment was vital for them to grow and learn their voice as they connected with others and shared the progress of their plans. Opportunities for students to consistently synthesize their experiences and truly reflect on their decisions and action plans further allowed them to take ownership of the learning. Learners indicated that while having freedom to learn and be inquisitive was initially difficult to embrace, once they were accustomed to their feelings about their learning experiences, they met challenges with an attitude of inspiration.

Many students reflected on their familiarity and comfort with the traditional factory models of learning, where learning occurs through recipe and regurgitation. Learners discussed how this traditional focus may hinder the learners' ability to make choices that directly affect their learning experience; this includes taking ownership of learning, and developing their own voice in the learning environment. Finally, we suggest that there is little room for metacognitive skills to grow if learners are expected to replicate content exactly as they are taught because there are no authentic opportunities for students to apply their learning. Therefore, based on the literature review and the findings of this study, we share the following themes that are important considerations for new courses and programs:

- Choice and ownership of learning positively influenced the learner's experience.
- Voice is a manifestation of choice in learning and positively influenced the learning experience.

- Metacognitive practices and opportunities for reflection assisted learners' as they developed their voice.

Choice, ownership, and voice cannot exist within a program that is not consistently interconnected. Courses must complement each other on a programmatic level and should include authentic experiences of our learners. From our research, we can confirm that learner choice is important and necessary for learners to take ownership of their learning. Through choice and ownership, voice is manifested. Perhaps one of the most important findings is that these elements should not exist without one another, nor can they exist in an ill-structured environment that is too open-ended; they must be embedded carefully within a significant learning environment that embraces authentic learning opportunities.

Limitations

One limitation of this study was that all the participants came from one M. Ed. degree program. Obtaining data from one program may not fully represent the viewpoints of the influence of the COVA learning approach as it applies to other M. Ed. level students. In reference to course blocks, respondents spanned six courses across the program, so the level of experience of those respondents varied. Some were in the first couple of courses in the program, others were in the middle of the program, and some were towards the end of the program or in their final Capstone course. To gain a comprehensive viewpoint, the team surveyed participants throughout the program rather than in one course block only. A separate study addressed perceptions of learner choice, ownership, and voice through authentic learning and categorized responses by course block.

Additional limitations lie in the findings because some of the students may have spoken favorably about choice, ownership, and voice because they are currently in a program that utilizes the COVA learning approach; however, there is no reason to believe this occurred because there were also many examples of students lamenting the challenges of this approach. More studies that involve sampling of students in other courses or programs might strengthen the findings of this study. Follow up questions and interviews would further allow the team to analyze choice, ownership, and voice to gain a more in-depth view of the learners' perceptions.

Future Research Opportunities

Since learners are given freedom to control many aspects of their learning opportunities, the team might investigate how self-efficacy is affected by the

attributes of choice, ownership, and voice in learning and the learning environment. Bandura's (1977) notion that perceived self-efficacy leads to greater changes in behavior is a potential research avenue that is worth exploring. Similarly, the link between self-efficacy and ownership of learning should be explored.

Further research should consider some of the perceived cultural differences in choice, ownership, and voice and how this approach could benefit students from cultures other than North American. Buchem et al. (2014) raised the point that the type of control and ownership given to the learner should be further researched. Degrees of choice, ownership, and voice within cultural contexts could further support or challenge the findings of this study that could reveal additional avenues of thinking.

Rodgers (2006) described that student feedback would help make decisions with our students about learning and what is important to them rather than making decisions for them. Feedback from students would be helpful in determining the impact or effects of choice, ownership, and voice with students that come from a more rigid and disciplined academic approach, as opposed to the DLL program.

Additional research could survey faculty members to identify models of academic motivation that can be used to design instruction for meaningful learning and engaging students. Findings from this research could help us improve our learning approach, as specific models may highlight or address areas faculty members and students identify as important to learning.

Finally, after further analysis of the findings, varying viewpoints and experiences with learner choice, ownership of learning, and learning voice in the program emerging from participants in different course blocks would be a logical next step for this study and will be addressed in a future study.

Conclusion

The purpose of this study was to examine student perceptions of the influence of learner choice, ownership in learning, and learner voice on learning and the learning environment. We have found that there is a trajectory of personal value associated with choice, ownership, and voice, but we propose that these elements must be nested within an authentic and significant learning environment. While this method of learning might seem unconventional to some, personal and meaningful learning experiences can be effective and lead to deeper learning because they challenge existing ideas (Dirkx, Mezirow, & Cranton, 2006). With the ebb and flow of teaching and learning, it is important that we consider our students' learning needs first and fixate those needs at the core of our instruction. In

fact, we argue that for choice, ownership, and voice to effectively work, each element must be embedded programmatically with integrity and fidelity through authentic learning opportunities.

Our investigation has also confirmed Buchem, Tur, and Hölterhof's (2014) notion that perceived ownership and control is an indicator of whether learners engage in learning and the learning environment. When students are engaged in learning, they are making choices, developing ownership and agency, and using metacognitive strategies to build their identity as learners. Learner voice and reflection through iterative processes that give them opportunities to make mistakes and fail forward gives learners the sense of control and supports the shift in learning that is needed. Therefore, a carefully crafted learning environment will heed Bandura's (1977) claim that learners' belief systems about their own abilities will likely affect whether they will be able to adapt and learn in any given situation; thus, a learner's perceived success can contribute to self-efficacious beliefs about progress and achievement. If learners measure their progress and achievement by how accurately they can regurgitate information, they will continue to memorize content only. If learners are given choices in learning, opportunities to engage through ownership of those choices, and a voice that is powerful in supporting their choices, they will not only learn the content, but they will cultivate intellectual, social, and affective skills that are fundamental to human development. Our core proposition that emphasizes learner choice, ownership of learning, and learner voice through authentic learning opportunities has a positive influence on learning and the learning environment.

Given the findings of this study, those wishing to investigate elements of the COVA learning approach might consider the following questions. Considering these questions could initiate the process of developing a new culture of learning that gives learners an opportunity to experience learner choice, ownership in learning, and learner voice that has the potential to be a driving force for change in teaching and learning pedagogy.

1. Are there opportunities in my course and program for students to make personalized and authentic choices that influence their learning experience?
2. To what degree do students take ownership of the learning if they are given choices in their learning and the learning environment? Do students actually take ownership of learning if they are referred to a prescriptive rubric or checklist every time they must complete an assignment?

3. Is student voice in learning important for students to develop metacognitive skills?
4. Can one or all elements of choice, ownership, and voice truly exist if one or more element is missing?

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Beyond the Click: Rethinking Assessment of an Adult Professional Development MOOC

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The purpose of this study was to evaluate the design and implementation of an international faculty development MOOC about flipped teaching. Qualitative and quantitative data, such as traditional MOOC analytics, interviews, and Concerns-Based Adoption Model (CBAM) survey data, were collected as participants learned how to flip instruction. This study indicates that measures of online engagement, such as number of clicks and number of online discussion posts, do not necessarily translate to a change in attitudes about teaching practice. Adult participants (teachers, faculty, and researchers) in this MOOC presented as strategic learners and applied personalized approaches for their own teaching development while learning in a MOOC.

Massive open online courses (MOOCs) attract participants from a multitude of backgrounds with a variety of motivations and purposes (Kizilcec, Piech, & Schneider, 2013; Wang and Baker, 2014), including professional development (Ziegenfuss, 2016). This paper explores the experience of faculty and K-12 teachers in a professional development MOOC designed to help instructors learn how to implement the flipped (inverted) classroom (Furse, Ziegenfuss & Bamberg, 2014). In this study it quickly became apparent that the participants were not just interested in flipping. Most were seeking a change in teaching methods and were interested in general teaching improvement. The MOOC was learner-centered, allowing participants to choose a variety of learning activities and content depth. We found that traditional benchmarks of course engagement, such as linear progression through a curriculum and number of “clicks” on course content, were not good indicators of course engagement (Perna et al., 2014). In this paper we will explore a more learner-centered assessment strategy that includes how individual learner goals impacted MOOC participation and resultant change in concerns and teaching conceptions.

Literature Review

Faculty Development and Conceptual Change

Learning how to invert instruction in which pre-class recorded lectures or reading material provide the foundation for in class active learning requires more than just knowing how to create online videos (Bishop & Verleger, 2013). Testing out and adapting new teaching pedagogies requires re-thinking how students learn (Ambrose, Bridges, DiPietro, Lovett & Norman, 2010), acquiring new course design strategies (Fink, 2013; Ziegenfuss & Lawler, 2008), and developing new conceptions about teaching practice (Ho, Watkins &

Kelly, 2001). This transformation of personal teaching and learning beliefs is crucial to instigate a shift in teaching practice and is commonly aligned to a model of conceptual change (Åkerlind, 2008; Ho et al., 2001) that extends beyond application of pedagogical techniques to include reorienting assumptions and frameworks about teaching and learning. The conceptual change process involves exploring alternative frameworks that trigger a paradigm shift in thinking rather than just the addition of techniques to existing frameworks (Ho et al., 2001).

A conceptual shift can be triggered through course designs that integrate opportunities where participants reflect and connect their prior experiences, their new knowledge, and the application of new knowledge to change their practice (Taylor & Cranton, 2012). After reviewing 250 different studies, Kasworm and Bowles (2012) concluded, “[T]ransformative learning represented a learner or environmental process focused on learner change in perspective, worldview, and/or sense of self ... most often based in a self-reported shift from previously held beliefs and assumptions about self and world” (p. 389). Wenger, Trayner, and de Laat (2011), who have developed a framework for assessing the value of communities and networks, concur and state, “[C]ommunity and network members need to recognize their own experience of participation in the results and the process of evaluation if they are to use it for reflection and guidance” (p. 7). These studies indicate that a transformational experience is not about quantity of engagement, but rather the quality of engagement. Therefore, the problem of assessment of quality engagement becomes evident. Wenger et al. (2011) also contend that qualitative and quantitative measures from both personal and collective narratives at five different levels are needed to evaluate the value of a community experience: activities and interactions, knowledge capital, changes in practice, performance improvement, and the redefining of success (pp. 19-23).

Examining the analytical processes involved in arriving at new understandings is key (Ambrose et al., 2010). Higher education faculty often receive little or no formal training in how to teach (Fink, 2013), and the occasional teaching workshop may not spark a teaching paradigm shift (Herman, 2012). The faculty development literature recommends a more sustained experience where faculty are able to integrate theory and practice, interact with peers, and reflect on their own practice (Ho et al., 2001; Marton & Ramsden, 1992). This paradigm shift in thinking integrated with a conceptual change approach, has been documented and validated in the literature (Ho et al., 2001; Vosniadou, 2003). Emerging models for community building and online delivery of faculty development may also help elicit this type of significant impact (Siller, Bastian, Muus-Mehrholz, & Siebertz, 2014). This paper will focus on assessing the impact of our MOOC through changes in attitudes of the participants.

MOOCS for Rethinking Faculty Development

Conventional MOOC assessment strategies use the binary measure of completer/non-completer or counting page views (“clicks”). These have significant limitations for capturing course efficacy or learner engagement (Sharples, McAndrew, Weller, Ferguson, Fitzgerald, & Hirst, 2012; Kizilcec et al., 2013). Many students who enroll in MOOCs have no intention of actually finishing the course (Kolowich, 2014). Rather, they are there to explore a particular topic and then move on to something else. This is especially the case for faculty/professional development MOOCs (Lane, 2013).

However, an emerging body of research has begun to propose a more nuanced assessment of learner engagement, needs, and preferences by creating statistical-probabilistic engagement models (Ramesh, Goldwasser, Huang, Daumé & Getoor, 2013), mechanisms to monitor social media (Koutropoulos, Abajian, Hogue, Keskin & Rodriguez, 2014), and adaptive learning modules (Sonwalkar, 2013). Research by Kizilcec and his colleagues (2013) also bolster this premise and move beyond the binary of completer/non-completer. Instead, they argue that there are four prototypical engagement trajectories amongst MOOC students: completing, auditing, sampling, and disengaging. Many participants in MOOCs (auditors and samplers) would most likely have been considered non-completing under the binary model, yet this may be exactly the engagement these learners sought. Kizilcec et al. (2013) also concur and suggest that further investigation into learner preferences and needs would help uncover points of disengagement and inform course design changes to meet individual needs of all learners.

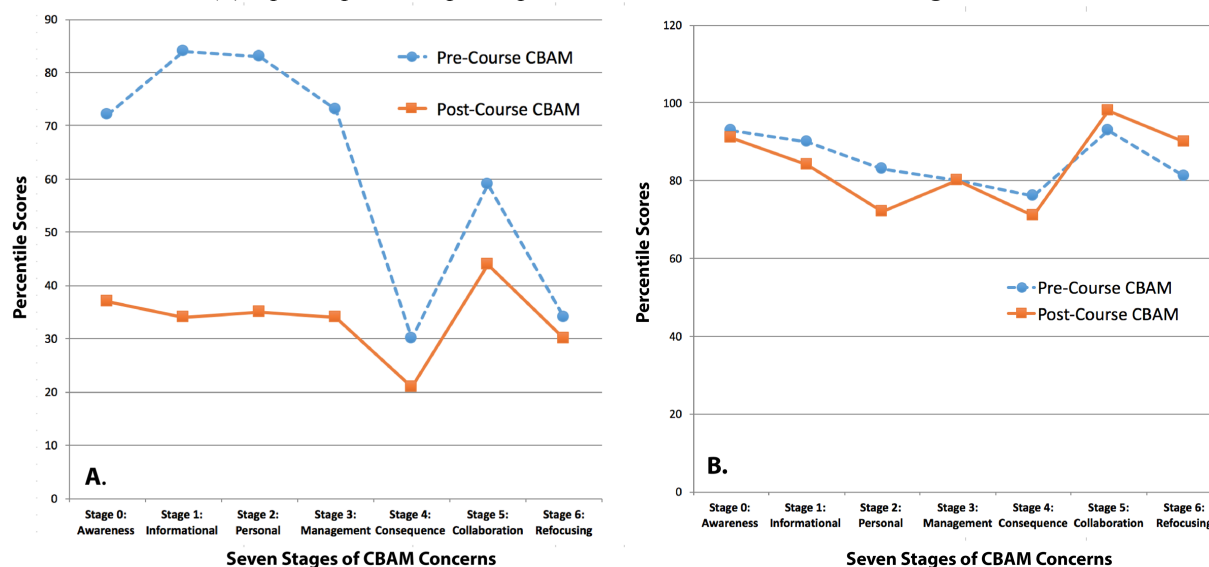
One validated model for measuring conceptual change when rethinking teaching practice is to measure change in concerns through the pre- and post-Concerns Based Adoption Model (CBAM) survey (Hall & Hord, 1987). The CBAM measures faculty/teacher concerns and perceptions as they approach teaching innovations. It has been used in both K-12 and higher education contexts (Dell, 2004). The CBAM identifies seven stages of concern that people move through as they become aware, implement, and rethink their practice when learning a new innovation. *Awareness (Stage 0)*, is where there is little concern or interest in a particular innovation or practice. In our case, a teacher who knows little about flipped instruction would have a high concern Stage 0 score. A teacher with interest in gaining more information about a teaching innovation would have a high *Informational (Stage 1) score*. A teacher with a high *Personal (Stage 2) score*, would be concerned about impacts from adopting this new method. High *Management (Stage 3) scores*, show concern about managing time and resources to adopt the method or innovation. High *Stage 4 or Consequence scores* indicate concerns about how this new innovation may impact students. Those interested in sharing experiences with others would have a high *Collaboration (Stage 5) score*, and as a teacher begins to think about improving or customizing methods, *Refocusing (Stage 6)* becomes the main focus. The CBAM scores presented in a chart form to teacher participants for reflection is a way to compare pre- and post-professional development and evaluate how a participant’s concerns have changed. Although the CBAM can be used as a quantitative pre- and post survey (Ward, West & Isaak, 2002), this study used the CBAM instrument in a more qualitative way to visually provide a profile to teacher participants that demonstrates how their concerns changed across the MOOC (Evans & Chauvin, 1993). We expect participants in a faculty development MOOC to begin at various places on the stages of concern continuum and for these concerns to evolve across the course. Our goal was to use the CBAM profiles to help participants visualize and reflect on personal changes in their thinking and concerns across time, not to statistically quantify the change (see Figure 1 on pg. 15).

The Flipped Classroom MOOC

The Teach-Flip MOOC (<http://teach-flip.utah.edu>) was developed by Dr. Cynthia Furse (professor of Electrical & Computer Engineering) and Dr. Donna Ziegenfuss (associate librarian) at the University of Utah as part of a National Science Foundation (NSF) grant for Transforming Undergraduate Education (TUES) in STEM (Science Engineering Technology & Math). Three modules (*Gathering Information:*

Figure 1

CBAM profiles of 2 participants: (A) who reported substantial change in their concerns about the flipped classroom and (B) a participant who participated and demonstrated minimal changes in concerns



Introduction to Flipping, Engaging Students Online: Creating Video Lectures, and Engaging Students in Class: Active Learning) were developed. Each module included three levels: A: Basic (introductory knowledge), B: Intermediate (first attempts at integrating the concepts in their classroom), and C: Advanced (more complete, advanced integration into their classroom).

The data for this paper was collected in one iteration of the MOOC taught across 6 weeks as a public and free course through Canvas.net with over 850 enrolled higher education and K-12 teachers from every continent and grade level, as well as across a variety of disciplines. In the pre-course demographic survey, which 259 participants completed, 45% self-identified as active participants, 30% as passive, 11% as observers, and 10% as drop-ins. Actual participation was defined and analyzed through the course by using analytics data, which tracked individual participation.

During the first week of the course the average number of participations (actions, as distinguished from number of participants) was 116. This participation dropped to 25 after the first week. This drop in participation is typical of MOOCs (Khalil & Ebner, 2014) and was, in fact, anticipated by the participants themselves. Of participants who completed the post-MOOC survey, 77% gave the course a 4- or 5-star rating (on a scale of 1-5) and indicated they were satisfied with the course. Given this, we pondered how to measure success.

Conceptual Framework

This study is grounded in a framework of conceptual change and premised on the thesis that change through transformation of personal practice extends beyond mere techniques. It includes a reorienting of one's underlying assumptions and frameworks about teaching and learning (Akerlind, 2008). When an alternative framework for teaching (in this case, flipped instruction) is presented, different conceptual elements prompt a rethinking of practice. The goal of this project was to spark a paradigm shift in thought (e.g. learner-centered teaching) rather than just the addition of a new teaching technique (e.g. active learning) onto an existing practice framework (e.g. sage-on-the-stage). In many cases, the participants had other ideas.

Method

To explore the relationships among participants' changes of thought as they engaged in the different modules, we employed quantitative and qualitative methods to collect and analyze data. Information was gathered through (1) online analytics data (module and page clicks); (2) pre- and post-course surveys administered by the Learning Management System vendor to gauge participants' demographics, information on previous MOOC experience, course expectations, rationales for taking this MOOC, and their satisfaction with the MOOC; (3) interviews with participants who disengaged with the course; (4) online discussion forums where participants discussed their

teaching dilemmas and responses to the course content; and (5) a pre- and post-Concerns Based Adoption Model (CBAM) survey (Hall & Hord, 1987) to assess change in thinking and concerns about flipping a course; and (6) a final feedback survey, intended to guide course improvement, administered in the last module. Quantitative analysis involved comparing the learning analytics data (i.e., frequency of each participant's individual page visits, their total time spent on the site, as well as the content accessed), pre-course survey about expectations for the MOOC, and pre- and post-course CBAM concerns.

The CBAM Stages of Concern (SoC) survey includes 35 Likert-scale questions (scale of 1-7), with five questions for each of the seven stages of concern, and it is used to explore concerns about adoption of new teaching methods and technology. Score of the questions for each stage are summed, and then the stage sum is aligned to a percentile score, which is obtained from a conversion table that is used for each of the stages of concern. The percentile scores on the y-axis are plotted against the seven stages of concern on the x-axis. In this study, the pre- and post-CBAM plots are charted together to create an individual profile that visually illustrates how a participant's concerns may have changed throughout the course. The purpose of the profile was to provide a tool that participants could use to reflect on their change of concerns across the MOOC. This survey was developed in the mid-1970s, and it has been verified and widely used in educational research at both higher education and K-12 levels.

We were also interested in the reasons participants disengaged from the course. After the first module at the end of week 2, we saw the greatest number of participants cease to engage (230 participants). We interviewed fifteen participants who had initially engaged in the course and viewed at least two modules, but then dropped off in their engagement. Semi-structured interviews were conducted by telephone/skype, audio-recorded, and transcribed. The questions were built around factors that were participant controlled (e.g., time, motivation, foundational knowledge), instructor controlled (e.g., scope of course, disciplinary focus, curricular sequence, pedagogy, flipped conceptual model), and technologically controlled (e.g., support and hardware).

The interviews, as well as online reflections and comments from the pre- and post-surveys, were analyzed using an inductive thematic method (Marshall & Rossman, 2014). Constant comparative methods were used to code and categorize the data. Factors causing participants to disengage with the course were clustered thematically. The qualitative data of individuals who emerged as having high levels of CBAM change, yet whose participation analytics indicated a low quantity of engagement, were further

analyzed to determine and interpret what factors contributed to their framework shift. From there, we honed in on current and active participants in order to get a sense of overall activity and what completion of course work looked like. Based on individual learning analytics (total number of modules, activities, and discussions viewed), post-course completion was coded as completing, disengaging, auditing and sampling, and then compared to pre-course intention survey data.

Results

Pre- and Post-survey Results

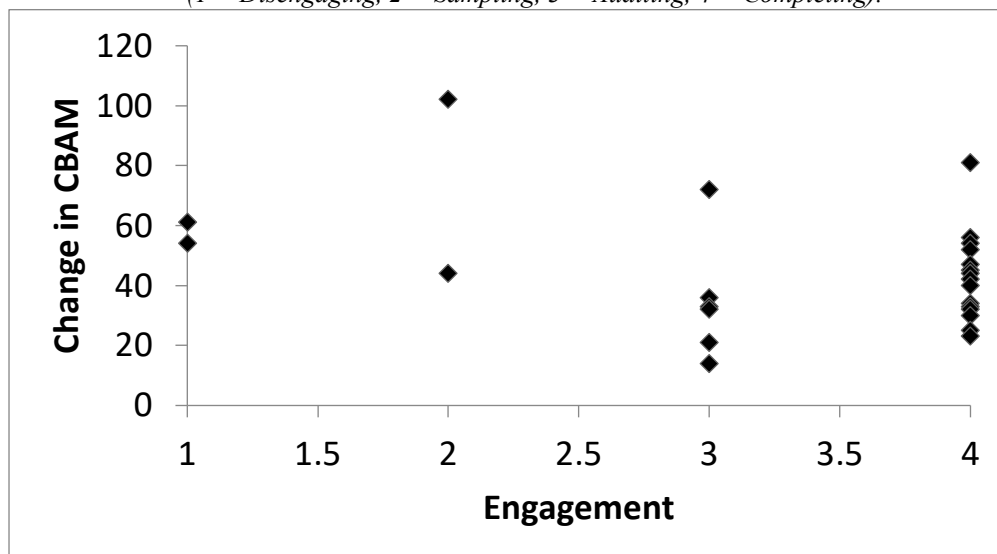
Of the participants who took the pre-course survey, 48% reported they were taking the MOOC because they enjoyed learning about interesting topics, 13% said they were curious about MOOCs, and 10% just wanted to try out Canvas (the MOOC LMS). Others reported they hoped to gain skills for a new career or promotion or that they were considering going back to school. When asked what professional or personal goals they had for the course only 38% were interested in learning about the flipped teaching strategy, 30% hoped to improve their general teaching practice, 10% wanted to learn about how to teach others, and 8% considered the course as professional development. Others were conducting MOOC research or were interested in integrating technology into teaching.

In the post-course survey, when asked how this MOOC helped them reach their goals, they reported a variety of outcomes. Some noted they now had a broader understanding of flipping the classroom, and they reported more confidence in doing it. Others said they learned to create videos or had better ideas for changing their teaching practices. Those interested in research said the course clarified research questions for them and compelled them to further explore flipping.

The final course survey also indicated that the participants found value beyond just "how to flip." One participant said, "I've been aware for a long time that I have not received enough education in teaching, ... In some ways, this material helped me improve on things I didn't know I needed to improve, like learning outcomes taxonomies! Who knew!" A comment about the broader impact of the course was, "I have a better understanding of how I would like to change my teaching system." Another participant stated the following:

It made me stop and reflect on teaching; here in Italy we are talking/discussing a lot about key competencies for life, assessment/evaluation of our teaching activity/ the whole system of education; what's behind flipping is of great value and benefits my students.

Figure 2
*CBAM concern change plotted against the pre- and post-course engagement for 25 participants
 (1 = Disengaging, 2 = Sampling, 3 = Auditing, 4 = Completing).*



In post-course follow-up email correspondence, some participants reported similar reflections about what they had learned. One participant reported, “I have learned so much that I feel more secure using flipping in my classes ... I plan to give a mini-workshop to my adjuncts about the flipped classroom.” Another response was, “I am already doing some flipping with one class.” In addition, when we interviewed participants who demonstrated low levels of course engagement after 2 weeks, they identified time and lack of interest as major factors:

- “I teach in a middle school ... and September is always the busiest time not only for me professionally but personally.”
- “I was also enrolled in another online course and did not have time for both.”
- “Now, my problem is that my schedule is hectic. I have to move over to the self-pace.”
- “Yes, ... I plan on going back to it in order to grasp it when I have more time and can handle it.”

CBAM Profiles as a Visual Representation of Change in Concerns and Thinking

CBAM profiles provided a qualitative picture of changes in concerns participants had about flipping their classes from the start to the end of the MOOC. Figures 1 A. and B. demonstrate two examples of CBAM profiles from this MOOC experience. Participant A was concerned about what flipping the

classroom was and what it entailed (high percentile scores in stages 0-3) in the pre-CBAM, but less concerned about this in the post-CBAM. We would interpret this to mean that the participant learned about flipping and what it entailed from the MOOC because the post-course concerns were lower. In the post-CBAM, this participant’s concerns progressed to being concerned about sharing information with others, which we would interpret to mean she was now interested in sharing what she had learned with others in her sphere of influence. Participant B, however, self-reported as an observer in the pre-course survey, and participated only minimally. Therefore, there is little change in the pre- and post-survey CBAM percentile results.

Participation Data and Conceptual Change

The two CBAM examples in Figure 1 could lead us to believe that greater engagement in the course led to a higher level of conceptual change for participant A vs. participant B. However, as we examined more of the CBAM results, we found numerous cases where participants with low or moderate levels of engagement exhibited higher levels of change in thinking, and vice versa. Figure 2 shows both CBAM and engagement data for the 25 participants who completed all surveys, participated in learning modules, and completed a pre- and post-CBAM survey. Engagement was measured by module and learning activity clicks. We defined the level of engagement from the total number of module webpages viewed, the number and type of modules

Table 1
Definition of Levels of Engagement Based on Course Analytics

Engagement Level	# Modules (of total of 6)	# subsections (of total of 18)	# discussion posts (of total of 18)
4 Completing	5	10	3
3 Auditing	4	6	1
2 Sampling	1	2	0-1
1 Disengaging	Clicked on at least 1 item		

viewed, and the number and type of discussions in which the person participated. The MOOC course design included 3 modules, and each module had an overview and 6 subsections. Each subsection also had an associated discussion. Levels of engagement were defined from these “clicks,” as in Table 1. We gave discussions less weight, as not all participants chose to engage publically in this way. Comparing engagement defined as in Table 1 to pre-survey responses, we found that 60% of the participants engaged at the level they originally intended. Of the original 250 participants who signed up for the course, 119 introduced themselves in the online discussion forum at the beginning of the course. For module 1, 84 completed the basic material, 56 completed the intermediate, and 20 completed the advanced material. For module 2, basic, intermediate, and advanced materials were completed by 25, 19, and 5 participants respectively. For module 3, basic, intermediate, and advanced materials were completed by 11, 9, and 9 participants respectively.

Next, we compared the levels of engagement with the change in concerns, as measured by subtracting the difference in pre- and post-CBAM percentile scores. Figure 2 shows that participants with high levels of engagement had a wide variation in their levels of CBAM change. This is not particularly surprising, as people learn and experience the world differently. What was perhaps more surprising was that even minimal indication of engagement could provoke a substantial CBAM shift for some participants. For the seven low engagers in our sample who viewed seven or fewer webpages and discussions, five experienced changes in their CBAM percentile score. No one single factor could be attributed to prompting a change in attitudes about the flipped classroom. The bottom line was that quantity of “clicks” did not translate to participants’ perceived change. CBAM change in this figure was measured using the differences in the pre- and post-CBAM scores for the seven stages of concerns summed together for each participant (high numbers indicate higher levels of change).

Follow-up E-mails

We contacted participants by email several months after the MOOC concluded to learn about the impact of

the MOOC on their practices. The main themes from the emails reflect (1) a higher comfort level with the flipped classroom and (2) a realization of the time commitments for taking a MOOC:

- After a couple of weeks I started understanding more of what works for students (i.e. shorter videos which took pressure off me in terms of class prep, so therefore more focus on students’ needs/expectations) and what their concerns are, hence the change in my 'concerns'. So now I have less concerns overall about flipping.
- ...[F]irst, I signed up for too many MOOCs, and now I don't have enough time. They all sounded so fascinating! Second, I'm a bit lazy when it comes to actually putting the work in creating videos, etc. I really just wanted to get a feel for flipped learning.

Discussion

This paper compares participant measures of engagement and change in a MOOC faculty development program about the flipped classroom. This free, online, voluntary adult education course included a wide variety of participants: higher education faculty, K-12 teachers, trainers, and professional developers from all over the world with various participation motivations.

Our first finding was that participants’ actual participation in the course generally corresponded to their self-reported intended engagement. In the pre-course survey 45% self-identified as active participants, 30% as passive, 11% as observers, and 10% as drop-ins. In analyzing actual engagement of those who persisted, we found that 60% engaged at the level they had planned.

The goal of our course was to teach faculty how to flip their course and to motivate them to move towards rethinking their teaching practice, but participant motivations varied tremendously. Some sought specific skills to flip their teaching, others were seeking broad pedagogical training, and yet others were just sampling and experiencing the Canvas learning management system. When measuring change in concerns and conceptions about flipping

their courses, in using the CBAM measurement we found that the quantity of engagement as measured by content “clicks” did not necessarily translate to conceptual change. Given the variety of learner goals, this should not be surprising. Specific bits of information, online discussion interactions with peers, or just simply being exposed to new ideas had an impact, whether or not the participants completed all of the content in the course. One participant stated, “I now have a better understanding of how I would like to change my teaching system.” Consonant with the framework and findings of Kizilcec et. al (2013), the binary of completers and non-completers was not a useful framework for determining course efficacy or participant learning. Instead, participants’ preference for a personally relevant and experiential learning environment that could be easily juggled with other life responsibilities seemed to guide how they approached the course (Merriam, Caffarella, & Baumgartner, 2007). Our course was specifically designed so that students could explore each topic at a level that met their individual needs, and participants utilized that structure. Park & Choi (2009) argue that designing relevant and self-directed instruction may increase motivation, especially in online instruction. Therefore, the importance of learner-centered course design to meet the wide variety of participant objectives also underscores the need for learner-centered assessment.

We also found that the quantity of engagement was an ineffective method of measuring the overall impact of this MOOC learning experience and its ability to drive conceptual change. Using “clicks” as an indicator of learning or change in teaching practice would have over-predicted change for highly engaged learners and under-predicted change for low engagement participants. It became clear that assessment needs to move beyond measuring page clicks as a success metric. Instructors/designers need to think of assessment more broadly, incorporating ways to directly measure action, attitude change, or personal goal attainment. Learner-centered course design should be aligned with the myriad of learner participation preferences. As was witnessed in this course, the engagement with one or two modules, or a cursory sampling of the material, may be all participants want and need to fulfill their individual professional goals.

We found that a combination of quantitative and qualitative metrics provided a more comprehensive approach to assessing course effectiveness. We agree with Merriam, Caffarella and Baumgartner (2007) when they purport that, although we often focus on designing and assessing formal education with narrow and defined outcomes, it would also be prudent to consider and support flexible and alternative methods for assessing adult learning.

From this study, the dimension of adult goal attainment appeared to be a weighty dimension mediating participant engagement. The traditional, linear framework for curricular design does not apply to contexts such as this faculty development MOOC. We found that, although the course was specifically about how to design, create, and implement flipped instruction, only 38% of participants said their goal for taking the course was to learn about flipping. Therefore, more self-directed, incidental, and social, or tacit learning participant needs compel a different sensibility to flexible course design, learning sequencing, and aligned assessments. As noted in Kolowich (2014), most learners enroll in MOOCs to explore the content and then move on to something else. Hence, it seems only appropriate that new MOOC models seize the self-guided and divergent proclivities of learners (Khalil & Ebner, 2014; Leckart, 2012). Along with learner-centered course design, must come learner-centered course assessment.

Conclusion

This article described the assessment of a faculty development MOOC. Comparing the participant engagement (measured by number of module clicks and participation in online discussion boards) and conceptual change across the course using the Concerns Based Adoption Model (CBAM), we found no patterns between the quantity of engagement with the content and conceptual change in participants. Therefore, it is important for faculty developers to consider that quantitative engagement measures (“clicks”) alone may not be an effective way to measure the effectiveness of adult professional development. Instead, as indicated in this study, measurement of concerns and change in perceptions, such as that provided by the CBAM, may be a better alternative. The visual CBAM format also created an opportunity for participants to reflect about how their thinking has changed across the course. This is an example of what Schugurensky (2000) calls “retrospective recognition” in which the learner develops awareness that an “unintentional and unconscious learning experience took place” (p. 6).

To build on this research, future research could investigate additional strategies for utilizing the CBAM, or other similar measurements of change, as a formative assessment tool to enhance the visualization of change. It is also worthwhile contemplating if other types of attitude change or knowledge development might be helpful to measure as well, such as Technological, Pedagogical, and Content Knowledge (TPACK), which is a conceptual framework related to the integration of teacher technology skills and pedagogical knowledge (Mishra & Koehler, 2006; Voogt, Fisser, Pareja Roblin, Tondeur & van Braak,

2013). From this research, it is also recommended that longitudinal post-course follow-up be used to evaluate the future activity of these faculty participants to see how successful they were in the implementation of the flipped teaching approach. Additional models and measurements related to measures of conceptual change are also warranted in order to provide a variety of tools for assessing change in teaching perceptions.

In addition to the CBAM Stages of Concern Survey (SoC) which was utilized in this research study, continuing research at the Southwest Educational Development Laboratory (SEDL) has developed a more comprehensive three-pronged framework of instruments for measuring change. This approach for measuring change includes the SoC, as well as the Levels of Use (LoU) survey, which measures how instructors react to change, and Innovation Configurations (IC) for mapping the process of change (Hord, Rutherford, Huling-Austin, & Hall, 2006). A future study could utilize this full framework of tools to develop a richer description for measuring and understanding concerns about adopting innovations. Quantitative CBAM research could also be conducted using statistical methods to analyze the degree of change at each CBAM stage and would be a logical extension to this qualitative CBAM study.

Additional instruments designed to measure teacher perceptions, such as the Teaching Perspective Inventory (TPI) created by Pratt and Collins (2000) or the Teaching Goals Inventory (Angelo & Cross, 1993), could also be used in conjunction with the CBAM for future studies to provide a triangulation of the findings. Other strategies for measuring conceptual change such as participant concept mapping might also be considered as a course assignment and used as an artifact for measuring change in teaching practice (Miller et al., 2009).

The take-away message from this study is that traditional measures of online engagement (number of “clicks,” number of online discussion posts, and other course analytics) do not directly align with change for adult professional development. If the objective of the course is to help instructors plan for and, even more importantly, change how they teach, then these attitudinal outcomes need to be measured directly. We used the CBAM and qualitative interviews to measure this shift in concerns, but there are other methods that could be used as well (Schugurensky, 2000). Our experience and findings point to the clear need for more personalized learner-centered assessments of the learning experience and outcomes in online faculty development focused MOOCs (Siemens, 2012). This also surely translates to the need for more personal learning assessments as part of a toolset for assessing learner-centered teaching.

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Science Students' Responses to an Oral Communication Skills Development Initiative: Attitude and Motivation

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Situated within the CID (Communication in the Disciplines) theoretical framework that promotes the focus of communication instruction on the oral genre standards of effectiveness, and employing a transdisciplinary approach, the current study explores science students' attitudes and motivation concerning an oral skills development (OSD) intervention. The cross-disciplinary based intervention involved the delivery of an oral skills development module over a ten-week period to thirty-four chemistry students in which staff from the English language section partnered with lecturers in chemistry to enhance these students' oral presentation of chemistry-based content. The performance of students participating in the module was compared with that of non-OSD chemistry students to verify whether there was a significant difference in performance. Surveys were also undertaken on OSD Chemistry students to see whether or not there was a significant change in attitude after the intervention. Results revealed a significant difference between OSD and non OSD students on a similar oral presentation task with OSD students attaining a higher level of performance. OSD students also demonstrated a positive, significant change in attitude post intervention. Implications of the findings, as well as possible areas for further research, are discussed.

Effective oral communication skills play a critical role in the personal, academic, and professional success of students, as not only do these skills enhance self-confidence, but they also aid in the formulation, structuring, and presentation of effective arguments. Furthermore, the importance of these skills in the world of work has been underscored by reports from the US Department of Labor, which in 1995 reported that communication skills will be in demand across occupations well into the next century, and more recently [2007], that effective oral, written, and listening communication skills are essential to decision making and resolving issues at the workplace.

This is entirely consistent with the worldwide consensus of universities that communication skills are essential to enhancing the employability of students (Mercer-Mapstone & Matthews, 2016). This sentiment finds support in the fact that effective communication skills are being considered as an expected learning outcome for both undergraduate and graduate science degrees, for example, in Australia, Canada, and the USA.

More specifically, oral communication skills are increasingly being viewed as indispensable tools in technical disciplines such as biology, chemistry, and mathematics where traditionally there had been focus on solely technical knowledge (Beaufait, 1991; Bjorklund & Colbeck, 2001; Denton, 1998; Yu & Liaw, 1998). As such, proficiency in communication is being regarded increasingly as equally important in achievement in the sciences as is technical knowledge.

The importance of oral communication skills to work performance of scientists is further supported by researchers such as Felder, Woods, Stice, and Rugarcia (2000), who found that engineering leaders ranked communication skills as being more important than technical skills. Darling and Dannels (2003) have also

asserted that the types of communication that engineers considered most important included messages regarding construction skills, teamwork, negotiation, and general question and answer exchanges.

Furthermore, the American Association for the Advancement of Science (AAAS) (2009) contends that the ability of biologists to collaborate and communicate with other disciplines is critical to addressing large and complex biological issues, given the increased interdisciplinarity of the area and the need to fully engage with "collaborators, multiple perspectives, and skills" (p. 15). For this reason, they recommend that all students gain experience in communicating "biological concepts and interpretations" (p. 15) through a variety of formal and informal written, visual, and oral methods and also that students graduating with an undergraduate biology degree be offered instruction, practice, and assessments in broader communicative abilities.

These recommendations have been welcomed by many science educators. For instance, Brownell, Pryce and Steinman (2013), Cleveland and Reinsvold (2017), and Greenwood and Riordan (2001) have expressed concern that teaching in the sciences tends to privilege delivery and assessment of students' knowledge of terminology over focus on enhancing their proficiency in communicating scientific-related information to non-scientists.

Indeed, according to Darling and Dannels (2003), although evidence suggests that communication skills are critical to engineering practices, other studies report that these skills are being inadequately developed in engineering courses and curricula nationwide (Black, 1994; Evans, Beakley, Crouch & Yamaguchi, 1993; Goldberg, 1996; Lumsdaine & Lumsdaine, 1995; Rogers, Stratton, & King, 1999; Sageev, Prieto, & Smaczniak, 1992).

This increased awareness of the importance of enhancing the communicative skills of scientists to enable competence in transmitting information to non-scientists has led to practitioners such as Brownell, Pryce, and Steinmann (2013) arguing for the integration of formal communication training into graduate and undergraduate curricula, as well as others such as Besley, Dudo, and Storksdieck (2015) and Dudo (2013) calling for communication training generally to enhance scientists' ability to engage the public.

At the same time, Treise and Weigold (2002) have reported a variety of efforts and outcomes for training in science communication on the part of scientists who for either professional or personal reasons actively seek support from a variety of resources to boost competence in this area. In fact, science communication has not only become embedded in the curricula of an increasing number of academic institutions (Rajput, 2017), but also has increasingly become an area of focus at academic conferences, in professional development workshops at academic institutions, in discussion fora, and in the media (Cooke et al., 2017).

This enhancement of science communication at all levels has implications for the infusion of communication skills into the science education curriculum which is entirely consistent with transdisciplinarity, a concept attributed to Piaget (1972) who, in highlighting the nexus between the disciplines, referred to transdisciplinary as a "higher stage succeeding interdisciplinary relationships which would not only cover interactions or reciprocities between specialised research projects, but would place these relationships within a total system without any firm boundaries between disciplines" (p. 138) (as cited in Bernstein, 2015, p. 2).

In seeking to clarify this concept Lawrence (2004, p. 489) purports that transdisciplinarity "is a way of achieving innovative goals, enriched understanding, and a synergy of new methods." Further, transdisciplinarity suggests an integration of disciplinary knowledges which includes complexity and multidimensionality and seeks to produce spaces where new languages, logics, and concepts can give rise to generative dialogue (McClam & Flores-Scott, 2012, p. 232).

Additionally, experts worldwide (Althaus 2005; Carolan, 2004; Klein, 2004; Landers 2009) involved in a wide range of disciplines from sociology to engineering have asserted that trans- or cross-disciplinary approaches to teaching, learning, and research are key to confronting and finding solutions to current issues of sustainability. Indeed, these experts contend that traditional discipline-based strategies are inadequate for grasping the "complexity and multidimensionality of sustainability as a socio-ecological crisis and for providing new integrated or synthesized approaches to addressing this crisis" (McClam & Flores-Scott, 2012, p. 231-232).

This position finds support in the contentions of Gibbons et al. (1994) whose theory of the production of knowledge in higher education purports that "the world needs both people capable of operating with both disciplinary knowledge (Mode 1) and with transdisciplinary knowledge (Mode 2)" (as cited in Aneas, 2015, p. 1716). This theory further asserts that higher education is constructed around Mode 1 "scientific" or disciplinary knowledge, while Mode 2, on the other hand, refers to the knowledge generated within interdisciplinary, social, and economic context, or what Marsick and Watkins (1997) and Cseh, Watkins, and Marsick (2000) describe as the ability to apply the varying facets of knowledge in order to address issues by finding solutions.

Transdisciplinarity, therefore, constitutes an integrated curriculum in which disciplinary boundaries are nullified and teaching and learning become organized around the creation of meaning within the social/global context of actual and relevant issues and themes. In the current study, the issue as indicated is the relevance of competent communication skills to scientists and the infusion of communication skills into the science curriculum to enable the development of these skills.

The Initiative

The Communication Across the Curriculum Initiative undertaken at our University was one which embraced transdisciplinarity, as it involved the infusion of communication skills into science courses which were delivered jointly by lecturers from both the science faculty and the English language section. This joint approach resulted from awareness of shortcomings in the overall communication skills of science students, which had led initially to the implementation of a Writing Across the Curriculum (WAC) initiative.

The outcomes of the first phase of this project highlighted the need for writing proficiency to be a part of the objectives of all courses, and for writing to be fully integrated into learning activities, if proficiency in this area on the part of students were to be achieved. Additionally, it was strongly suggested that competence in writing should be given due weight in the assessment of coursework and examinations.

Added to this was the perceived need for the enhancement of oral communication skills as there were concerns that students in chemistry were "still graduating with weak skills in this area, as evidenced by comments made to us by their internship supervisors and subsequent employers" (Garaway, personal communication, February 2015). In the same vein, life sciences lecturers wanted their graduates to be able to use language clearly and effectively in their presentation of scientific knowledge to their respective audiences in both oral and written forms.

These concepts are embodied in the Massachusetts Institute of Technology's (MIT) Communication Across the Curriculum Program, whose establishment in the 1990s was an outcome of the realization that its graduates needed more instruction and practice in writing and speaking to become successful scientists, engineers, and entrepreneurs. The principles and practices employed in enhancing the communication skills of students include ensuring that communication activities (writing or speaking) are integral to the purpose of the class; feedback given by the technical and writing staff complement each other and contribute to students' success, and effective communication is judged by the specific context, course goals, and disciplinary conventions (Perelman, 2009).

Also worthy of note is the alignment of this approach with the CID (Communication in the Disciplines) theoretical framework that promotes the focus of communication instruction across the curriculum on the oral genre standards of effectiveness, as well as evaluation practices of the target discipline (Dannels, 2001b). This framework also "assumes that students' learning that occurs in general, basic courses can be enhanced in the disciplines with instruction that is situated within practices that are salient to the discipline" (Dannels, 2001a, p.147).

In implementing our CXC (Communication Across the Curriculum) initiative, we began with the Departments of Chemistry and Life Sciences whose members had participated in the previous WAC (Writing Across the Curriculum) project. The CXC implementation process was designed to involve the selection of four courses from each of these departments: two courses at Level 2 (2nd year) and two at Level 3 (3rd/final year). One course at each of these levels for each of these departments was designated as writing intensive and the other as speaking intensive, which meant that writing and speaking modules were integrated into specific courses.

These courses were ones that were currently so positioned within the curriculum that most students were required to take them as this would ensure the exposure of a high number of students in these departments to a writing and speaking intensive course at Levels 2 and 3. In the case of chemistry the courses Chemical Analysis: Laboratory I (Level 2) and Chemical Analysis Laboratory 2 (Level 3) were selected for writing and speaking infusion, respectively. As with the case of MIT Communication Across the Curriculum Program, English language instructors would deliver the communication modules (writing and speaking), and lecturers in the discipline would deliver the content.

This transdisciplinary initiative where staff from the English Language Section partnered with lecturers in the Sciences in the delivery of science courses was viewed as a ground-breaking event for our institution

and warranted a structured approach, framed by objectives that would lead to research findings based on outcomes. Two major goals of the speech component of this initiative were to enhance students' motivation and attitude to developing competence in oral skills, as well as to enhance performance in this area.

Results from initial research undertaken on the above areas by Francis and McLaren (2014) were encouraging. The aim of this research had been to ascertain the impact of the intervention on attitude and performance, and findings had indicated a positive and significant change in attitude post intervention ($p < 0.05$). Results also indicated a significantly higher level of performance on the part of those who had been exposed to Oral Skills Development (OSD) modules as compared to those who had not.

Focusing the Investigation

The selection of the first goal—that of enhancing attitude and motivation for research purposes—was informed by the awareness that there are implicit factors at work which have an impact on performance and which are also important considerations in the delivery of oral presentation skills. For example, Light (2004) has asserted that students conceptualize their study and learning activities in distinct and different ways, and this has important implications for both teaching and learning. In addition to this, Ho, Watkins, and Kelly (2001) have reported that students' perception of instruction influences teaching strategies, which in turn impacts students' approaches to learning. Also according to Pintrich, Smith, Garcia, and McKeachie (1993), students' views and ideas on learning play a crucial role in performance, and it is essential to take these into account to optimize learning.

Furthermore, Orojloo and Vahedi (2011), who conducted research on the relationship between attitude, motivation, and language learning, found that motivation and attitude play a major role in enhancing proficiency and efficiency of students in language learning. More specifically, in the area of oral communication skills, where much of the research has tended to focus on second language learners, a relationship has been found among attitude, motivation, and learning.

For instance, it has been pointed out by Cohen and Macaro (2007, p. 15) that, "successful and highly motivated learners adopted more strategies, especially those involving planning, evaluation, and monitoring." Poorly motivated students, on the other hand, employed a limited set of strategies and "were less ready to act strategically." In addition to this, a study carried out by Lee (2006) revealed that students displayed higher self-efficacy after being trained in oral communication strategies. And more recently, Toomnan and

Intaraprasert (2015) found that students who displayed a positive attitude to developing competence in oral communication in English also made greater use of taught strategies.

In considering the sciences specifically, Budkaew and Kessomboon (2014) have indicated the importance of a positive attitude to achievement in oral presentation skills. This is evidenced by their finding of a statistically significant correlation between a positive attitude to developing oral presentation skills and performance scores in this area ($p < 0.05$) among sixth year medical students.

Additionally, findings on science students' attitudes generally have been mixed, with little overall improvement in attitude after intervention, in some cases, and increased self-confidence in others. For instance, Mercer-Mapstone and Matthews (2016) reported that although students found both scientific writing and oral communication to be important, the latter was perceived as being less important than the former in terms of perceived improvement, inclusion, confidence, and future use. Similar findings have been reported by Varsavsky, Matthews, and Hodgson (2014), who asserted that students' perceived importance of oral skills was higher at the conclusion of their course, than was their self-reported level of confidence and improvement. In keeping with this trend, Leggett (2004) reported earlier that students perceived their writing skills to be more important than their oral communication skills. On the other hand, Train and Miyamoto (2017) reported a positive increase in students' confidence and perception of their communication abilities both in writing and oral presentations. They further reported that this trend was sustained throughout their senior year.

The purpose of the present research was to verify if the previous positive findings on students' attitude and performance (Francis & McLaren, 2014) would be replicated, in which case a trend concerning the benefits of the OSD initiative would be indicated, which in turn would lead to the commitment of further resources to continue the intervention.

In addition to this, however, further information was being sought on the specific areas of attitude and perception in which changes occurred. These considerations led to the following questions:

1. Is there a significant difference in performance on oral presentations between OSD and non-OSD chemistry students?
2. Is there a significantly more positive attitude on the part of chemistry students pre-and post OSD exposure?
3. If a significant change in attitude and motivation has occurred, in what specific aspects of these variables is this to be found?

Method

The speaking intervention was offered to two groups of chemistry (Chemical Analysis) students over the second semester of the 2016/2017 academic year. The breakdown of the student population was as follows: a group of 34 chemistry students (8 males and 26 females) were sub-divided into three laboratory groups, comprising approximately 11 students each.

The Chemical Analysis course ran for a period of ten weeks. In this ten-week period, the groups were on occasion split into two sub-groups of 16 to 18 each with the same topic being taught for two consecutive weeks. As a result, students got breaks in between OSD sessions and small group sessions. The duration of the OSD intervention for both groups was one hour per week. This hour predominantly entailed the following:

- A review of what was done the week before, which was often done by the students;
- A presentation and discussion of the new topic using examples and illustrations that made reference to one or more area(s) of their studies;
- A speech activity related to the topic at hand in contexts that were relevant to their areas of study; and
- An oral report from the students on what they learnt.

Topics covered included the following:

- Managing anxiety;
- Verbal and non-verbal elements of delivery;
- Analyzing and connecting with the audience;
- Components of a presentation;
- Guidelines for effective presentations;
- Use of visual & audio aids;
- rehearsal of presentations;
- Demonstration of an in-class speaking activity; and
- Impromptu speaking strategies.

The terminal presentations were done by groups, and the rubric was divided into two main sections. The first section focused on the overall design and structure of the presentation, which reflected the group's effort and ability to work as a team. In order to make that determination, four sub-aspects were the points of focus. These included (a) the introduction, (b) the body, (c) the conclusion, and (d) the effective use of supporting material, which also considered creativity. Under the section "body," structure, flow, coordination, appropriate use of transitions, and effective use of allotted time were the focal points. The second main

section evaluated the presenters individually. In this section were six sub-sections for consideration: (a) the individual's use of voice, (b) gestures and body movement, (c) eye contact, (d) anxiety management, and (e) use of language. The first section was graded out of 12, and the second out of 18. Together, they totalled 10 sub-sections and a potential earning of 30 marks (see Appendix A).

Many of the students taking Analytical Chemistry also took the course Industrial Chemistry. However, not all Industrial Chemistry students had been exposed to OSD. Therefore, Industrial Chemistry had both OSD and non-OSD students, with the latter group comprising 30 students. The terminal performances of these two sets of students were compared using t-tests in order to determine the response to research Question 1.

Instrumentation

The development of questionnaires to gauge student attitude to writing took into account McLeod's (1991, p. 98) assertion that, rather than being considered as merely affective responses such as grief, anger and joy, attitudes should be viewed as "psychological states acquired over a period of time as a result of our experiences; these attitudes influence us to act in certain ways." Musgrove (1999, p. 3) has interpreted this to mean that "an attitude is a learned state of readiness rather than the act or response itself. Synonyms would include tendency and predisposition."

As such, the 10-item pre-test questionnaire (see Appendix B) was administered to students prior to the inception of teaching. The questionnaire sought to determine students' perception in a variety of areas which included the importance and usefulness of oral skills (Q.1,2,5 and 8), their autonomy and motivation concerning oral skill development (Q.3, 4,6 and 7), and self-evaluation of their ability and confidence in their oral presentation skills (Q.9 and 10, respectively). Likert scale scores ranged from strongly disagree (1) to strongly agree (5). At the end of the semester, prior to the final exam, the questionnaire was again administered to students. The Cronbach alpha reliability coefficient for the questionnaire was .7085.

The same instrument used for both the pre-test and the post-test aimed at investigating the attitudes of the students toward oral skills development. It consisted of ten (10) questions with demographics requiring student identification number, gender, and age group information. Participants' responses were measured using a Likert Scale and their options were *Strongly Agree*, *Agree*, *Undecided*, *Disagree*, and *Strongly Disagree*. A proposal for the research was submitted to the University's Ethics Committee who approved it.

Results

All of the data collected was coded and entered into the SPSS statistical program. The Likert scale responses were coded from 1 to 5, with 1 being the weakest response degree, (*Strongly Disagree*) and 5 being the strongest response degree (*Strongly Agree*). Therefore, in this study the higher figures in result reflect more positive responses.

As previously stated, non-OSD and OSD students' scores on oral presentations were subjected to t-test statistical procedures in order to verify whether there were significant differences in oral presentation skills between those who had been exposed to OSD and those who had not been. As was the case previously, it was found that the OSD Chemistry group displayed a significantly higher level of performance than their non OSD counterparts: OSD group (M=36.91; SD=4.722) and non OSD group (M=35.68; SD=5.042); $t(65) = 2.405, p < 0.05$.

As previously indicated, Question 2 sought to verify whether there was a significantly more positive attitude on the part of chemistry students post OSD exposure compared to pre-exposure. It was found that students' attitude after intervention was significantly more positive compared to their attitude before intervention: pre-intervention (M 33.29; SD=4.548) and post-intervention ((M=37.64; SD=4.162); $t(34) = 2.382, p < 0.01$. Based on the fact that results for Question 2 revealed a significantly more positive attitude to OSD after intervention, Question 3 then sought to verify the specific areas in which significant differences were revealed.

In regard to students' perception of the importance and usefulness of oral skills (Q.1,2,5 and 8), a paired samples t-test revealed a significantly more positive perception post intervention on Questions 1 and 5, with no significant differences being noted for the other questions. In the case of Question 1 ("All students should be exposed to an Oral Skills Development module"), there was a significant and positive difference between the scores for the pre-intervention (M4.10; SD=0.64) and the post-intervention (M=4.60; SD=0.50) [$t(34) = 2.346; p < 0.05$] responses to the statement.

In the pre-intervention questionnaire the largest percentage of the participants, 71.4%, strongly agreed with the statement. After the intervention, this figure increased to 77.1%. The percent of participants who agreed with the statement fell by 5.7% in the post-intervention, from 25.7% to 20%. The percentage Undecided remained unchanged. None of the members of the group disagreed or strongly disagreed. This information is presented in Table 1.

Results for Question 5 ("Good speaking skills are important for all science students"), as previously stated, revealed a significantly more positive response

Table 1
All Science Students Should be Exposed to a Speaking Course

	Pre-Intervention	Post Intervention
Undecided	2.9%	2.9%
Agree	25.7%	20.0%
Strongly Agree	71.4%	77.1%

Table 2
Good Speaking Skills are Important for all Science Students

	Pre-Intervention	Post Intervention Scores
Undecided	5.7%	0%
Agree	28.6%	20.7%
Strongly Agree	65.7%	79.3%

Table 3
I Would be Willing to use the Feedback I Receive on my Speech to Improve my Skills in this Area

	Pre-Intervention	Post Intervention Scores
Undecided	10.3%	0%
Agree	30.6%	26.8%
Strongly Agree	50.6%	70.8%
Disagree	8.5%	2.4%

Table 4
In General, I Work on my Presentations so That my Performance Reflects the Best I am Capable of

	Pre-Intervention	Post Intervention Scores
Undecided	5.9%	0%
Agree	26.8%	24.4%
Disagree	12.0%	7.6%
Strongly Agree	55.3%	67.0%

post intervention compared to pre-intervention: (M=3.40; SD=1.139) (M4.10; SD=0.64) and the post-intervention (M=4.11; SD=0.90) [$t(34) = 1.304$; $p < 0.05$].

Table 2 reveals a pattern similar to that of Question 2 in that there were no participants who “disagreed” or “strongly disagreed” with the statement. There was also a decline in the percentage of participants who agreed with the statement, from 28.6% in the pre-intervention to 20.7% in the post intervention, while those participants who strongly agreed with the statement after the intervention increased from 65.7% to 79.3%, “pulling in” those who had previously agreed or were undecided.

Concerning student motivation and autonomy in regard to oral skills development (Q.3, 4, 6 and 7), paired samples t-tests revealed a significantly more positive perception post-intervention on Questions 3, 6, and 7.

In the case of Question 3 (“I would be willing to use the feedback I receive on my speech to improve my skills in this area”) there was a significant and positive difference between the scores for the pre-intervention (M3.69;

SD=0.99) and the post-intervention (M=4.57; SD=0.56) [$t(34) = .274$; $p < 0.05$] responses to the statement.

Table 3 shows participants’ willingness to use feedback to improve the skill area. There was a drastic increase (50.6% to 70.8 %) in participants who “strongly agreed” with the statement concerning the utility of good speaking skills. Those who were “undecided” decreased from 10.3% to 0%, and those who agreed and disagreed also decreased from 30.6% to 26.8% and 8.5% to 2.4%, respectively.

Significant differences were also noted for Questions 6 and 7. In the case of Question 6 (“In general I work on my presentations so that my performance reflects the best I am capable of”), a paired samples t-test yielded the following statistical data: pre (M=4.29; SD=.667), post (M=4.66; SD=.561) and the intervention survey results [$t(34) = 1.528$; $p < 0.01$].

Table 4 illustrates the percentage distribution for those who worked to the best of their ability on their presentations. The percentage of those who “strongly

agreed” moved from 55.3% to 67.0%, while those who *“agreed”* and *“disagreed”* fell from 26.8% to 24.4% and 12.0% to 7.6%, respectively. The percentage of those who were *“undecided”* fell to 0% post intervention.

Question 7 (“I am willing to undertake whatever work is necessary to improve my oral presentation skills”) yielded the following statistical data: pre (M=3.85; SD=0.65) and post (M=4.00; SD=0.66) intervention survey results [$t(34) = 1.528$; $p < 0.05$].

Table 5 illustrates that, unlike previous results which indicated a fall in the percentage of those in the *“Agree”* category, the percentage of those agreeing remained the same (28.6%) for Question 7. On the other hand, there was a significant percentage increase from 51.6% to 68.5% for the *“Strongly Agree”* category, as well as a noticeable percentage decrease in the *“Undecided”* category from 18.4% to 2.9%.

Questions 9 and 10, which sought to determine students’ level of confidence in their ability to deliver effective oral presentations, yielded significant and positive results post-intervention. In the case of Question 9 (“I have the capacity to deliver effective oral presentations”), responses yielded the following results: pre-intervention (M=3.37; SD=.710) and post intervention (M=3.71; SD=.910); surveys, [$t(34) = -2.163$; $p < 0.05$].

Table 6 illustrates results for all five categories of the Likert scale, with a percentage fall in the *“Strongly Disagree”* category from 2.9% to 0%, and a fall of 12.3% to 8.0% in the *“Disagree”* category. A fall in percentage was

also noted for the *“Undecided”* category (26.4% to 10.1%), while a percentage increase was noted for both the *“Agree”* and *“Strongly Agree”* (44.7% to 58.4% and 13.7% to 23.5%) respectively.

For Question 10 (“I am confident in my ability to deliver effective oral presentations”) the following results emerged: pre-intervention (M=3.09; SD=.639) and post (M=3.29; SD=.622) ($t(34) = -1.961$; $p < 0.05$).

Table 7 reveals a percentage fall in the *“Strongly Disagree”* and *“Disagree”* categories from 2.9% to 0% and 8.6% to 5.7% respectively. A percentage decline was also noted for the *“Strongly Agree”* category where there was a slight fall from 68.6% to 65.9%, while conversely, percentage rose in the *“Agree”* category from 20.0% to 28.6%. There was no *“Undecided”* category for this question.

Trends noted for the above findings include the consistent reduction in percentage of the *“Undecided”* responses, in most cases to 0%, in keeping with the equally consistent increase in the percentage *“Agree”* and *“Strongly Agree”* responses. This strongly suggests that those who were undecided concerning the value of oral communication skills, their autonomy and motivation in developing these skills, and their ability and confidence in presentation skills unanimously adopted a more positive stance. This is strongly supported by the repeated reduction in the percentage of *“Disagree”* and *“Strongly Disagree”* responses, when indicated via responses.

Table 5
I am Willing to Undertake Whatever Work is Necessary to Improve my Speaking Skills

	Pre-Intervention	Post Intervention Scores
Undecided	18.4%	2.9%
Agree	28.6%	28.6%
Strongly Agree	51.6%	68.5%

Table 6
I Have the Capacity to Deliver Effective Oral Presentations

	Pre-Intervention	Post Intervention Scores
Strongly Disagree	2.9%	0%
Disagree	12.3%	8.0%
Undecided	26.4%	10.1%
Agree	44.7%	58.4%
Strongly Agree	13.7%	23.5%

Table 7
Which of the Following Best Describes Your Level of Confidence in Your Ability to Deliver Oral Presentations

	Pre-Intervention	Post Intervention Scores
Strongly Disagree	2.9%	0%
Disagree	8.6%	5.7%
Strongly Agree	68.6%	65.9%
Agree	20.0%	28.6%

Discussion

Results from the study are consistent with previous findings (Francis & McLaren, 2014), which had indicated a significantly higher level of attainment on the part of students who had been exposed to the OSD module, as well as a significantly more positive attitude after exposure. This trend has demonstrated the value of this intervention and has gone a far way in persuading our university's administration to commit the necessary resources for continuing this initiative.

A similarity between these and other findings outside of our context is also noted, as is seen in the case of the previously mentioned results of Lee's (2006) investigation which had indicated that students displayed a higher level of self-efficacy after training in oral communication strategies. The findings of Varsavsky, Matthews, and Hodgson (2014), as well as Train and Miyamoto (2017), which were also previously mentioned, are also consistent with those of the current study, as is evidenced in their report on the enhanced perception of the importance of oral skills and self-confidence on the part of students at the conclusion of their course.

What is particularly gratifying, however, is the significant and positive change in student perception in all areas of attitude and perception being measured: the value of oral skills development, motivation to improve performance and autonomy in this area, and increased confidence in oral presentation skills. This clearly signals a global attitudinal change which augurs well for the overall development of other students participating in this intervention.

Conclusion

We believe that the positive outcomes of our intervention are due in great part to the transdisciplinary approach which involved the infusion of OSD instruction into the chemistry course, as opposed to offering this as a "stand-alone" course, as this enabled students to see its relevance to their area of study. For instance, all practice presentations were related to the content of the course, and the final presentation, which was graded, was a course related project undertaken in groups. Students were thus also able to see immediate results related to the effort and work they had put into their presentations.

Further, we believe that transdisciplinary-based interventions of this type should be applied more widely in higher education to enhance the capacities of students and, in so doing, better equip them to function in an increasingly more complex and multidimensional environment, as previously suggested by Gibbons et al. (1994) and more recently by Aneas (2015).

For instance, science education, given its wide application and relevance in the current global environment (e.g., climate change, sustainability, alternative sources of energy, nuclear threat) could very well provide a starting point for the move toward transdisciplinarity with areas in addition to communication being incorporated. Such areas could include critical thinking, ethics/philosophy, history, etc. This is consistent with the previously mentioned position of experts involved in a wide range of disciplines (Althaus, 2005; Belsky, 2002; Carolan, 2004; Fry, 2001; Gough, 2002; Klein, 2004; Landers, 2009) who call for cross-disciplinary approaches to teaching, learning, and research in order to tackle and address issues relating to sustainability.

We also believe that attempts should be made to verify if results similar to those from this study would be obtained for students in other transdisciplinary initiatives, such as the social sciences, involved in a similar OSD. Additionally, a qualitative component could be introduced in further research whereby students are interviewed after the emergence of findings in order to gain further insight and to explain why a positive change in attitude or performance in specific areas occurred or did not occur.

This study has also offered evidence in support of the positive outcomes and benefits to be gained by providing oral skills development sessions to a particular group of students. Although science students were the focus of the study, it is believed that a similar intervention for students from other disciplines would yield the same results.

Finally, it is important to note that the significantly positive results have also provided renewed impetus for members of our university's administration to continue providing the necessary resources for the exposure of chemistry and life sciences students to this intervention. Further, it has laid the foundation for making a case for affording other science students in sub-disciplines such as physics, mathematics, and engineering—as well as, by extension, students from other disciplines—the same opportunity to enhance their oral presentation skills.

In fact, given the essential role of oral presentations skills in students' academic and professional performance and development, academic institutions must ensure that all students are exposed to this area of learning.

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Appendix A
Oral Evaluation Rubric

ORAL PRESENTATION COMPETENCY INSTRUMENT

Student's Name _____ Evaluator's Name _____

Circle one of the numbers after each question based on your analysis of the task: (3) agree, (2) average or (1) disagree

GROUP

- | | | |
|----------------------|---|-------|
| I. INTRO. | The Structure of the Introduction is effective
- use of attention getter
- clear purpose
- preview of main points
- motivation | 3 2 1 |
| II. BODY | Pattern of Organization is clear and appropriate
--structure, flow
--coordination
-- appropriate use of transitions to develop points
--effective use of allotted time | 3 2 1 |
| III | Effective Use of Supporting Material
--visuals
-- other creative means | 3 2 1 |
| IV CONCLUSION | The Structure of the Conclusion is effective
--transition signal
--review of main points
---strong closing | 3 2 1 |

INDIVIDUAL

- | | | |
|--|---|-------|
| 1. Appropriate use of voice re: | -pace/speed
-volume/projection
--no distracting vocal mannerisms | 3 2 1 |
| 2. Use of appropriate gestures and body movement | -smooth, controlled, natural
- no distracting physical mannerisms | 3 2 1 |
| 3. Effective diction | -clear and distinct enunciation
-correct pronunciation | 3 2 1 |
| 4. Maintains eye contact | | 3 2 1 |
| 5. Manages anxiety | | 3 2 1 |
| 6. Language Use | -appropriate level of formality
- reflects awareness of audience
- clarity, conciseness/correctness | 3 2 1 |

Appendix B

Speaking Across the Curriculum Survey

ID: Gender: **Male** **Female**Age: **Under 18; 18-20; 21-24; 25 and over****SECTION A**

The following cover a possible range of approaches to writing at university. Please indicate your response to each statement by **CIRCLING** the rating that best describes your approach.

SA = Strongly Agree; A= Agree; U=Undecided; D= Disagree; SD=Strongly Disagree. Please respond to ALL statements.

All science students should be exposed to an oral development course	SA	A	U	D	SD
Good presentation skills will enhance my performance in my future career	SA	A	U	D	SD
I am willing to use feedback I receive on my presentations to improve my skills in this area	SA	A	U	D	SD
I am willing to spend extra time practicing to ensure effective delivery of my presentation	SA	A	U	D	SD
5.Effective presentation skills are important for all science students.	SA	A	U	D	SD
6. In general, I work on my presentations so that my performance reflects the best that I am capable of.	SA	A	U	D	SD
I am willing to undertake whatever additional work is necessary to improve my oral presentation skills.	SA	A	U	D	SD
Learning to speak well will enhance my personal development.	SA	A	U	D	SD
I have the capacity to deliver effective oral presentations.	SA	A	U	D	SD
I am confident in my ability to deliver effective oral presentations.	SA	A	U	D	SD

SECTION B

The following statements seek to determine your prior experiences with writing as well as your perception of your writing ability. Please indicate your response to each statement by circling the rating or descriptor which relates most closely to your perception or experience.

11. Which of the following best describes your level of confidence When writing assignments for your courses?

Very High High Medium Low Very Low

12. Which of the following best describes your writing skills?

Excellent Good Satisfactory Fair Poor

END OF QUESTIONNAIRE

THANK YOU

Students' Academic Self-efficacy in International Master's Degree Programs in Finnish Universities

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This study analyzes students' academic self-efficacy while studying in international master's degree programs in Finland. The primary aim is to determine if students' self-efficacy varies depending on their field of study and nationality. This study contributes to the research on students' self-efficacy in an international academic context with a special focus on social and course performance tasks. The results indicate some variations in students' self-efficacy, particularly in students from different fields of study. Recommendations for activities supporting students' self-efficacy are provided based on the results of the analysis. Implications for future research, as well as limitations of the study, are discussed.

This study aims to examine the self-efficacy of graduate students in international master's degree programs (IMDPs) in Finland, with a special focus on field of study and nationality. Although this study explicitly examines Finnish IMDPs it can be assumed that many of the observations made in this study could also apply to other non-English speaking European universities and IMDPs (cf. Urbanovic, Wilking, & Huisman, 2016). This study seeks to analyze students' self-efficacy in executing various academic tasks in order to gain a deeper understanding of students' views on their ability to perform during their studies. Moreover, providing information on students' self-efficacy will contribute to the development of the IMDPs' curricula and practices, and thereby support teachers' work and students' learning.

Self-efficacy refers to a person's belief that s/he is capable of successfully completing a task in a designed environment (Bandura, 1986; 1997). In this vein, academic self-efficacy is defined as a student's judgment in successfully executing academic tasks (Chemers, Hu, & Garcia, 2001). Academic self-efficacy covers the general studying experience in a higher education institution and includes both social and academic aspects, depending on the type of environment and interactions (Gore, 2006; Solberg, O'Brien, Villarreal, Kennel, & Davis's, 1993).

The theoretical framework for self-efficacy can be found in Bandura's (e.g. 1982a; 1986; 1997) Social Cognitive Theory (SCT). As described in the SCT (Bandura, 1982a), an individual's self-efficacy, goals, and outcome expectations determine his/her behavior. Bandura (1982b) noted that perceived self-efficacy asks individuals to judge whether or not they are capable of performing specific tasks rather than if they will actually perform the task. Thus, self-efficacy refers to capability judgments, not expected outcomes. Mastery experience, vicarious experience, social and communicative persuasion, and physiological arousal are sources of self-efficacy (Bandura 1977; 1986; 1997). DeWitz, Woolsey, and Walsh (2009) further

explained these four sources of self-efficacy as past performance in a task, learning from others through observation, emotional states, and social support. There is an interrelation, as previous studies have suggested (e.g. Bong, 2001; Chemers et al., 2001), between students' self-efficacy and their academic performance. Therefore, delving into the factors which contribute to students' academic success, including students' self-efficacy, is deemed important.

International Students in Finnish Higher Education

European trends and the globalization of the economy have strongly influenced higher education reforms in Finland (Weimer, 2013). Concomitantly, over the past few decades, Finnish higher education has turned towards internationalization (Dervin & Tournebise, 2013) and transitioned away from a Nordic state-centered welfare model in favor of European market-driven policies (Rinne, 2000). As a result of active internationalization measures, Finnish universities and universities of applied sciences have established a number of IMDPs; currently there are more than 200 IMDPs (Finnish National Agency for Education, 2017a). The proportion of universities offering English-taught programs ranks Finland as the leading provider in the Nordic region (Wächter & Maiworm, 2014).

Considering the OECD indicators (2018), 12% of all master's degree students in Finnish higher education are international. Here, the term "international student" refers to an individual enrolled in a Finnish higher educational institution who left their country of origin and moved to another country for the purpose of study (OECD, 2018, p. 201). The number of international students attending Finnish universities has doubled over the past decade (Official Statistics of Finland, 2016), from 2.7% of the total student population in 2004 to 6.5% in 2016. In 2016, a little more than 21,000 international degree students were studying in Finnish universities and universities of applied sciences

(Finnish National Agency for Education, 2017b). The most common nationalities of international degree students are Russian, followed by Vietnamese, Chinese, Nepalese, Indian, and Pakistani (Finnish National Agency for Education, 2016).

Current practices which are established to support students in IMDPs, especially at the beginning of their studies, are orientation days which introduce students to the structure of their program and university services, such as the library facilities or the IT services. Moreover, survival guides are distributed with daily life information and facts about the country, city, and university. Some universities have also established a tutor system in which an experienced student assists the new student with practical matters, such as getting a bus card and becoming familiar with the university campus. Moreover, English language support during the thesis process and academic writing courses are usually offered in IMDPs.

Master's degree students are expected to become self-directed learners and to develop their critical thinking, problem solving, and research skills (Drennan & Clarke, 2009). This is also expected in the context of Finnish universities, where students are required to work independently throughout their studies. However, a recent study revealed that IMDPs' students have varying expectations of the supervisor's responsibilities according to their nationality (Filippou, Kallo & Mikkilä-Erdmann, 2017). The diverse population of the IMDPs requires teachers' cultural awareness. Thus, research on IMDPs, students' learning and self-efficacy, which helps in understanding students' perceptions of their own abilities in a new cultural environment, is deemed necessary both for the students and their teachers.

International Students' Challenges

International higher education students' acculturative stress, challenges, well-being and academic adjustment have been widely investigated (e.g. Smith & Khawaja, 2011; Telbis, Helgeson & Kingsbury, 2014; Zhang & Goodson, 2011). Telbis and colleagues (2014) specified four problems that can obstruct international students' success in their studies: social adaptability, academic competence, language challenges, and financial difficulties. Moreover, Wong (2004) and Smith and Khawaja (2011) noted that though all university students experience academic stress, international students must also deal with language anxiety and adapt to the new educational environment and new learning styles, which can further increase their academic stress.

Additional challenges international students often face include depression, loneliness, and acculturative stress, all of which are consequences of living in a host

country with different social interaction styles (Arthur, 2003; Smith & Khawaja, 2011). Furthermore, international students face the obstacles of adjusting to a different climate, as well as life without a responsive network of friends and family (Leder & Forgasz, 2004; O'Reilly, Ryan & Hickey, 2010). On the other hand, the participants in Leder and Forgasz's study (2004) mentioned that learning in an environment which differs from that of their home countries can also denote a positive change. The challenges described in this section have inspired a number of studies examining international students' self-efficacy (e.g., Telbis et al., 2014; Zajacova, Lynch & Espenshade, 2005).

Self-efficacy in Higher Education

Meta-analyses suggest that academic self-efficacy is a strong predictor of grades (Richardson, Abraham, & Bond, 2012; Robbins, Lauver, Le, Davis, Langley, & Carlstrom, 2004), motivation, and achievement (Multon, Brown & Lent, 1991). Gore, Leuwerke and Turley (2005) highlighted the importance of college self-efficacy in developing students' academic engagement, interactions, and goals, as well as influencing their enrollment decisions. A recent review (Bartimote-Aufflick, Bridgeman, Walker, Sharma, & Smith, 2016) similarly indicated that students' learning outcomes, learning strategies, self-regulation, and metacognition highly correlate with self-efficacy.

Previous research has pointed out that students with high self-efficacy work harder, pursue more challenging goals, and are more persistent when they encounter difficulties (Bandura, 1997; Pajares, 2003). Students with high self-efficacy can better monitor and self-regulate their efforts and more effectively use their cognitive strategies for time management and learning as compared to students with lower self-efficacy, and this leads to higher academic performance (Chemers et al., 2001; Komarraju & Nadler, 2013).

Self-efficacy has also been linked to emotional constructs such as mental and physical well-being, and stress (e.g., Finney & Schraw, 2003; Gore, 2006; Solberg & Villareal, 1997). Barry and Finney (2009) asserted that individuals with lower levels of self-efficacy experience more stress and anxiety, and lower motivation compared to individuals with higher self-efficacy. Similarly, having conducted a longitudinal study, Wei, Russell and Zakalik (2005) found that the social self-efficacy of university students is a mediator between feelings of loneliness and subsequent depression. Overall, the multiple studies, their various designs and their significant results as related to self-efficacy and the aforementioned constructs, explain why self-efficacy is considered as a strong behavior and performance predictor.

Comparing students' self-efficacy according to their field of study. Previous studies have examined students' academic self-efficacy based on their field of study, such as engineering (Marra & Bogue, 2006) and educational psychology (Finney & Schraw, 2003). However, researchers have investigated students' self-efficacy without examining the field of study as a comparable variable (e.g., Komarraju & Nadler, 2013). Abd-Elmotaleb and Saha (2013) categorized the participants' fields of study as practical or theoretical, and they concluded that the academic achievements of students from theoretical faculties are more influenced by their self-efficacy than the students from practical faculties. Furthermore, their study indicated that there were no statistically significant differences on students' self-efficacy according to their field of study. A lack of references in previous studies which investigated the impact of self-efficacy on students' academic performance according to their field of study has also been noted (in Abd-Elmotaleb & Saha, 2013). In an attempt to bridge this gap, this study uses the field of study as a variable of comparing students' self-efficacy.

Comparing students' self-efficacy according to their nationality. Since self-efficacy has been found to be a strong and positive academic and psychological predictor, it can be assumed that international students who have high self-efficacy face fewer emotional and academic challenges. Constantine, Okazaki, and Utsey (2004) underline that social self-efficacy is linked with international students' adaptation. They also found that university students from Latin America were more socially self-efficacious than those from Africa and Asia. Zhang and Goodson's (2011) review investigated predictors of international students' psychosocial adjustment in the United States. Among many variables, like country of origin and personality, they found that self-efficacy was positively related with sociocultural adjustment.

Methodology

Research Questions

The purpose of this study is to examine and discuss the self-efficacy of students in Finnish IMDPs by seeking answers to the following research questions:

1. What are the differences between students' academic self-efficacy according to their field of study?
2. What are the differences between students' academic self-efficacy according to their nationality?

Procedure

Five Finnish universities that organize IMDPs participated in this research. The international officers and coordinators of the IMDPs mediated as the students received an email with information and a link to the online questionnaire. Participation was anonymous and voluntary. At the time of this study, the participants were registered as active students who had started their studies in IMDPs between 2011 and 2013 inclusively. The data collection was held in two phases: the first round took place during the Spring 2013 semester, and the second round took place during the Fall 2013 semester. The latter round was used as a reminder to answer the survey.

Participants

The research population comprised 2915 participants. There were 493 respondents (response rate 17%), 248 female respondents and 245 male respondents. The students were between 21 and 56 years of age ($M = 27.29$; $SD = 4.457$). Most respondents were technical sciences students (38%), followed by IT students (17.7%), natural sciences students (12.2%), humanities students (11.7%), business students (11.3%), and social sciences students (9.2%).

The students represented sixty-seven nationalities, and the largest groups of respondents were as follows: Finnish (18.1%), Chinese (9.3%), Indian (6.5%), Russian (6.5%), and Pakistani (6.3%). The aforementioned cultural groups of students are analyzed in this study. The students are referred to by their nationality, even though the author acknowledges the significant differences within cultural groups and between individuals. The variable of nationality was chosen in order to group students who have experienced similar educational environments and cultural practices prior to their arrival in Finland. A relationship between students' cultural background and their learning styles and patterns have been reported by previous studies (e.g., Charlesworth, 2008; Marambe, Vermunt, & Boshuizen, 2012) and with this publication there is no intention in forming stereotypes against these groups.

Table 1 reflects the percentages of international students registered in all Finnish universities in 2016 by the Finnish National Agency for Education (2017b) and the participants of this study by continent. Table 1 indicates that the collected data is representative in terms of the students' demographics despite the low response rate.

College Self-Efficacy Inventory

This study used Solberg et al.'s (1993) College Self-Efficacy Inventory (CSEI) as the instrument to measure

Table 1
IMDPs Students and Their Continent of Origin.

Continent	Finnish National Agency for Education %	Respondents %
Africa	8.7	7.3
Asia	46.9	45.1
Australia and Oceania	0.5	0.4
Europe	36.3	38.4
North America	3.7	3.8
Latin America and the Caribbean	3.6	4.8

students' self-efficacy. The CSEI measures students' degree of self-efficacy in multiple university-related tasks and consists of three subscales including roommate self-efficacy, course self-efficacy, and social self-efficacy.

Studies by Barry and Finney (2009) and Vuong, Brown-Welty and Tracz (2010) solely used the CSEI. Barry and Finney (2009) examined the CSEI's evidence validity, discussed its weaknesses, and concluded with a three-factor model containing 15 items. Part of their criticism focused on the instrument's lack of social peer efficacy measurements and the reliability measurement of the total scale score. Vuong and colleagues (2010) studied all three CSEI subscales and found that academic performance and persistence are positively related with self-efficacy. Significant differences were found between student groups of different ethnicities and the three subscales of self-efficacy, leading the researchers to the recommendation for further research on this phenomenon. Gore et al.'s psychometric study (2005) found the CSEI to have high internal consistency reliability and thereby assisted in establishing the construct validity of CSEI scores, preliminary supported "the viability of a three-factor correlated solution for scores on the CSEI" (p.238), and underlined that CSEI can be used in any academic domain.

This study used the CSEI's course and social self-efficacy subscales to measure students' self-efficacy. The course self-efficacy subscale (seven items) assesses students' course performance, such as understanding the course literature and writing essay papers. The social self-efficacy subscale (six items) measures students' efficacy on interpersonal tasks such as talking to professors and participating in class discussions. The course and social self-efficacy subscales were included in the questionnaire because they address academic issues inside the university environment. Therefore, the roommate subscale that examines interpersonal aspects in shared housing areas was deemed irrelevant and was excluded.

The scale's instructions stated, "Please read each of the following 13 statements and choose the number that represents how confident you are about successfully completing the following tasks, for example, 'using different research methods'." The items were rated on a

seven-point Likert-type scale that described the strength of self-efficacy from weakest to strongest, ranging from 1 = "not at all confident" to 7 = "extremely confident." Higher scores indicated greater self-efficacy. The seven-point Likert-type scale differed from the original (10-point Likert-type scale), and four statements were paraphrased to fit the university's environment, for example, the Item 5 of the CSEI, "Keep up to date with your school work," was changed to, "Keeping up with academic work."

Analysis and Instrument Reliability

To analyze the data, statistical tests such as the one-way ANOVA were run using SPSS Statistics 20, a software package for statistical analysis. The first research question was tested using a one-way ANOVA to compare the self-efficacy items, the overall course, and social self-efficacy scales of the six largest groups by field of study. The second research question was tested using a one-way ANOVA to compare the self-efficacy items, the overall course, and social self-efficacy scales of the five largest groups by nationality. Post-hoc tests such as Duncan's and Tukey's tests were conducted to confirm where the differences between groups occurred. When the data met the assumption of homogeneity of variances, Tukey's test was conducted, and when the data did not meet the assumption of homogeneity of variances, Duncan's test was conducted. Eta square was also calculated to indicate the variable's effect.

An examination of the Kaiser-Meyer-Olkin measure of sampling adequacy suggested that the sample was factorable ($KMO = 0.85$). Principal component analysis was conducted as well, and the two components together explained 38.74% of the variance, proving that the division between social and course self-efficacy items is statistically justified. The internal consistency for the CSEI instrument resulted in a Cronbach's alpha of 0.86. Two other reliability tests were carried out to confirm the internal consistency of the course and social self-efficacy subscales. The Cronbach's alpha was 0.79 for the course self-efficacy and 0.82 on the social self-efficacy

Table 2
Academic Tasks and Descriptive Statistics.

Subscale	No.	Academic Task	<i>M</i>	<i>SD</i>
Course Self-efficacy	1	Using different research methods	5.05	1.30
	2	Writing essay papers and assignments	5.40	1.31
	3	Doing well on exams	5.29	1.26
	4	Taking good notes during the lectures	5.13	1.38
	5	Keeping up with academic work	5.41	1.17
	6	Managing time effectively	4.86	1.43
	7	Understanding course literature	5.58	1.15
Social Self-efficacy	8	Participating in class discussions	5.31	1.51
	9	Asking a question in class	5.20	1.61
	10	Talking to professors	5.60	1.37
	11	Talking to university staff	5.50	1.45
	12	Making new friends at the university	5.32	1.53
	13	Joining a student organization	4.35	1.77

subscale. For the comparison of the five largest cultural groups, the other cultural groups were excluded, and additionally reliability tests were carried out, which resulted in a high internal consistency for all 13 items ($\alpha = 0.89$) and strong internal consistency levels for the subscales of course self-efficacy ($\alpha = 0.82$) and social self-efficacy ($\alpha = 0.85$).

Results

Descriptive Statistics of Academic Self-efficacy and IMDPs Students

The means and standard deviations of the statements regarding students' course and social self-efficacy (Table 2) indicate that they are highly self-efficacious when it comes to talking to professors and understanding course literature. However, the students felt less capable of using different research methods, managing time effectively and joining a student organization. Overall, the IMDP students have high levels of course ($M = 5.25$; $SD = 0.87$) and social self-efficacy ($M = 5.21$; $SD = 1.12$). A moderate correlation between the subscales of social self-efficacy and course self-efficacy was recorded ($r = 0.543$, $n = 466$, $p = 0.000$).

Academic Self-efficacy and Students' Field of Study

The overall social self-efficacy of humanities students ($M = 5.60$; $SD = 0.98$) was statistically significant and higher [$F(5,459) = 3.728$, $p = 0.003$] than that of the business students ($M = 4.92$; $SD = 1.23$) and IT students ($M = 4.88$; $SD = 1.36$). The students' field of study seems to have a medium influence on their self-efficacy linked with professors and staff discussions. As shown in the results of the one-way

ANOVA tests (Table 3), the students from the social sciences felt less capable in using different research methods in their studies compared to students in other fields, especially IT students.

Academic Self-efficacy and Students' Nationality

Students coming from Finland, Russia, India, Pakistan, and China did not differ regarding their overall course and social self-efficacy. However, a few differences were noticed when one-way ANOVA tests compared the responses (Table 4). The interaction between students' nationality and their self-efficacy in writing essay papers and assignments accounted for 10% of the total score. Similarly, the results show that the self-efficacy was influenced by students' background at a medium effect size.

Discussion

The purpose of this study was to provide a more comprehensive view on the academic self-efficacy of IMDP students while analyzing their field of study and nationality. The results clearly show that IMDP students have high self-efficacy in most of the academic tasks, which indicates a high level of motivation and skill, as well as appropriate materials and assignments in IMDPs.

The findings suggest that students' self-efficacy on academic tasks within the IMDPs environment varies according to their field of education. These results are inconsistent with the results of Abd-Elmoteleb and Saha (2013). This variation might, however, have resulted from the different categorization of programs and field of study. In the research of Abd-Elmoteleb and Saha (2013), the authors divided the programs into two categories: theoretical and practical field of studies.

Table 3
One-way ANOVA Results on Academic Tasks and Students' Field of Study.

Academic Task	Groups	<i>M</i> (<i>SD</i>)	ANOVA	<i>p</i>	η^2
1. Using different research methods	IT	5.24 (1.31)	$F(5, 459) = 2.329$.042	0.025
	Social Sciences	4.52 (1.33)			
4. Taking good notes during the lectures	Humanities	5.58 (1.16)	$F(5, 461) = 3.719$.003	0.036
	Social Sciences	5.50 (1.23)			
	IT	4.68 (1.48)			
6. Managing time effectively	Natural sciences	5.35 (1.28)	$F(5, 460) = 3.605$.003	0.038
	Technical Sciences	4.97 (1.30)			
	IT	4.43 (1.58)			
8. Participating in class discussions	Technical Sciences	5.49 (1.36)	$F(5, 460) = 2.420$.035	0.026
	IT	4.90 (1.64)			
10. Talking to professors	Humanities	6.07 (1.06)	$F(5, 461) = 4.444$.001	0.046
	Social Sciences	5.79 (1.37)			
	Natural Sciences	5.77 (1.19)			
	Business	5.08 (1.54)			
11. Talking to university staff	Humanities	6.15 (1.07)	$F(5, 461) = 4.370$.001	0.045
	IT	5.18 (1.64)			
	Business	5.06 (1.58)			
Overall social self-efficacy	Humanities	5.60 (0.98)	$F(5, 459) = 3.728$.003	0.039
	Business	4.92 (1.23)			
	IT	4.88 (1.36)			

Results for the groups showing $p > 0.05$ are not reported.

The groups were selected based on the pair comparisons (post-hoc tests).

For their statistical analysis they used t-test in order to compare the theoretical and practical fields of studies. In this study, on the other hand, the programs were categorized into six groups: technical sciences, IT, natural sciences, social sciences, humanities, and business, and thus a one-way ANOVA was conducted for the statistical analysis. The division of programs into more discrete categories might have revealed these differences and characteristics between the students.

Most of the statistical differences were observed between IT and humanities students. The IT students seem to have less self-efficacy in non-practical and communicative tasks, while they feel more capable of using various research methods. Studies in IT tend to include less class discussion and note-taking lectures but more team-work activities, analytical skills, and practical techniques such as engineering. The nature of note-taking in IT is also very different from that of the

humanities or social sciences, due to the lack of narratives and different types of assessment. The IT students' low self-efficacy on time management highlights the need for more guidance and workshops on effective time management.

The results suggest that the business and IT students feel less capable in having discussions with their professors and staff members. Academic staffs in disciplines like IT and technical sciences aim to prepare students' for their future working career. This comes into contrast with disciplines like the humanities and social sciences where class discussions are aligned with developing critical thinking since the goal is to develop students' character and general education (Braxton, 1995, as cited in Sawir, 2011). Given the finding that social support is one of the main sources of self-efficacy (Bandura, 1997), more organized social activities and events that promote academic interaction between the students and teaching staff in the IMDPs, as well as between international and local students, could foster friendships and provide social support (Telbis et al., 2014). Knowing students' profiles and their beliefs regarding academic tasks and providing them with positive feedback and encouragement could enhance self-efficacy by increasing their motivation. As Dewitz and colleagues (2009) claimed, by supporting and motivating international students, the teachers can directly and positively influence students' self-efficacy.

Using research methods is a necessary skill for completing a master's thesis and degree studies (Filippou, Kallo & Mikkilä-Erdmann, 2017). This study showed that the students from the social sciences feel less capable of using different research methods, which should alert the university teaching staff. As Murtonen's

study (2015) reports, some education students may still have confused conceptions about empirical, theoretical, qualitative, and quantitative research even after the completion of a research methodology course. Another reason that could influence students' beliefs towards the use of research methods is the uncertainty regarding the use of these skills in their future (Murtonen, Olkinuora, Tynjälä, & Lehtinen, 2008).

Students' nationality was found to be a moderate indicator of students' self-efficacy. Finnish students had higher self-efficacy in talking to university staff, writing essay papers, and completing assignments. The Finnish students may feel more comfortable since they study in a familiar social-academic environment (Wright & Lander, 2003), even though in this study the language of instruction is not the local language. Furthermore, students coming from China had lower self-efficacy compared to the other groups in writing papers, succeeding in exams, and understanding course literature. This might be a result of both language anxiety in academic writing tasks and in using English. In previous studies, students with a Chinese background studying abroad noted the aforementioned tasks as challenges (Brunton & Jeffrey, 2014; Vinther & Slethaug, 2015). Thus, courses on academic writing and speaking skills based on students' needs could be provided or enhanced. Furthermore, the exams might also be perceived and expected differently since students' previous experiences influence how they prepare and write an exam (Pilcher, Smith, & Riley, 2013). Hence, discussions on students' prior knowledge, experiences and academic traditions could be considered and initiated by the teachers and thesis supervisors.

Table 4
One-way ANOVA Results on Academic Tasks and Students' Nationality.

Academic Task	Groups	<i>M</i> (<i>SD</i>)	ANOVA	<i>p</i>	η^2
2. Writing essay papers and assignments	Finnish	5.90 (0.96)	$F(4, 215) = 5.980$	<.001	0.100
	Chinese	4.85 (1.42)			
3. Doing well in exams	Indian	5.81 (0.89)	$F(4, 215) = 3.339$.011	0.058
	Chinese	5.04 (1.22)			
7. Understanding course literature	Russian	5.81 (1.09)	$F(4, 216) = 3.335$.011	0.058
	Chinese	5.04 (1.29)			
11. Talking to university staff	Finnish	5.71 (1.41)	$F(4, 216) = 2.796$.027	0.049
	Pakistani	4.80 (1.76)			

Results for the groups showing $p > 0.05$ are not reported.

The groups were selected based on the pairwise comparisons (post-hoc tests).

Conclusion

The findings of this study are vital for IMDPs' coordinators, thesis supervisors who could reconsider their current practices in relation to students' academic self-efficacy where necessary. The few items with low academic self-efficacy can be perceived as indicators of students' challenges, and the programs could therefore build on these needs and provide differentiated courses in research methodologies or supplementary courses in English academic writing, speaking, and presentation skills. Moreover, thesis supervisors could initiate conversations on students' self-beliefs and teachers could consider including interactive and innovative teaching approaches (Sawir, 2011). More time management workshops and social activities involving students and staff members, regardless the field of study, are needed. The universities could develop activities to enhance cultural awareness and intercultural competencies among teaching staff.

Limitations

Despite the fact that this study was carefully prepared and carried out, there were some unavoidable limitations. Firstly, the low response rate might have occurred as a result of both the time needed to complete the questionnaire and the students' busy schedules. Furthermore, it is impossible to know exactly how many emails were sent, received, opened, or perceived as spam email or how many addresses were valid. Therefore, the population and response rate should be considered estimates. As Nulty (2008) noted, the low response rate is more common in online surveys than paper surveys. However, paper surveys were not chosen for this study due to the length of the questionnaire and costs. Secondly, only one instrument was used for this study, and it failed to measure a number of academic tasks, such as interacting with classmates. Students' responses were mere statements, which means that in practice they might act differently. Finally, it is difficult to know how well each statement represents each field of study, such as doing well in exams since it is possible that some IMDPs have more exams than others.

Directions for Future Research

Future research could focus on examining emotional constructs and students' adaptation to Finnish higher education, or how self-efficacy is related to students' sociocultural adjustment. Replication of this study with a wider sample of Nordic universities could establish the validity of the findings and justify the use of field of study and nationality as variables. More studies on students' experiences and expectations of the academic tasks could

provide a clearer view of their beliefs in the IMDPs. Additional questions that could be further investigated include, "Were you expected to participate in class discussions at your former university?," or, "Are you expected to participate in class discussions at your current university?" The similar or different practices between the former and current university could be linked with their self-efficacy beliefs.

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Evaluating Graduate Student Out-of-Class Learning: The Professional Field Trip

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Out-of-class experiences provide important learning opportunities for students; however, limited research has explored the value of these experiences to graduate students. The purpose of this study was to evaluate graduate sport management students' professional field trip experiences to determine if they met student expectations and achieved trip learning objectives. Results from pre- and post-trip surveys, a student focus group, and industry professional interviews suggested the trip exceeded expectations overall. Specifically, it improved students' professional preparation, helped them connect to course content, and increased their connection to the academic program. Students perceived the trip to be a valuable educational and social experience. Sport management faculty should consider coordinating field trips for graduate students, as they perceive them to be beneficial to their learning and graduate student experience. Also, evaluating out-of-class experiences is valuable for improving institutional support and providing evidence of student learning outcomes.

There are many reasons why students decide to pursue sport management graduate degrees. For some, it represents an opportunity to gain experience in the collegiate sport industry by working as a graduate assistant. For others, it helps them explore their career interests and develop their professional skills while working as a full- or part-time employee. As a result of busy schedules and multiple responsibilities, it is often challenging for faculty to engage graduate students in valuable out-of-class learning experiences, which can help them develop personal, professional, and academic skills.

Graduate students often attend classes at night based on the time demands created by their full-time, part-time, or graduate assistant employment positions. These work experiences are valuable out-of-class experiences for university students because they are able to observe their hopeful field of employment (Higgins, Dewhurst, & Watkins, 2012). Unfortunately, because of the time demands of these jobs, their opportunities for growth and development outside of the classroom or work can be limited. However, these out-of-class experiences are important because they can be vital parts of the learning experience as they impact student learning and development (Kuh, 1995). Some examples of out-of-class learning experiences include job shadowing, field trips, volunteer activities, and networking with professionals in the field through interviews. Graduate faculty should consider organizing structured out-of-class learning experiences for graduate students that will supplement their classroom and work experiences.

Many different out-of-class activities can lead to positive outcomes for college students (Kuh, 1995), and these experiences can be categorized into three areas including student support, connecting students to campus, and co-curricular engagement (Franklin, 2013). Examples of out-of-class learning activities include conversing with faculty, collaborating on teaching and research projects, living in a residence

hall, working, and participating in institutional governance, as well as involvement in clubs and organizations, volunteerism (Kuh, 1993), field trips (Lei, 2010), and employment (Franklin, 2013).

Out-of-class activities are beneficial because they can increase students' self-awareness, autonomy, confidence and self-worth, altruism, reflective thought, social competence, practical competence, knowledge acquisition, academic skills, application of knowledge, esthetic appreciation, vocational competence, and sense of purpose (Kuh, 1993). According to Krakowka (2012), "teaching is more than simply giving students information; it is about inspiring student interest in a subject" (p. 236). She continues to explain that it is the teacher's job to encourage students to be actively involved in the learning process, and field trips provide a venue for this type of active learning. Seeing professionals working in the field allows students to "observe employees demonstrating a work ethic, helping others, and working efficiently" (Brunt Veverka, 2015, p. 49). Industry engagement, according to Bruns and Chopra (2017), is an important part of student learning, and field trips are one example of this type of engagement. The purpose of this study was to assess a professional field trip and its impacts on student learning and development. This was achieved by examining student-reported experiences and learning outcomes related to the trip. The trip is designed to encourage students to learn professionally, utilize networking skills, and gain insight into the real world of working in sport management. During this trip, networking included getting to know other students in the program outside of their existing circle and meeting professionals.

Literature Review

Chickering and Gamson (1987) stated, "Learning is not a spectator sport. Students do not learn much

just by sitting in classes listening to teachers, memorizing pre-packaged assignments, and spitting out answers” (p. 4). While these authors were advocating for active learning in the classroom, their statement also highlights the importance of engaging students in active, out-of-class learning experiences to improve their learning and development in college. Research in higher education often applies the theory of student involvement (Astin, 1984) to examine student engagement outside of the classroom. According to Astin (1984), the theory of student involvement “emphasizes active participation of the student in the learning process” (p. 522). He suggests that the extent to which students will achieve learning outcomes depends on the time and effort devoted to their goals. The greater the student involvement, the greater the learning and development (Astin, 1984). As a framework for this study, the theory of student involvement would suggest that the more involved graduate students are in their educational experience, the greater gains they will make in learning and personal development. A professional field trip provides an opportunity for students to put in effort and time to increase their development and learning.

From a general perspective, Kuh (1995) found that interactions with peers during out-of-class learning experiences were important for developing personal competence, humanitarianism, and cognitive complexity. Additionally, out-of-class academic activities were important for helping students apply knowledge they learned while in class. Kuh (1995) also determined students valued leadership, peer interaction, faculty interaction, outside of class academic activities, work, travel, and institutional ethos as positively impacting their learning outside of the classroom. More specifically, Berte and Jones (2014) acknowledged field trips as a well-established strategy for increasing student learning, reflection, and engagement. Also, they found students valued the field trip as a learning experience. In fact, past research on field trips has indicated that cognitive and affective learning can occur as a result of these experiences (DeWitt & Storksdieck, 2008). Field trips can increase synthesis of information, improve reasoning skills, increase self-confidence and efficacy, and improve research collaboration skills (Lei, 2010). Students are also able to learn first-hand and make learning more enjoyable (Lei, 2010). The instructor and students can interact in a more relaxed setting and build stronger relationships with teachers (Lei, 2010). Potentially, the field trip can be structured to encourage students to apply what they learned in the classroom to a professional setting.

For elementary and high school students, research has shown that field trips have long-term impacts on cognitive, social, and cultural understanding (Forest & Rayne, 2009). Forest and Rayne (2009) found using field

trips in a post-secondary chemistry course to be a useful way to reinforce class concepts and suggested positioning out-of-class activities during class to help students see the value during the experiences. They also found that students were more interested in continuing in the chemistry major. In a study on middle school students, Whitesell (2016) found small positive effects of participating in field trips on students’ science scores.

Some research has also been conducted on college students’ perceptions of field trips. Through informal discussions with her students, Krakowka (2012) learned college students remembered field trips the most, which motivated them to learn. Similarly, teacher education students found field trips to be memorable, while also reporting they gained new knowledge and cemented their understanding of course concepts (Djonko-Moore & Joseph, 2016). These students also valued the authentic learning experience (Djonko-Moore & Joseph, 2016), a finding that may be similar across disciplines. Based on surveys of undergraduate history students across multiple years of a course, Rohlf (2015) determined that field trips had long-term impacts on behaviors and attitudes, and positively impacted learning.

Leydon and Turner (2013) found that field trips have many benefits for undergraduate students. First, students were able to gain a deeper understanding of course content and gain valuable experience with equipment by taking field trips. Second, students felt the trip allowed them to connect with peers, which was an important goal. Finally, students were able to better connect with faculty as a result of this trip. Overall, they determined that introducing a field trip into the course resulted in a more positive and interactive learning environment, increased student engagement and comprehension, and positively facilitated the transition from high school to college for students. Moreover, Malbrecht, Campbell, Chen, and Zheng (2016) suggested a field trip for college chemistry students was valuable, not only for getting experience using equipment, but also for linking students to professionals in the field and helping them see themselves as future employees.

Research examining impacts of field trips on graduate students is limited; however, Castleberry (2007) examined the impacts of a trip to a prison on graduate and undergraduate students in a business ethics course. He evaluated the trip by surveying students after trip completion. Results indicated that students who attended the trip had a positive impression of the trip and felt all objectives of the trip were achieved. He determined that this method was effective for helping students learn and connect to legal and ethical issues in business. Based on these findings, it seems graduate students also can benefit from out-of-class learning experiences tied to course content, but more research is needed.

The purported benefits of field trips suggest that these experiences can help students build social connections, and research has shown that developing interpersonal relationships in college can positively impact academic performance (Martin & Dowson, 2009). Martin and Dowson (2009) explain that these social relationships are a part of relatedness, which is an academic domain and is important for teaching students how to function in academic environments, which in turn impacts persistence and performance. For graduate students, Hlebec, Kogovsek, and Ferligoj (2011) found that social support and personal networks positively impacted academic performance, a finding that has been duplicated in multiple studies across differing levels of college students (Pym, Goodman, & Patsika, 2011). Additionally, Tinto (1975) explained that social integration into college helped students persist and resist dropout. Tinto's assertion was supported by a study conducted by Robbins, Allen, Casillas, Peterson, and Le (2006), which determined that social connections positively impacted retention of college students.

Astin (1984) noted that the theory of student involvement should be explored by assessing different forms of student involvement. Experiential learning and out-of-class learning are examples of student involvement that should be assessed to determine their impact on student learning and development. Explicit research on the learning outcomes of experiential learning is needed to determine if these strategies are effective or not (Gosen & Washbush, 2004). Additionally, since the majority of past research has focused on undergraduate student involvement, Pontius and Harper (2006) advocated for research into student engagement outcomes for graduate students. Finally, this research is valuable because asking for student feedback post-trip is an important learning experience for an instructor (Lei, 2010).

This study endeavors to assess the learning outcomes and effectiveness of a professional field trip for graduate students. The trip was planned using the nine guidelines suggested by DeWitt and Storksdieck (2008), which were created after a comprehensive review of the literature on field trips. These guidelines suggest field trips should 1) be based on the goals and contexts needed for the class; 2) be embedded into the curriculum; 3) offer multiple learning opportunities; 4) create opportunities to utilize the unique qualities of the setting; 5) provide structure, but also allow time for exploration; 6) give students some control over the experience; 7) encourage students to engage in discussions with peers and others involved in the trip; 8) be based on exploration, discovery, or process skills instead of merely facts; and 9) be improved through feedback of teachers and students. The following research questions were explored:

1. Did the field trip meet student expectations?
2. Were the goals of the trip met?
3. How do students believe the professional field trip augmented their learning?
4. How can the experience be improved in the future to enhance student learning and development?

Method

The professional field trip examined in this study is taken annually during the fall semester. All graduate students in the sport management sequence are invited to attend; however, attendance is not a mandatory element of the students' degree program. Each year, the field trip visits a different major city in the Midwest and is planned by students in the program. In the year this study took place, students planned a trip to Milwaukee, WI, where they visited the BMO Harris Bradley Center, Marquette University athletics facilities, and Miller Park. Students travelled to Milwaukee in two vans, which were assigned to help students get to know other students with whom they did not work with or take classes with already. During the visit to BMO Harris Bradley Center, students participated in a networking session, which consisted of local professionals hosting roundtable discussions with students. Students were asked to move three times during the session to meet different professionals. Prior to the trip, students were told there would be a networking session and they were given biographies of the professionals. They were also told to dress professionally and come with specific questions either written down or in mind to ask these professionals, in order to make this session more valuable and focused. This session was the main networking session outside of their cohort of peers. Students were then taken on a tour of the building. Next, students visited Marquette University for a tour of their athletics facilities. Finally, students attended a baseball game at Miller Park, where they were encouraged to get to know peers in the program that they did not have classes with (first-year students were encouraged to get to know second-year students and vice versa).

Three second-year graduate students planned the trip early in the fall 2016 semester under the guidance of faculty. Students planned the event as part of their culminating experience in the program. Also, having students plan the event helped create buy-in and ensured that students would be interested in, and excited about, the trip's itinerary. We have found that giving students ownership of the trip conveys the value of their contributions to the entire program and solidifies their connection as active participants in their learning.

Additionally, these students assisted in the present study and, as such, were neither part of the sample surveyed nor the focus group interview conducted. Berte and Jones (2014) advocated for creating detailed learning outcomes prior to planning the trip. These students met with faculty and created the following learning objectives prior to planning the event:

1. Establish a relationship with professionals in the field to build your professional network.
2. Gain advice on your career path and the skills needed to be successful in the sport industry from professionals currently working in the field.
3. Expand your knowledge of the next step in your careers by getting in touch with people who recently graduated and are working in sport.
4. Improve your networking skills by giving you an opportunity to utilize them.
5. Enrich your graduate school experience by participating in a fun and enjoyable immersion experience.
6. Build camaraderie among students in the program to improve cohesion on class projects and build long-term connections.
7. Enhance your knowledge of sport facilities and how they are run.
8. Help you see connections between course content and real-world applications of the content.
9. Explore college and professional sport entities to broaden your view of potential career options in the field.

The Human Subjects Committee granted approval for this research project. The trip was classified as an out-of-class experience as there was no grade attached to their participation and it was not attached to any specific course. It was an educational and professional development experience.

This study was conducted as an action research project, which is a process where teachers scrutinize their own teaching practices and analyze the results of their inquiries in an effort to make positive changes in their teaching (Crothers, 2015). Because of the reflective nature of these projects, they are content specific and generally conducted in the teacher's classroom (Crothers, 2015; Efron & Ravid, 2013). Investigating their teaching methods in this way provides teachers with evidence to support for the pedagogical decisions they make (Crothers, 2015). Action research includes four stages as explained by Mills (2000), including deciding on an area of focus, collecting data, evaluating and interpreting data, and making a plan of action. Action research was an appropriate research design for this study because the specific and reflective nature provides information that is actionable and evidence for future practices. This

mixed-methods study used qualitative and quantitative data to examine the research questions. To increase the reliability of data, data for the project were triangulated and included surveys, a student focus group, and interviews with professionals. The survey was created by writing statements related to the learning objectives and adapting a group of questions used by Berte and Jones (2014). Questions for the focus group and interviews were developed based on the objectives and trip events. Both the interviews and focus group were semi-structured, where an interview guide was created to guide the interview, but researchers were given the autonomy to ask follow-up questions as needed. All researchers reviewed the survey, focus group, and interview questions to ensure they were aligned with the trip goals and were asking students and professionals questions that would provide information related to whether or not these goals were met.

Prior to participating in the trip, graduate students who signed up for the trip were sent a pre-trip survey with questions related to the defined learning objectives, as well as questions related to their expectations for the trip. Twenty-two students attended the trip and were invited to participate. Of these, 18 completed the pre-trip survey. The survey link created through Qualtrics was emailed directly to students. Once students returned from the trip, they were emailed a link to the post-trip survey, which contained the same questions, revised in past tense, as the pre-trip survey. Nineteen students completed the post-trip survey. Data from the survey were downloaded into SPSS Statistics Version 22, and descriptive statistics and t-tests were used to examine differences in means.

A group of six attendees were selected at random to participate in the post-trip focus group. Six students were chosen because focus groups are most effective when six to twelve participants are used, and since 22 students attended the trip, 6 students included 25% of the population studied. All students were entered into a database alphabetically, and then a random number generator was used to invite respondents. Once six respondents agreed to participate, the focus group was scheduled. One researcher conducted the focus group while the student researchers observed the group and took notes. The group lasted approximately 45 minutes. Data were transcribed for thematic content analysis. The six-step thematic content analysis process outlined by Braun and Clarke (2006) was used to analyze data. First, the two faculty researchers familiarized themselves with the data by reading it through multiple times. Then, initial codes were generated using inductive coding. Once data were coded, both researchers searched for themes and organized the data into themes. Then themes were shared between the two researchers and themes were reviewed and discussed. Themes were defined, named, and then reviewed by both again. Finally, a report on the data was produced.

Table 1
Means and Standard Deviations of Students' Perceptions of Participating in the Field Trip

Statements (changed to past tense for post-trip survey)	Pre		Post	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Help me to cement difficult information	3.74	.81	3.72	.90
Encourage me to interact in a more relaxed environment	4.26	.93	4.39	.50
Allow me to escape the routine of the classroom	4.58	1.02	4.89	.32
Increase my motivation for learning	4.26	1.10	4.39	.70
Provide me with firsthand experience related to the topics discussed in the program	4.53	.96	4.50	.62

Table 2
Means and Standard Deviations for Student Perceptions' of Attaining Learning Objectives

Statements (changed to past tense for post-trip survey)	Pre		Post	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Have more professional contacts.	4.11	.99	4.00	.84
Have improved my networking skills.	4.16	.96	4.22	.65
Have a deeper knowledge of what it is like to work in the sport industry.	4.26	.93	4.28	.58
Be more excited about my future in sport management.	4.37	.96	4.22	.73
Feel more connected to my cohort.	4.53	.96	4.67	.59
Know more about what to expect in my future career.	3.89	.99	4.11	1.02
Have a better understanding of the job search process.	3.68	1.11	3.61	.98
Be able to see connections between course content and real-world application.	4.21	.92	4.39	.50
Be glad I participated in the trip.	4.63	.96	4.89	.32
Feel the trip was a valuable experience.	4.63	.96	4.83	.38
Know more about my potential career path.	4.00	1.05	3.94	.87
Have built at least one solid connection with an industry professional.	4.05	1.03	3.56	1.10
Be more knowledgeable about the next step in my career.	3.89	.94	3.56	1.04
Feel that I had fun while on the trip.	4.53	.96	4.89	.32
Be more comfortable completing class projects with other students in my cohort.	4.05	1.03	4.56	.51
Have a better understanding of sport facilities and how they are operated.	4.32	1.00	4.39	.61
Have expanded my knowledge of potential career options in professional sport.	4.16	.96	4.17	.51
Have expanded my knowledge of potential career options in college sport.	4.05	.91	4.06	.73

The last source of data was from professionals students interacted with during the trip. Five professionals were selected for interviews using convenience sampling. Student researchers conducted interviews over the phone, which lasted 10-30 minutes each. Because data saturation was reached after these five interviews, data were then transcribed. The thematic analysis process described in the focus group analysis was used.

Results

This study utilized a survey, focus group, and interviews to collect data in an effort to examine the expectations of students in the program. These data were collected from students in the program, as well as industry professionals who engaged with the students throughout the trip. Results are presented and organized

by the type of data. Summative conclusions are then drawn with respect to all forms of data collected.

Surveys

When comparing the pre- and post-test survey results, student responses remained stable on the Berte and Jones (2014) scale (Table 1). After participating in the field trip, students felt strongly about all statements except cementing difficult information, which was rated the lowest on the five-point scale. They most appreciated the escape from the routine of the classroom.

Students also were asked a series of statements related to the learning objectives for the trip. Table 2 lists the means and standard deviations of their pre- and post-trip survey scores. Overall, there were no significant differences between pre- and post- surveys, which indicated the trip met student expectations.

Overall, students felt moderately to extremely positive about attending the field trip both before (17 students) and after (17 students) the trip.

Focus Group

Responses during the focus group solidified students' overall positive feelings related to the trip, and the successful completion of the learning outcomes. Figure 1 organizes the themes.

Logistical successes. Students felt that the trip met or exceeded their expectations. One student commented, "I didn't think it was going to be as good as it was." Additionally, the trip was logistically smooth. One student appreciated the set-up of the networking panel, stating, "You got that sheet of the panel and where they were from and what they did. I thought that was very valuable and just being able to identify with who you'd like to talk to more."

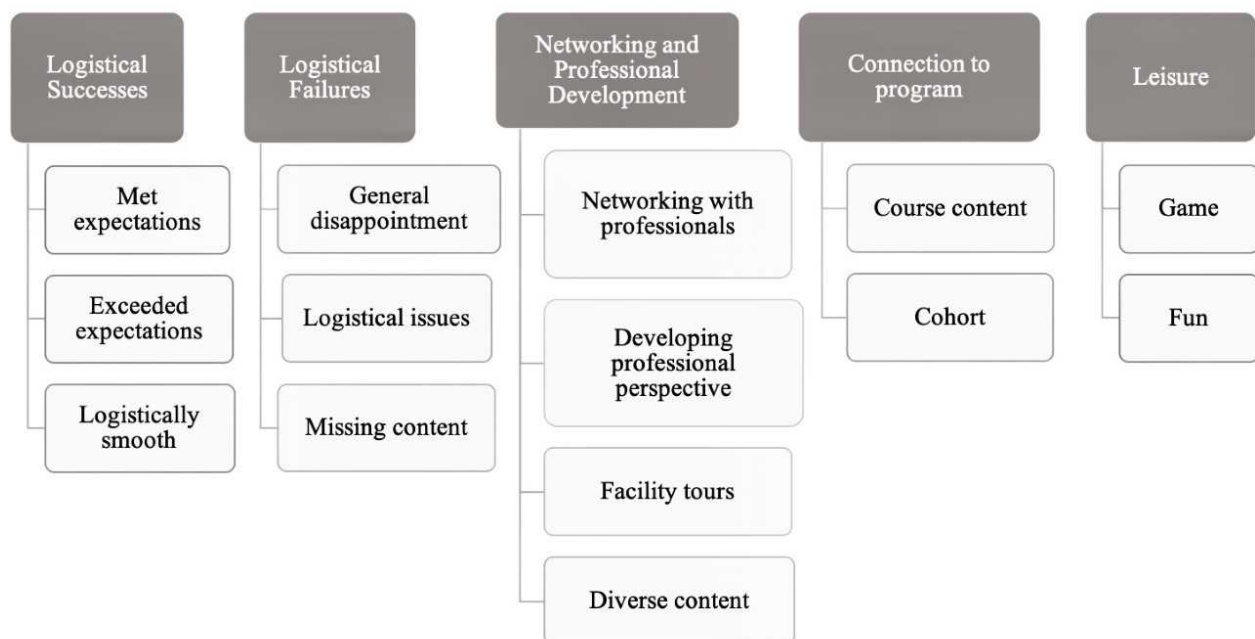
Logistical failures. Overall, student frustrations were related to issues outside of the organizers' control, such as hoping for access to things that were not available, wanting additional panel members in their specific areas, or being frustrated with too much down time between events.

Networking and professional development. The ability to effectively network, improve their knowledge of the field, and take in diverse content was important to

students. One student highlighted the connection made to a future career path, stating, "Actually being able to pick the brains of some of them and seeing what their path to their career was really helpful." Also, students commented on how the set-up of the event allowed them to get more detail: "[T]he table discussions versus the panel allows for good and more, better follow-up questions because when you're handed a mic and you ask your one question and want more clarification, you get two or so minutes after that, but if you don't, you're up a creek, so the opportunity to ask more personalized questions and get answers that ways definitely helps enhance the experience." Students were also able to gain perspective that they were currently lacking in their classroom and work experience. Specifically, one respondent stated, "I think anytime you have the opportunity to see things from a different perspective, to get out of a) your bubble and b) your comfort zone," while another highlighted, "Definitely providing perspective on things that I thought I had experience in, and someone comes in, and they have a lot more to say about it." Finally, students valued the diverse content, stating, "I also appreciated the breadth of the scope of the trip in terms of really getting a feel for a couple of different avenues within sports management."

Connection to the program. Students who responded specifically mentioned how they connected what they learned on the trip to things discussed in

Figure 1
Focus group themes



class. For example, one student stated, “I’ve even mentioned twice things that I talked about on the trip with a couple [of] other students in class, saying, ‘You were talking about this. Well, what do you think about this’ and having that apply directly to some of the SBJ posts or even just class discussions where you get other people’s perspectives.” Additionally, another student explained, “I would say from Intro to Sport, we talk a lot about the business side of things, and sometimes when you watch a game, you don’t really think about what is going on, so I think you’ve done a good job of drilling that into our minds because I was watching the Cardinal’s game the other night, and that was one thing that I thought of.” Another important aspect of the connection to the program was their connection to each other. Multiple students mentioned this:

- “We probably don’t get to know each other as much within the classroom, so that was a way for us to get out and build those relationships and get to know one another.”
- “And knowing how we all got into this and how different all of our interests are and our backgrounds is pretty awesome, to be able to pull from as many different backgrounds and interests as we can when we interact in the future, beyond class.”
- “When you add in the shared experience with your classmates that you may previously not [have] known as well, I think it definitely adds a lot of value to that.”

Leisure. Finally, students felt the trip allowed them to have fun and relax. One student explained the trip was important because it was “just having a good time talking and hanging out.” They valued the experience as a way to de-stress and “get out of that setting and go have a good time....” Also, students were able to enjoy sport outside of work and school and stated that the game was their favorite part of the trip. One student was even excited about the experience because “catching a foul ball was pretty cool.”

Interviews with Professionals

To corroborate students’ feelings and perceptions about the trip, interviews were conducted with professionals the students interacted with during the trip. Interviewees included panel members, as well as individuals who conducted and facilitated tours and events. Interviews with professionals yielded four major themes related to the field trip including professional preparation, student engagement and interest, successes, and improvements.

Professional preparation. Respondents overwhelmingly indicated that students were well prepared for the trip and networking. One aspect of their preparation was their thoughtful and meaningful questions. One respondent indicated, “I think it was clearly evident that some had done their research, were ready to ask questions.” These questions were often geared toward their careers. For example, one respondent shared, “They did ask pretty intriguing questions about getting your foot in the door and how to get yourself started in the field of sports.” Students also demonstrated professionalism in attire and mannerisms. For example, respondents stated, “I think they approached the event very professionally,” and, “...[E]ye contact, firm handshake, all that general stuff was on point.”

Student engagement and interest. Interviews also revealed that students were engaged and interested during the trip. Multiple respondents pointed out students’ interest in what the professionals were sharing, stating, “They were interested in the subject matter,” “...genuinely interested in the subject matter,” and “...clear that they were interested in the subject matter.” Additionally, students were engaged according to professionals who stated, “They were engaged on all fronts...,” “Everyone was engaging...,” and, “I think most of the students that came there were eager to learn...”

Successes. Overall, professionals had very positive comments about their interactions with students and the trip in general. One professional stated, “I have nothing but positive things to say about it.” Another professional commended the program for taking students on a trip, stating, “I think what you’re doing is pretty progressive. I think that’s a great idea.”

Improvements. Professionals were specifically asked about potential ways to improve the trip. Their comments focused on changing the panel format. One respondent suggested, “...[H]ave a more formalized or constructed round-table event where there was a set amount of time at each table...” Another suggested, “. . . [P]ossibly create a combination of sort of what we did and a social event with the panelists and kind of evolve that into something less formal.” Finally, professionals suggested students could prepare more:

- “Coming with a reason is huge, a reason why you want to work in sports, as well as a reason as to why you’re there in general.”
- “Survey[ing] the students about who, or specific departments, they would like to network with.”

Discussion

Out-of-class learning experiences are vital to students on college campuses nationwide (Higgins et al., 2012). Sport management as a discipline has

evolved into a highly applied area of study, and in order to find employment in the highly competitive sport industry, sport management students must develop strong professional networks and gain real-world experiences, or they run the risk of failing to ever begin down their chosen career path. Because of this, it is imperative for sport management faculty to connect students with the industry outside of the classroom. Since field trips are a well-established strategy for enhancing student learning and engagement (Berte & Jones, 2014), the program in this study has offered field trips for graduate students each academic year. This study evaluated the program's professional field trip that visited three facilities and allowed students to network with a number of individuals working in the sport industry in Milwaukee, Wisconsin. Further, this study endeavored to answer four research questions: 1) Did the field trip meet student expectations? 2) Were the goals of the field trip met? 3) How do students believe the field trip augmented their learning? 4) How can the experience be improved in the future to enhance student learning and development? Results of this study provide evidence that addresses these questions and the trip's learning objectives.

In general, the field trip to Milwaukee exceeded student expectations, as evaluated by Berte and Jones' (2014) out-of-class learning scale, which measured student perceptions. Specifically, the trip encouraged students to interact, allowed them to escape the classroom routine, and increased their motivation to learn. As it relates to the nine learning objectives of the trip, results indicated student expectations were met as well. Combined with Castleberry's (2007) findings, the results indicate field trips can be effective for enhancing graduate student learning outside of class. However, it is possible that the consistency in student responses before and after the trip could be credited to their understanding of the field trip and the itinerary for the day's trip, prior to attending, as well as the fact that the trip delivered on promises made. One item of concern from this survey was the decrease in the expectation that the trip would improve their understanding of the job process. Potentially, creating talking points for students to take to the networking event could remind them to ask questions related to finding a job.

Student responses from the focus group supported the survey data. Students highlighted a general theme of the trip exceeding expectations, while specifically noting having the itinerary and information on the panel members prior to the trip being an unexpected positive that set them up for success during their experience. Further, while an additional theme of logistical failures was identified, none of the sub-themes that emerged indicated the trip either generally or in a specific area fell below student expectations. In this study, no differences between pre- and post-trip scores indicate

the trip was successful in this regard. Overall, realizing students received the benefits they expected from the trip supports the continued use of the trip to augment their learning experience. Additionally, it speaks to the success of the current planning process. Other faculty who plan to implement a professional field trip should carefully organize the trip's goals, create a student planning committee, and communicate the trip's itinerary to attendees at the start of the trip.

This study also examined if the goals of the educational field trip, which were specified by the faculty and students upon planning the trip, were met upon conclusion of the day. Results indicate each of these learning objectives was met; however, it is clear that a concerted effort should be made in the future to prepare students for the networking environment they will encounter. Other researchers have highlighted this, such as Trimble (2015), who stated it is important to properly prepare students for the site visit to a business, and McLoughlin (2004), who stressed the importance of students being prepared for the trip by examining their own expectations and understanding how the trip ties to their in-class learning. Since this field trip takes place outside of a specific class, students were not given any pre-trip information or preparation. One important suggestion for this field trip is to hold an introductory or pre-trip session that allows students to get together and discuss and learn about what they will be doing prior to leaving on the trip. Additionally, faculty can provide a networking skill session prior to the trip so that students feel more prepared for the experience, as well as to help students create questions for professionals they will meet during the trip.

Interestingly, the objectives that students rated highest measured the trip's ability to connect them with their degree program and fellow students. Prior research from Leydon and Turner (2013) also found the connection to other students to be a positive outcome of field trips for college students. Further, another theme of connection to the degree program emerged from the focus groups. Students explained the unique connections they were able to forge among other students as a critical component of the experience. The strong connection students felt to the degree program is an important outcome of the trip because it will foster a deeper commitment to their coursework and improve their relationships with faculty. Also, it appears the trip fostered a camaraderie that is viewed as beneficial to the future learning experiences, such as group projects, of students throughout their degree program. Students' perceptions related to the importance of the social connections the trip resulted in support Martin and Dowson's (2009) and Tinto's (1975) claims that social connection is an important for academic success. It is critical that faculty realize the importance of intentionally encouraging student connectedness as an added way to support their growth, development, and success.

Additionally, students valued the entertainment and unique setting of the trip. Specifically, a unique theme related to the leisure experience of the trip emerged. Students described the overall enjoyable and fun experience they had while on the trip, specifically highlighting their attendance at the MLB game. Berte and Jones (2014) pointed to the importance of out-of-class experiences allowing students to relax and have fun. Often, between coursework and work, graduate students have little free time to simply enjoy sport. It is important for students to remain excited and passionate about the industry, thus allowing them to connect with the leisure side of the sport industry is necessary.

Students also indicated the trip helped them learn, further supporting the results of Malbrecht et al. (2016), Djonko-Moore and Joseph (2016), Rohlf (2015), Leydon and Turner (2013), and Castleberry (2007), which suggest field trips are important learning experiences for college students. Survey results indicated that students felt they developed a deeper knowledge of the field, could see strong connections to course content, understood sport facilities with greater expertise, and were more comfortable collaborating on future in-class projects and assignments. Additionally, students saw the connection to course content that had been covered during the semester to be an important part of the trip. More specifically, students explained that the field trip augmented their overall learning experience by allowing them to connect the trip with past course content, see examples of course topics in practice, and learn through the facility tours. For many faculty, a main reason to take professional field trips relates to the opportunity for students to make these connections. It is important to continue to connect to the field trip in class after it occurs to further cement these connections.

Finally, a theme of professional development and networking was evident throughout the surveys and discussions with students, supporting the findings of Malbrecht et al. (2016) that professional development is an important piece of field trips for college students. This theme included student reflections on many of the trip objectives, such as networking, development of a professional perspective, and facility tours. When viewed in relation to the survey data, it is possible students are perceiving an overall connection between the information they received and its role in their professional development.

While the general response by the student focus groups indicated the objectives were met, it should be noted that students did identify missing content as a sub-theme of the logistical weaknesses of the trip. This missing content was related to connecting with specific professionals in their field. In the future, students who may attend the trip should be surveyed prior to the trip to identify common areas of interest. This will help the

students planning the trip to purposefully reach out to professionals who meet the majority of students' professional goals.

The last goal of this study was to identify ways the trip might be improved. While the trip did generally exceed expectations and the majority of the feedback received indicated students and industry professionals enjoyed and benefitted from the event, two significant areas should be addressed in the future. First, the planning team for this trip should consider ways to further connect the information elements of the trip to the future career path students will take. Specifically, finding ways to incorporate substantive feedback by industry professionals on student resumes, cover letters, or interviewing skills could be relevant. Incorporating these types of initiatives may serve to deepen the connection between the trip and its content and the career development of the students. Second, additional efforts should be made to tailor industry representation from the specific career areas students who register to attend the trip are seeking as mentioned above. While the focus on venue and event management was beneficial and the diversity of organization type was appreciated, students would benefit from connecting with more early to middle career professionals in the specific roles they see themselves seeking.

To triangulate the data, we also sought the opinions of the professionals who interacted with students during the trip. Overall, professionals agreed that the trip was a valuable and important experience for students. They also supported students' general perceptions that they were successful in using and improving their networking skills when talking with the professionals. Additionally, they felt their conversations were beneficial in helping students understand their jobs and the sport industry. Finally, professionals overall thought the event was excellent, but they suggested offering a more social environment to connect with students as well. Since students really valued their leisure experience, it might be beneficial to add a short social with professionals as well, potentially prior to attending the game, to allow students to capitalize on that relaxed environment for connecting with professionals.

The final step in action research is the teacher's reflection on, and application of, what was learned. The instructors in this study were pleased that the overall student experience on the trip was positive. Students reported a high degree of satisfaction with the trip's ability to meet their expectations on most criteria, and the themes that emerged from the focus group data were generally positive in nature. As a result, a primary consideration for the researchers is to continue offering the trip in a similar format. The trip's ability to facilitate networking among industry professionals, as well as to develop student-to-student connections within the cohort, is a critical result of this learning

activity. These types of interpersonal connections have always been a focal point for the academic program in which the students in this study were enrolled. As such, the industry field trip is viewed as a strength that should be retained. For the researchers, it was especially important to learn how much students valued connecting with each other and their perception that this is important to their success in the program. In the future, adding a student mentoring component to the program would capitalize on the value of connecting students across cohorts and potentially increase the benefits of social connections that students experienced during the trip.

It is notable that the students did not feel the trip helped them cement difficult course content to the degree the researchers would have hoped. In the future, the program will seek to create an itinerary and talking points for the networking sessions that will allow students to have conversations that go beyond professional development advice and are also directed toward strategic decision-making in the field. Additionally, it may be helpful to host a post-trip meeting, so students receive a debriefing session where they can actively reflect on the trip, ask questions, and connect more firmly to course content. Finally, while logistical issues with regard to traveling in a large group are to some degree inevitable, more student input during the planning phase of the trip helps increase buy-in and lessen the negative effects of logistical failures.

The value of evaluating the field trip cannot be overstated, and the researchers would recommend faculty in other programs plan to evaluate similar trips or experiences for students in their programs. The data collected from students and professionals is valuable for improving future trips, encouraging future students to attend the trip, and asking for institutional support for the trip. Over time data can be collected and used to recruit new students to the program and showcase the benefits of the program to university administrators.

Conclusion

Astin's (1984) theory of student involvement suggests more involved students deepen their learning. The results of this study support that students who chose to attend the professional field trip felt they improved their overall graduate school experience. Students seem aware of the benefits of being actively involved in their learning and appreciate opportunities to do so. From a programmatic standpoint, graduate sport management programs should expand opportunities for students to become involved in their learning outside of class. This could include a professional field trip, but it might also involve seminars, workshops, or volunteer experiences.

Evaluating the field trip provided our department with actionable data for upcoming years. Student expectations were met or exceeded, although students did make a few suggestions for change, such as providing more content in their interest areas. In subsequent years, we will provide networking training prior to the trip. The trip also met the learning objectives it was designed to achieve, such as improving job expectations and networking skills, connecting students across cohorts, and allowing students to have fun outside the classroom. Students found professional, personal, and social value in the trip by learning more about their field and career and connecting their trip experiences to course content. Continual assessment of the trip will help provide a case for continued funding and inspire departmental support.

While this study focused on evaluating one year of the professional field trip in one program, this type of action research can provide suggestions for faculty in other programs. However, future research should apply a similar framework to trips at multiple universities or should be conducted longitudinally. A common issue with research on teaching and learning is the inability to connect learning experiences with improvements in knowledge or learning. Future research should create measures related to student knowledge pre- and post-trip to provide this type of evidence of student learning. While very valuable, student perceptions provide one piece of the assessment picture, and faculty should continually strive to corroborate perceptions with other evidence of learning. Future research should also examine other graduate student out-of-class learning experiences, such as the graduate assistantship, to evaluate student learning outcomes related to work experiences.

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Caring About Success: Students' Perceptions of Professors' Caring Matters More Than Grit

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Retention in higher education has become an important area of focus in recent years; however, much of the research has been conducted on large, research-intensive universities, leading to questions of whether these findings apply to institutions with different characteristics. In the current study, forty-four students at a small, teaching-focused university completed self-report measures on their academic success (performance and commitment), sense of belonging, and grit. Participants were classified as belonging to one of four groups: HPHC (high performing, high commitment), HPLC (high performing, low commitment), LPHC (low performing, high commitment), or LPLC (low performing, low commitment). ANOVAs and post-hoc tests revealed that LPLC students were significantly lower than all other groups on self-reported professors' pedagogical caring. Interestingly, no group differences emerged for grit, social acceptance, or global university belonging. Implications for prevention and intervention programs are discussed.

Understanding variables that influence student success is paramount to institutions. According to a recent report, only about half of the students who enter American colleges and universities actually graduate (Schneider & Yin, 2011). Low retention rates cost students thousands of dollars in tuition, as well as taxpayers billions of dollar in grants and state appropriations (Schneider & Yin, 2011). As Strauss and Volkwein (2004) noted, institutions can strengthen their capacities for educational and administrative planning through a better understanding of how to predict student retention. Additionally, accrediting agencies are placing greater emphasis on student commitment and retention (McMurtie, 2000). Furthermore, student retention rates are becoming a more common performance indicator (King, 2016).

This area of study can be considered crucial in ensuring a stable future for higher education. An institution's success can be strongly impacted by its retention rates. While high school GPA and standardized test scores like the ACT/SAT can be helpful in predicting students' success in higher education, certainly other characteristics may be helpful as well (e.g., Duckworth, Peterson, Matthews, & Kelly, 2007; Strayhorn, 2014). According to the National Center for Education Statistics, the 6-year graduation rate for first-time, full-time undergraduate students who began their studies in fall 2008 was 65 percent at private nonprofit institutions (U.S. Department of Education, 2016). It was higher for females than for males (68 vs. 62 percent).

Institutions with higher retention rates typically have programs in place that ensure student success (Tinto, 1987). Tinto's model (1987) of persistence in postsecondary institutions highlights the need for students' integration in academic and social systems. The integration that Tinto (1987) modeled could include programs that are more tailored to the individual, based

on his or her demographics, such as socioeconomic status and pre-existing academic record. Research on retention in higher education has focused on both systemic and individual factors; however, much of the research has been conducted at large, public, research-oriented institutions (e.g., Freeman, Anderman, & Jensen, 2007; Hoffman, Richmond, Morrow, & Salmone, 2002; Strayhorn, 2011). The current study considered how two factors- students' sense of belonging and grit- impact their success at a small, private, teaching institution. Success was examined through academic performance and academic commitment.

Sense of Belonging

Students' sense of belonging has been associated with higher levels of academic engagement and achievement (Buhs, 2005; Zumbunn, McKim, Buhs, & Hawley, 2014). The need to feel accepted and supported by teachers and peers may be especially important as young adults move from high school into college, or from one college to another (Tinto, 1987). This sense of belonging can be assessed at the level of the institution or/and at the level of the classroom. Freeman and colleagues (2007) found associations between students' sense of class belonging and their academic self-efficacy, intrinsic motivation, task value, and perceptions of instructors' support. They also found that students' sense of university-level belonging was connected to their sense of social acceptance.

Adjusting to college can be a very stressful time for many individuals. It can arguably be more difficult for those who identify as a minority, as well as those in a lower socioeconomic status (Tinto, 1987; Zumbunn et al., 2014), which is why the current study included a diverse group of participants. According to Stayhorn, (2011) the greatest outcome for belonging could be

found in places like the student's chosen department or classroom. No matter the size of the university, most of a student's time can be spent learning and making connections in the classroom. Findings from Hoffman and colleagues (2002) reveal that sense of belonging to the institution is related to perceptions of valued involvement in the campus environment. Their findings further show that this involvement is based on establishing supportive peer relationships along with beliefs that faculty are compassionate and recognize students as individuals.

Faculty members are in a unique position to provide students with a sense of belonging. Academic concerns have been found to be one of the main causes of distress in first-year college students (Hoffman, et al., 2002). Tinto (1987) found that a positive encounter with faculty members can indicate positive academic outcomes, which could help alleviate the previously mentioned stressor. Once the academic piece of the professor-student relationship is satisfied, other aspects of the relationship grow, further increasing a student's sense of belonging or fit (Zumbrunn et al., 2014). It has been suggested that if an environment itself is perceived as caring, then the need to belong is fulfilled (Baumeister & Leary, 1995; Freeman et al., 2007). Freeman and colleagues (2007) found that faculty members who encouraged student interaction and participation, and were perceived as warm and organized, fostered the strongest sense of belonging on campus.

Since most research on sense of belonging at universities have been conducted at large institutions (e.g., Freeman et al., 2007; Hoffman et al., 2002), we know very little about whether these findings extend to other college environments. For instance, at larger schools, it may be peers and extracurricular activities that make a student feel at home (Tinto, 1987), but for a smaller school, it may be the faculty that promote bonding with the institution. This current study adds to the literature in its examination of the role of belonging in academic success at a small institution.

Grit

An individual characteristic that may play a significant role in academic success is grit. Grit is conceptualized as perseverance and passion for long-term goals (Duckworth et al., 2007). Duckworth's concept of grit (2007) has been related to educational success, including higher GPAs, college satisfaction, sense of belonging, and commitment to academic field/career (e.g., Bowman, Hill, Denson, & Bronkema, 2015; Duckworth et al., 2007; Strayhorn, 2014). In one of the seminal studies on grit, Duckworth and colleagues (Duckworth et al., 2007) examined predictors of success among Ivy League undergraduates and United States Military Academy (West Point)

cadets. In this study, grit demonstrated incremental predictive validity of success measures over and beyond IQ and conscientiousness. In a later published study, Duckworth and Quinn (2009) found that when measured using a short scale, grit influences retention rates among West Point military cadets.

Grit may provide a particularly significant role for minority students. Strayhorn (2014) studied predictors of academic success among Black men enrolled in predominately White institutions. He found that grit was positively related to college grades. Furthermore, he found that grit added predictive validity beyond traditional measures of academic success, such as high school GPA and standardized exam scores. Portes and Rumbaut (2006) suggest that an ideology of grit may help individuals respond positively to prejudice and discrimination. O'Neal and colleagues (2016) studied Latina/o first-generation college students. Interestingly, among all their participants, grit was higher than that of the largely Caucasian participants in the original grit study sample (Duckworth & Quinn, 2009). O'Neal and colleagues (2016) found that among Latina/o students, grit was used to overcome stressful emotions and external obstacles to academic achievement.

However, a recent meta-analysis of the grit literature failed to find strong relations between grit scores and success (Credé, Tynan, & Harms, 2017). Their findings suggest that the relations between grit and academic performance and retention are modest and do not compare with other well-known predictors of academic performance. Importantly, Credé and colleagues (2017) do acknowledge that small to moderate effect sizes can be useful when marginal improvements in individuals' performances can have meaningful positive consequences. In other words, a small increase in academic performance could mean the difference between graduating and dropping out for thousands of college students.

There are some important limitations to the grit research, which the current study seeks to address. First, past research has been conducted among undergraduates at large universities (Bowman et al., 2015; Strayhorn, 2014) and highly selective institutions (Duckworth et al., 2007); the current study was conducted at a small, private, teaching-focused institution. Scarr and McCartney's (1983) concept of niche picking would suggest that the students who choose to attend a large institution differ in significant ways from those who choose to attend a small institution. For example, research by Corker Donnellan, Kim, Schwartz, & Zamboanga (2017) shows that students at different universities differ in terms of average levels of Big Five personality domains. Specifically, larger campuses had more extraverted students than smaller campuses. Additionally, past research has focused on students in their early years of

education (e.g., Bowman et al., 2015), while the current study included undergraduates at various levels of their education. Including all undergraduates ensure a broader understanding of what truly retains students at all points of their education. Finally, the current study takes a novel approach by including both measures of academic performance and commitment in its definition of academic success. Duckworth and colleagues' definition of grit (2007) lends itself well to this approach, and it will be interesting to evaluate how grit impacts academic success.

Research Questions and Purpose of Study

Thus, the current study sought to better understand the relationship between socio-emotional variables and academic success at a small, teaching-focused university. One systemic factor, sense of belonging, was investigated along with one individual factor, grit. Importantly, this study took place at a small university. Prior studies have been conducted at large institutions on students' sense of belonging (e.g., Freeman et al., 2007; Hoffman et al., 2002) and grit (e.g., Bowman et al., 2015; Strayhorn, 2014). Possibly, findings from previous studies do not generalize to small institutions. As Tinto (1987) emphasized, academic and social systems of an institution impact student persistence. These systems likely differ at small institutions, given differences in class sizes and student/professor ratios, types of students attracted to these institutions, and expectations placed on faculty and students.

Also unique to this study is a more inclusive view of academic success. For the current study, academic success includes both academic commitment and class performance (i.e., GPA). Prior studies only evaluated performance, which may present an incomplete picture of persistence and success at an institution.

In sum, we asked the following research questions:

1. Are variables positively correlated with each other?
2. Are there group differences (based on academic commitment and academic success) on sense of belonging?
3. Are there group differences on grit?

Method

Participants

Forty-four students (11 males; 32 females; 1 gender fluid) completed all the questionnaires. While the sample is small, it is relatively diverse. Participants ranged in age from 18 years to 30 years, $M=21$, $SD=2.27$. There was a range in reported ethnicity: 84.1% Caucasian, 11.4% African American/Black,

2.3% Native American/ American Indian, and 2.3% Hispanic/Latino. Sixteen distinct majors were represented among the participants, with the largest numbers identifying as counseling psychology majors (27.3%), conservation and wildlife majors (11.4%), animal science majors (11.4%), and biology majors (11.4%). Participants also varied in self-reported GPA with a minimum of 1.3 and a maximum of 4.0, $M=3.24$, $SD=0.61$. Academic status also varied, with 20.5% identifying as freshmen, 6.8% as sophomores, 36.4% as juniors, and 36.4% as seniors. Participants differed in the number of years they had spent at the current institution: 25% reported being in the first year at the institution, 25% reported being in their second year, 25% reported being in their third year, and 25% reported being in their fourth year.

Procedure

Upon receiving approval from the Institutional Review Board, participants were recruited from a small, private university in the northeastern part of the United States to participate in a quantitative research study. Undergraduate students were contacted through email with a link to online survey questionnaires. When the link was opened, consent information appeared. Students who actively acknowledged consent were granted access to the questionnaires. There was no compensation for participation in the study. Participants completed the following questionnaires as part of a larger project; in total, participants responded to 50 questions.

Measures

Demographics. Participants responded to 19 questions, including identification of their age, gender, major, race/ethnicity, length of time at the current institution, year/ class standing, and current GPA.

Academic commitment. Academic commitment was measured using three items from Bowman et al.'s study (2015). Participants were asked to indicate the likelihood that they would persist until graduation, change major field, and change career choice using a 5-point Likert scale. An academic commitment score was created using the sum of participants' responses to those three questions.

Sense of belonging. Sense of belonging was assessed using the measure from Freeman, Anderman, and Jensen (2007). They had adapted Goodenow's (1993) Psychological Sense of School Membership (PSSM) for use with university students to measure belonging at the classroom level and at the university level. For this study, the adapted version that assesses students' sense of belonging at the university level was used. There are 16 items total, of which 5 items which measure social acceptance, 5 items that measure

Table 1
Intercorrelations of Variables (N=44)

	GPA	AcCom	SocAc	ProfCar	UnivB	Grit
GPA	1					
AcCom	.30	1				
SocAc	.13	.33*	1			
ProfCar	.34*	.36*	.68***	1		
UnivB	.19	.13	.53***	.45**	1	
Grit	.27	.18	.46**	.30*	.53***	1

Note. GPA= Current GPA, AcCom= Academic Commitment, SocAc= Social Acceptance, ProfCar= Professors' Pedagogical Caring, UnivB= University Belonging

* $p < .05$, ** $p < .01$, *** $p < .001$

professors' pedagogical caring, and 6 items that measure global university belonging. Social acceptance indicates students' sense of belonging in the social realm, mostly in terms of peer acceptance. Professors' pedagogical caring refers to the extent to which students' feel valued by their professors. Global university belonging represents students' sense of feeling accepted by the institution. Participants were asked to rate the items using a 5-point Likert scale.

Grit. Grit was measured using Duckworth and Quinn's (2009) 12-item questionnaire. Participants were asked to self-report on items using a 5-point Likert scale.

Group Identification

Participants were identified as belonging to one of four academic success group based on their self-reported GPA and academic commitment score. Academic commitment scores reflected students' dedication to their major and profession, while GPA reflects students' academic performance. Academic commitment scores ranged from 7.0 to 14.0, with a median score of 13.0. Twenty-six students reported an academic commitment score of 13.0 or greater. Self-reported GPA ranged from 1.3 to 4.0. Thirty-two students reported a GPA of 3.0 or greater.

High-performing, high commitment students (HPHC) were identified as those with a self-reported GPA of 3.0 or greater and an academic commitment score of 13.0 or greater. High-performing, low commitment students (HPLC) were identified as those with a self-reported GPA of 3.0 or greater and an academic commitment score below 13.0. Low-performing, high commitment students (LPHC) were identified as those with a self-reported GPA below 3.0 and an academic commitment score of 13.0 or greater. Low-performing, low commitment students (LPLC) were identified as those with a self-reported GPA below 3.0 and an academic commitment score below 13.0.

Results

Based on the procedures described above, 23 participants were identified as HPHC students, 10 as HPLC students, 6 as LPHC students, and 5 as LPLC students.

Pearson correlations were conducted among the variables of interest: GPA, academic commitment, the belonging scales (social acceptance, professors' pedagogical caring, and global university belonging), and grit. All correlations are reported in Table 1, with significant correlations noted. Significant positive correlations between academic caring, the belonging subscales, and grit were found, indicating that these variables are connected with each other. As scores on one of these variables increase, scores on another variable increase as well. ANOVAS were conducted to assess group differences on each of the belonging scales (social acceptance, professors' pedagogical caring, and global university belonging) and on grit. No group differences were found on grit, social acceptance, or global university belonging. However, there were group differences on professors' pedagogical caring, $F(3, 40) = 5.34$, $p < .01$. Post hoc comparisons using the Tukey HSD test indicated that the mean score of LPLC ($M = 16.80$, $SD = 3.35$) was significantly lower than the other groups (LPHC: $M = 22.00$, $SD = 2.00$; HPHC: $M = 21.70$, $SD = 2.01$; HPLC: $M = 21.20$, $SD = 3.49$). Therefore, students who were low performers and who indicated low commitment perceived professors as less caring than students in any of the other groups. ANOVA results are presented in Table 2 for this finding.

Discussion

The primary purpose of this study was to explore the relationship between socio-emotional variables and academic success at a small, teaching-focused university. We hypothesized to find positive correlations among all variables. We also expected to find significant group differences when considering students' sense of belonging and grit. Specifically, we

Table 2
Analysis of Variance for Professor Caring

Source	SS	df	MS	F	P-Value
Between groups	105.53	3	35.18	5.34	.003
Within groups	263.27	40	6.58		
Total	368.80	43			

expected to find the students who are high-performers with a strong academic commitment to report higher scores on sense of belonging than students who do not perform as well and/or do not report a strong academic commitment. Results supported only a few of these hypotheses.

Our finding that a sense of belonging was connected to student academic success matches the work of previous studies in this area (e.g., Palmer, O'Cane, & Owens, 2009; Strayhorn, 2012; Zumbunn et al., 2014). There has been a plethora of studies assessing these variables in middle and high school students (Anderman, 2003; Catalano, Oesterle, Fleming, & Hawkins, 2004; Crosnoe et al., 2010; McNeely, Nonnemaker, & Blum, 2002; Murray & Zvoch, 2011; Roorda, Koomen, Spilt, & Oort, 2011) and in college students at large public universities (Bowman et al., 2015; Duckwork et al., 2007; Freeman et al., 2007; Komarraju, Musulkin, & Bhattacharya, 2010; Strayhorn, 2013). Considering how belonging beliefs may be context-specific (Strayhorn, 2012; Tinto, 1993), the present study makes a significant contribution in its inclusion of students at a small, private, teaching-focused university.

Results of this study suggest that specific aspects of belonging have different consequences for academic success. A nuanced understanding of how students form a sense of belonging and how that sense of belonging functions is needed, particularly in a smaller university setting. The lack of group differences on social acceptance and global university belonging might suggest that at a smaller university, students are impacted more by individual relationships than they are by broader institutional networks. The social acceptance subscale focused mainly on peer acceptance, while the global university belonging subscale encompassed a broader sense of belonging at the institution. The significant group differences of professors' caring emphasize the role faculty play in student success, expanding on prior findings that link belonging with achievement processes (Zumbunn et al., 2014). The professors' pedagogical caring subscale assessed the extent to which students felt valued by their professors. Velasquez, West, Graham, & Osguthorpe's (2013) review of the literature emphasizes the role of a caring pedagogy and argues for development of valid instruments measuring it, particularly in higher education. Future research should

address how professors can demonstrate care with students in appropriate and effective ways.

Our measure of academic success included commitment to major/field in addition to grades. The research on this aspect of academic success has received less attention in the literature. Previous studies (e.g., Komarraju et al., 2010) have found a link between the student-professor relationship and academic self-concept. Interestingly, analysis on the belonging scales only revealed significant group differences for professors' pedagogical caring, not social acceptance or global university belonging. Student belonging is associated with both academic and social support from teachers (Catalano et al., 2004); however, much of the research has focused on campus community belonging (Strayhorn, 2012).

We were surprised by the lack of significant findings concerning grit. Grit was correlated only with the subscales of sense of belonging, but not with GPA or academic commitment. There were no significant group differences among any of the groups. More recent research on grit does confirm the construct's limitations (Credé, Tynan, & Harms, 2017). For example, in a study conducted at West Point (Maddi et al., 2017), grit was related to cadet's retention, but not their first year performance. Similarly, in a study of first-year college physics students, grit was not a significant predictor of student academic achievement or course success (Bazelais, Lemay, & Doleck, 2016). Certainly, continued study is warranted to better understand how individual factors, like grit, impact students' academic success.

There are limitations to the current study that should be noted. One limitation of this study is that, due to its descriptive and correlational nature, it should be seen only as providing suggestions on ways in which the examined variables influence one another. Longitudinal analysis could explore dynamic sources of student- and instructor-variables to ascertain how they impact students' academic performance and commitment. Additionally, it is important to note that all data collected was in the form of self-reports. Future research may benefit from observations data; for example, observations of instructors' behaviors that may contribute to students' perceptions of caring. Nonetheless, this study marks an important contribution to our understanding of the factors related to student success at a small, teaching-focused university.

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Effects of Individual and Situational Characteristics on the Use of Student-Centered Pedagogy in Calculus I

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Investigations into attrition of STEM-intending students indicate that poor experiences in introductory courses are at least partly to blame, specifically the students' frustration with lecture-driven teaching methods. In this research, hierarchical linear modeling is used to identify the individual and situational characteristics of instructors who support the use of student-centered pedagogy in Calculus I. Of specific interest are the effects of class size and perceived departmental support on an instructor's employment of student-centered pedagogical approaches. Overall, the effects of class size and support are functioning as the literature would suggest: instructors with large classes and minimal departmental support report lower usage of student-centered pedagogical approaches. The interesting finding is that these effects are more salient at the institutional level as compared with the instructor level. By analyzing national data gathered from 490 instructors distributed across 160 institutions, the findings of this research provide large-scale empirical support for several interview studies that have identified the importance of situational characteristics and highlight the importance of institutional context over the context experienced by individuals. Furthermore, this research suggests that change strategies might be more effectively supported through the department chair and/or course coordinators, as opposed to targeting individual instructors through professional development opportunities.

It is widely reported that the United States (US), as well as many European nations, are struggling to produce sufficient Science, Technology, Engineering, and Mathematics (STEM) graduates at the university level (e.g., Olson & Riordan, 2012; van Langen & Dekkers, 2005). For instance, in the US it is estimated that the number of STEM graduates must increase by an additional one million over current projections to meet the need of workforce demands (Olson & Riordan, 2012). This problem does not appear to be one of disinterest, but rather of retention as it has been reported that as many as 40% of STEM-intending students do not graduate with a STEM degree (Hurtado, Eagan, & Chang, 2010). While student retention, especially in the first year of college, is a complicated issue (e.g., Daempfle, 2003; Gerdes, & Mallinckrodt, 1994; Tinto, 1999), researchers have identified lecture-based instructional practices in introductory courses as a significant contributor to the loss of STEM-intending students.

Many of those students leaving STEM majors cite ineffective teaching methods and uninspiring atmospheres in introductory-level STEM courses, with introductory mathematics courses such as Calculus I often singled out as the primary reason for attrition (Olson & Riordan, 2012; Rasmussen & Ellis, 2013; Seymour, 2006; Thompson et al., 2007). Students are frustrated with what they perceive to be courses overburdened with content and with pacing structures that inhibit comprehension and reflection – a situation they believe is exacerbated by “modes of teaching that suggest that [the faculty] took little responsibility for student learning” (Seymour, 2006, p.4). The research supports these student reports. A recent meta-analysis by Freeman et al. (2014) found that in undergraduate

STEM courses, “active learning leads to increases in examination performance that would raise average grades by a half a letter” (p. 8410), and that students in lecture classes are 1.5 times more likely to fail than those in classes where active learning methods are used. However, despite the student retention problems and the amassing research advocating against its usage, lecture is still the predominant instructional practice reported across STEM in general, and in mathematics in particular. As presented in the HERI report, “the data continue to show that nearly two-thirds of faculty across STEM sub-fields utilize extensive lecturing in all or most of their courses” (Eagan, 2016).

In light of the HERI findings and related research, the purpose of this study is a focused investigation of a particular course, Calculus I, and the use of student-centered pedagogy therein. A hierarchical linear modeling approach is used on a national sample to investigate individual and situational characteristics of instructors that influence pedagogical decision-making and to identify factors that support the use of student-centered instructional practices.

Review of Relevant Literature

Given the propensity of extensive lecturing in undergraduate mathematics courses, one might mistakenly assume that instructors' teaching practice is the result of habit or apathy (for a review of such claims, see Weber, 2004). In actuality, case studies of mathematics instructors have found that their instruction is informed by rich belief systems, well-articulated pedagogical goals, and a good deal of thought (e.g. Johnson, 2013; Fukawa-Connelly & Newton, 2014; Jaworski, Treffert-Thomas, & Bartsch,

2009; Lew, Fukawa-Connelly, Mejia-Ramos, & Weber, 2016; Weber, 2012). Additionally, instructors do not teach in a vacuum, with many contextual features influencing what happens in their classrooms.

The literature has cited many reasons why instructors choose to lecture, and not least of these is the belief that lecture is the best method and/or necessary for content coverage (as discussed by Roth McDuffie & Graeber, 2003; Wagner, Speer, & Rosa, 2007; Yoshinobu & Jones, 2012). While we do not wish to discount the enormous influence personal beliefs have on instructional decision-making, we must acknowledge that a bevy of other external circumstances can factor considerably when instructors plan their courses.

These external factors are likely of particular importance because beliefs, values, and knowledge (i.e., conceptions) about teaching are often poor indicators of actual teaching behavior (see Henderson and Dancy, 2007 who cite both research in sociology and education). Accounting for inconsistencies between instructors' conceptions about teaching and their actual practices necessitates taking into account situational characteristics. Defined as "all aspects outside of the individual instructor that impact or are impacted by the instructors' instructional practices" (Henderson & Dancy, 2007, p. 10), these situational characteristics include both easily measurable contextual features such as class size, and those features more difficult to gauge such as departmental support and climate.

Class sizes in introductory STEM courses, such as Calculus I, are often highly variable. For instance, Selinski and Milbourne (2015) found the average class size for Calculus I at PhD-granting institutions to be 52.95 students, with a standard deviation of 53.661. With fluctuation this wide, class size is likely a factor in instructors' pedagogical decision-making. Research by Benton and Pallett (2013) has shown that teaching methods differ according to class size with instructors of large classes being less likely to "involve students in hands-on projects and real-life activities...form teams or discussion groups to facilitate learning, and ask students to help each other understand concepts or ideas." This was echoed by participants in Henderson and Dancy's (2007) study who reported teaching large numbers of students, in lecture hall with seats bolted to the floor, made it "harder to use many research-based methods that focus on interactivity, cooperative learning, and formative assessment" (p. 9).

Related to class size, and perhaps also a contributing factor to teaching practices, is the number of sections offered for a given course. Most US colleges and universities offer multiple sections of Calculus I each semester, with these sections often being taught by a wide range of instructors (e.g., postdocs, adjunct lecturers, graduate students, tenure-track or tenured

faculty). As described by Rasmussen and Ellis (2015), multiple sections can create situations where different students are being taught different content or taught in different ways (which can affect what they actually learn). Thus, with the presence of multiple sections, departments usually turn to coordinating certain aspects of the course. This coordination can include course schedules, textbook, homework, exams, exam grading, and quizzes; however, it can be much more extensive. As described by Rasmussen and Ellis (2015), coordination can also include holding regular meetings between instructors, sharing course resources, and providing feedback. In this way, coordination can help to set expectations and norms around teaching, thus influencing the departmental culture.

Departmental norms, expectations, and teaching culture appear to impact an individual's teaching practice in a number of ways. Departmental expectations about content coverage are ubiquitous when discussing decisions about instructional approaches (e.g., Johnson, 2013; Roth McDuffie & Graeber, 2003; Wagner, Speer, & Rosa, 2007). Apart from coverage pressure, departmental climate has the potential to be acutely influential. As reported by Henderson and Dancy (2007), working with colleagues who either lack knowledge about, or withhold support of, pedagogical reform inhibits an instructor's willingness to modify current practice. On the other hand, at institutions where collegiality and open communication is the norm, instructors not only have the opportunity for exposure to a range of strategies and pedagogical techniques from their colleagues, but also the safe space in which to attempt this non-traditional pedagogy. Thus, perceived notions concerning departmental expectations, lack of support from colleagues or supervisors, and a lack of common vision for reform among the faculty (Henderson & Dancy, 2007, Roth McDuffie & Graeber, 2003) collectively factor significantly when instructors plan courses.

Collectively these studies illustrate that the pedagogical decision-making of mathematics faculty is quite complicated. While there is adequate evidence of the effectiveness and appropriateness of student-centered approaches, the practical implementation of such techniques is affected by a range of factors related to collegial support, promotion and tenure considerations, course coordination, and class size. To that end, the present research investigates the teaching practices of university Calculus instructors and the effects of the aforementioned influences therein. Specifically, the following research questions are investigated: Are calculus instructors employing more active-learning methods or teacher-centered practices in their courses? Can this be explained by class size, number of class sections, or departmental support for innovative teaching?

Methods

The present study is situated within the larger research project entitled Characteristics of Successful Programs in College Calculus (CSPCC) that was designed to gain a nationwide overview of the college calculus programs across the US, as well as to identify more successful programs based on a combination of factors including: grades, affective variables (e.g., interest, enjoyment, and confidence), and intention to continue on to Calculus II (for more information on the CSPCC project, please see Bressoud, Mesa, & Rasmussen, 2015). The CSPCC project used a stratified random sample of colleges and universities in the U.S. based on the highest degree granted at each university (Associate's, Bachelor's, Master's, or Ph.D.). The first phase was comprised of a total of six surveys: three for the students (one at the beginning of Calculus I, one at the end of Calculus I, and one a year later to the students that gave their email addresses), two for the instructors (one at the beginning of Calculus I and one at the end of Calculus I), and one survey given to the Calculus course coordinator. For the purposes of this study, we limited our dataset to those instructor respondents who had completed the end of semester survey. In total, there were 490 instructors distributed across 160 institutions (average cluster size of $n = 3.06$). The nested nature of our data causes us to consider reports of these variables at both the instructor and institutional levels and investigate effects at each, thus allowing us to investigate the influence of institutional context on individual decision-making while remaining cognizant of the fact that an individual's perception may not be indicative of the departmental context at large.

For each instructor, three variables were considered: class size, perception of support, and a composite teaching practice (CTP) score. Class Size was measured as the number of students enrolled in the course at the end of the term. Perception of Support was measured using the following survey item: "From your point of view, how supportive is your department for

implementing innovative approaches to teaching Calculus I? on a 4-point Likert scale (1 = not supportive, 4 = very supportive)." The CTP score was determined based on self-reported teaching practices on a series of eight 6-point Likert scale (1 = *not at all*, 6 = *very often*) items measuring their frequency of occurrence. Each of the items was classified as being teacher-centered or student-centered on the basis of who was doing the mathematical work. See Table 1 for details.

TP1, TP6, and TP7 were averaged to obtain the teacher-centered (TC) score; TP2, TP5, and TP8 were averaged to obtain the student-centered (SC) score. TP3 was considered to be a somewhat neutral practice as this can theoretically involve both the teacher and the students doing mathematical work and was thus removed from consideration for the composite. TP4 is certainly a student-centered practice; however, this practice has the potential to be a one-shot opportunity in an otherwise lecture-dominated course. For this reason, and also the fact that a very small percentage of respondents indicated any use of this practice, TP4 was removed from consideration. The CTP was obtained by subtracting the TC score from the SC score. In this way, teaching practices have been condensed into a unidimensional measure where positive scores indicate a tendency towards student-centered practices and negative scores towards teacher-centered ones.

For each institution, four variables were considered, three of which were aggregate measures of instructor-level variables: class size, perception of support, and CTP. The only institution-level characteristic was that of course coordination. Not having a way to measure this directly (i.e. knowledge of common delivery methods, common HW assignments, etc.), this was measured indirectly. Operating under the assumption that multiple sections of the same course often necessitates course coordination, and that this need might increase as do the number of sections, the number of sections of Calculus I being offered at that institution for the time period under investigation was used as a proxy for course coordination; however, we acknowledge that this is not an ideal measure for coordination.

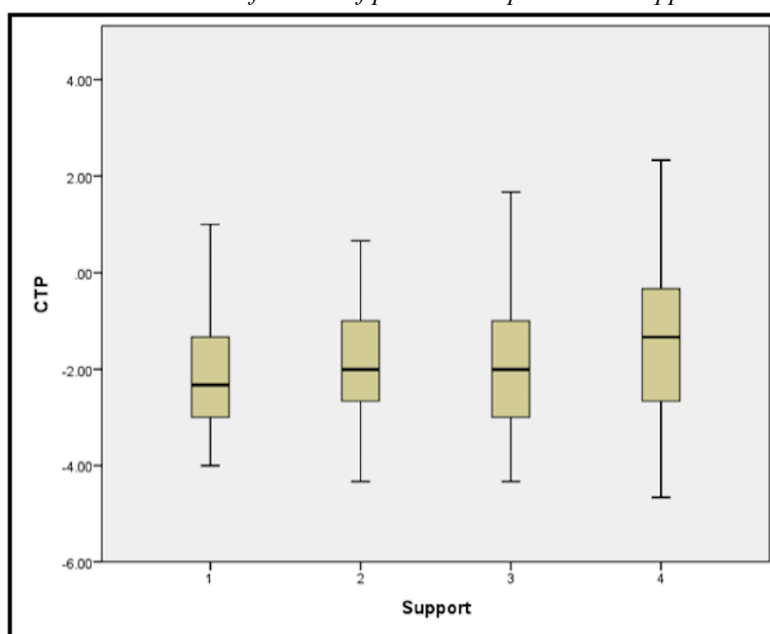
Table 1
Classification of teaching practices items

Item	Prompt	SC	TC	Omit
TP1	Show students how to work specific problems		x	
TP2	Have students work with one another	x		
TP3	Hold a whole-class discussion			x
TP4	Have students give presentations			x
TP5	Have students work individually on problems or tasks	x		
TP6	Lecture		x	
TP7	Ask questions		x	
TP8	Ask students to explain their thinking	x		

Table 2
Univariate Descriptive Statistics

Statistic	Instructor Level			Institution Level			
	Class Size	Support	CTP	Class Size Mean	Support Mean	CTP Mean	# Sections
Minimum	6	1	-4.67	8	1	-4.33	1
Maximum	321	4	2.33	321	4	0.67	52
Mean	41.97	2.879	-1.799	45.7126	2.8949	-1.8897	7.3563
St. Dev.	41.424	0.8696	1.3511	50.76861	0.68075	7.3563	7.16767

Figure 1
CTP score as a function of perceived departmental support



To inform the model, descriptive statistics were computed at both the univariate and bivariate levels. The univariate analysis provided descriptive statistics for each of our variables of interest. The bivariate analysis investigated the relationship between the independent and dependent variables to inform which, if any, should be included in the model. The research questions were then analyzed with a multi-level modeling approach using *HLM for Windows* software (version 7.26b, Raudenbush, Byrk, & Congdon, 1996-2015).

Results

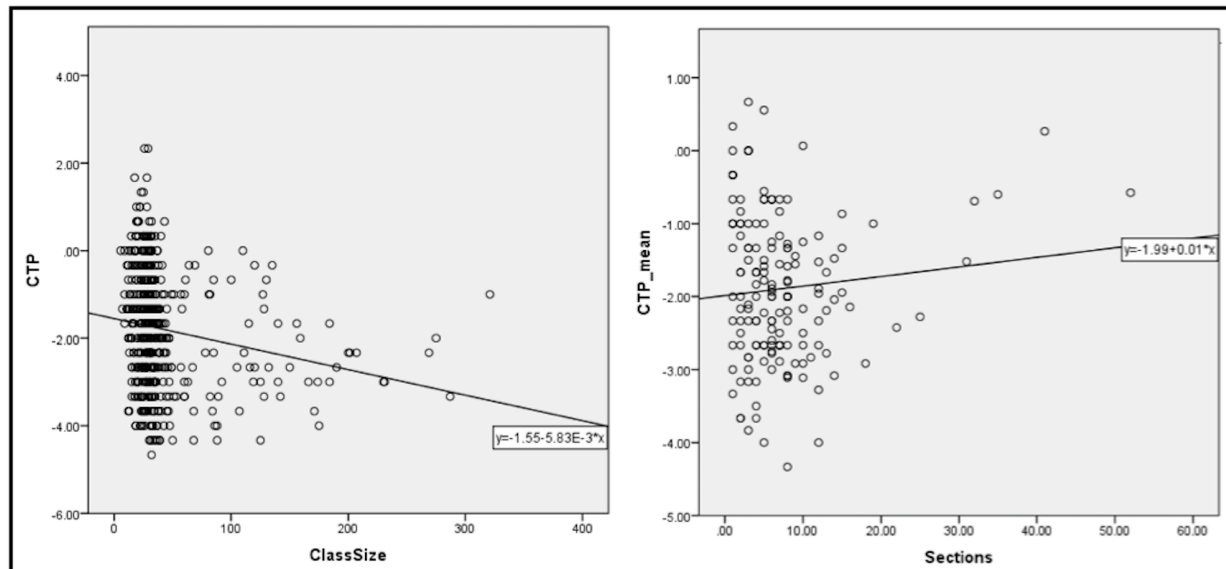
Descriptive Statistics

The initial univariate analysis (see Table 2) revealed that the participating institutions were quite disparate in terms of the number of students being served, both in terms of students per class and number

of sections per term. On average, instructors are reporting more teacher-centered practices than student-centered methods. While not surprising based on the extant literature, this is particularly interesting in this study because this predilection for teacher-centered practice (mean CTP = -1.8) exists despite promising perceptions of departmental support for innovative teaching (72.1% of instructors rate support as a 3 or 4 on the 4-point scale).

The initial bivariate analysis focused on the correlations between the variables under investigation. (Complete correlation matrices can be found in Appendix A.) There is reason to believe that both perceived support and class size have the potential to influence an instructor's pedagogical decision-making, and the data did corroborate this. At the instructor level there was a statistically significant positive correlation between perception of departmental support and CTP ($r = .131$, $p = .004$; see Figure 1); similarly, there was a

Figure 2
Scatterplots of CTP as a function of class size and number of sections



statistically significant negative correlation between class size and CTP ($r = -.179$, $p < .001$; see Figure 2). Both of these findings are consistent with the extant literature. At the institutional level, these correlations paralleled those at the instructor level; however, only the class size relationship was statistically significant ($r = -.19$, $p = .016$). Interestingly, there appeared to be a positive relationship between number of sections (our coordination proxy) and mean CTP score by institution, suggesting that coordination is functioning as an organized effort to employ student-centered approaches across multi-section courses; although, this failed to be statistically significant (see Figure 2).

HLM Analysis

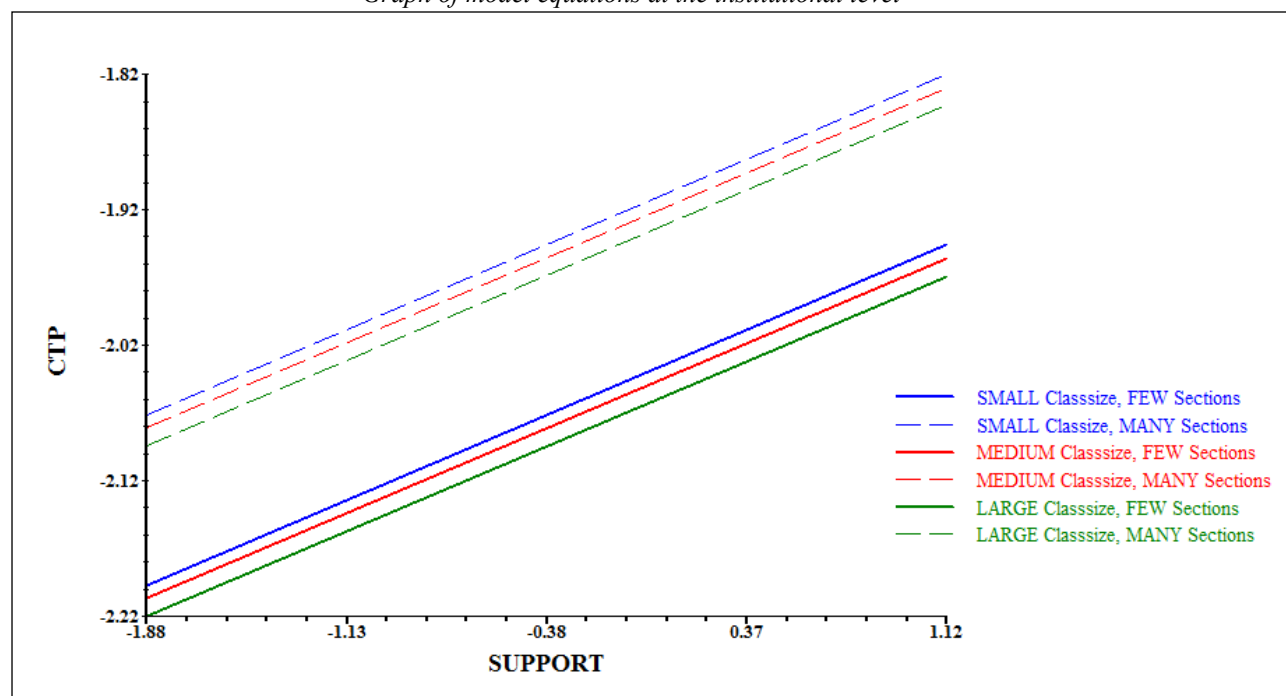
The multi-level modeling began with the unconditional model. In this model, we are able to estimate the mean CTP score and determine the suitability of the data for a hierarchical model. From this model, we were able to conclude that instructors are employing more teacher-centered practices (based on the mean CTP score of -1.91) and that a hierarchical model is appropriate for this dataset ($\chi^2 = 336.32592$, $df = 157$, $p < .001$), with approximately 24% of the variance in CTP scores attributable to between-school variation ($ICC = .2446$). In order to explain this behavior, two independently run model sets were estimated – one each for departmental support and class size – in which the predictors were analyzed at both the instructor and institutional level. Details for each of the sub-models can be found in Appendix B.

Looking at the effect of Support on CTP, there is a positive relationship between perceived level of support and use of student-centered teaching practices. This effect is seen at both the instructor and institutional levels; however, this is only significant at the institutional level ($\gamma_{01} = .252128$, $p = .045$). In practical interpretation, the observed result would imply that for every one-unit increase in support by institution, an instructor's CTP score will improve by .25 on average.

Looking at the effect of Class size on CTP, there is a negative relationship between the number of students and the use of student-centered teaching practices. This effect is seen at both the instructor and institutional levels; however, this is again only significant at the institutional level ($\gamma_{01} = -.004788$, $p = .003$). In practical interpretation, the observed result would imply that for every one-unit increase in average class size by institution, an instructor's CTP score will decrease by .004 points on average. This might seem like an inconsequential amount, but remember that a one-unit change in class size is not comparable to a one-unit change in support. With class sizes ranging from 6 to 321, it might be more appropriate to consider this coefficient in terms of 10-student increases (.04) or 100-student-increases (.4) as a more practical interpretation.

After considering sub-models for each main independent variable, the effects observed were used to inform a multi-predictor model in which the effects of Class Size and Support were considered simultaneously. The initial analysis made a fixed slopes assumption. In the combined model, the viability of a variable slopes model was investigated.

Figure 3
Graph of model equations at the institutional level



An iterative model-building procedure was used in which a deviance test was performed between iterations to determine suitability for parameter removal. These details can be found in Appendix C.

The final model retained the number of sections (SECTIONS), average class size (meanCLASSIZ) and typical perception of support (meanSUPPORT) at the institutional level and class size (CLASSIZ) and individual perception of support (SUPPORT) at the instructor level. The model estimated fixed slopes for class size and variable slopes for support at the instructor level. The final model equations, as well as the parameter estimates, can be found in Appendix D.

We can see that at the institutional level, increasing the number of sections has a positive effect (i.e. teacher behavior becomes more student-centered), as does increasing support for implementation of innovative teaching practices, whereas increasing class size has a negative effect. This result is well-captured in Figure 3¹ where the dotted lines (representing institutions with many sections) universally outrank the solid lines (representing institutions with few sections), and within each

grouping the average CTP score rises as class size decreases from large to medium to small. All model equations have positive slope, demonstrating the universal effect that increased support has on CTP – independent of class size and coordination.

At the instructor level, we see similar effects: increasing an instructor's class size relative to the institutional average has a negative effect, and increased perception of support relative to the institutional average has a positive effect. It is important to note, however, that with the variable slopes model, the effect of support can vary considerably among instructors, and while typically this has a positive effect, the range of possible values (-.584, .751) indicates that the effect of an instructor's discrepancy between perceived support and the institutional average can influence the instructor in either the student-centered or teacher-centered directions. In other words, the effect is not universal for individual instructors.

Discussion

Overall, the effects of class size and support are functioning as the literature would suggest. Here we highlight three specific examples. Firstly, increased class sizes negatively impact the use of student-centered pedagogy. Secondly, supportive departments

¹ Note that the CLASSIZ designations refer to the 25th/50th/75th percentiles for Small/Medium/Large respectively; Similarly, the SECTIONS designations refer to the 25th/75th percentiles for FEW/MANY respectively.

(as measured by the average of the instructor reports) are indeed increasing the amount of student-centered instructional practices on the average, even though the impact on individual instructors may vary. Finally, having multiple sections of the course taught at the same institution increases the amount of student-centered instruction, regardless of the size of those courses. This suggests that coordination may be a powerful influence on instructional practice.

What is interesting about these results is that these effects are more salient at the institutional level as compared with the instructor level. Taken together, these findings highlight the importance of institutional context (e.g., the average experience of individuals within a department) over the context experienced by individuals. These findings provide large-scale empirical support for several interview studies that have identified the importance of situational characteristics such as supportive administrators (e.g., Foote, Knaub, Henderson, Dancy, & Beichner, 2016; McDuffie & Graeber, 2003), class size and room layout (e.g., Henderson & Dancy, 2007; McDuffie & Graeber, 2003), and department norms (e.g., Henderson & Dancy, 2007).

Further, this research suggests that change strategies might be more effectively administered with support through the department chair and/or course coordinators as opposed to targeting individual instructors through professional development opportunities. These administrators may have some influence on factors like class size and the number of sections (which in turn may necessitate the need for coordination). Even in cases where these variables are outside of their control, chairs and coordinators can provide support for innovative teaching practices, including how such teaching behaviors would be viewed in light of tenure/promotion decisions. Alternatively, faculty could themselves foster a supportive environment for instructional change.

This study, while promising, has several limitations that must be addressed. Firstly, the level of coordination was only measured using the number of course sections as a proxy. The use of extant data made it hard to reliably measure this variable, but future research could gather data specific to this objective. Secondly, the cluster size is quite low for current recommendations. Fifty-one institutions only reported data for a single instructor, and the average was a mere 3.06 instructors/institution. Finally, the use of the CTP composite is controversial. Assuming that teaching practices can be reduced to a single dimension (student-centered to teacher-centered continuum) is probably overly simplistic and possibly unrealistic. Preliminary multi-dimensional scaling results indicate that this might better be modeled as a 2-dimensional construct. Future research would investigate this further and would aim to construct a better composite measure of teaching practices.

Conclusion

Our analysis of this national data, gathered from 490 instructors distributed across 160 institutions, provides three main findings and implications. First, the findings of this research provide large-scale empirical support for several interview studies that have identified the importance of situational characteristics and highlight the importance of institutional context as related to individual pedagogical decisions. The results of this research suggest that the decision to implement student-centered pedagogy, and the degree of implementation therein, is affected by class size, departmental support, and level of course coordination. The use of teacher-centered instructional approaches decreases, on average, as class sizes decrease and departmental support and level of course coordination increase.

Second, our analysis was able to determine that the effects of class size and departmental support on instructional practice are more salient at the institutional level. An interpretation of this finding, for instance, would be that an individual's instructional practice seems to be more influenced by the average class size in the department than by the class size of his or her individual course. Or put another way, instructors who teach *the only* small class (in a department with routinely large classes) are less likely to use student-centered instructional practices than an instructor in a department that routinely keeps class sizes small. A possible implication of this result is the consideration of the effect departmental culture (including instructional norms) has on individual decision-making, namely, that a department offering many small sections may be indicative of a culture that supports, facilitates, and expects good teaching.

Finally, our finding that institutional level variables are more influential than individual level variables suggests that instructional reform efforts aimed at department chairs and course coordinators might be more successful than those developed for individual instructors (e.g., professional development designed to disseminate best practices). Individual instructors can do little to decrease class size, increase departmental support for innovative teaching, and increase coordination. Furthermore, even if individuals were able to get these changes for themselves, the impact of such changes is likely to be limited if implemented in a department where this goes against the status quo. Our findings suggest that we see the strongest reports of student-centered instruction in departments where these supports and resources are the norm, and it would be remiss not to consider the influence the department chairs and course coordinators have in establishing that departmental culture.

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Appendix A

Correlation Matrices by Instructor and Institution

Correlation Matrix for all Indicators at the Institution Level

Indicator	1	2	3	4
1. Sections	-			
2. ClassSize_Mean	-.061	-		
3. Support_Mean	-.084	-.102	-	
4. CTP_Mean	.094	-.190*	.090	-

Note: * Correlation is significant at the 0.05 level (2-tailed).

Correlation Matrix for all Indicators at the Instructor Level

Indicator	1	2	3
1. ClassSize	-		
2. Support	-.138**	-	
3. CTP	-.179**	-.131**	-

Note: ** Correlation is significant at the 0.01 level (2-tailed).

Appendix B

Details of Sub-Models for Support and Class Size

Submodel Statistics & Parameter Estimates

Model	Fixed Effects			Variance Components			
SUPPORT	g_{00} (se)	g_{01} (se)	g_{10} (se)	s^2	t_{00}		
Unconditional	-1.91 (.08)	N/A	N/A	1.31392	(Base)	0.42549	(Base)
Means as Outcomes	-1.90 (.08)	.25 (.13)	N/A	1.32903	-0.0115	0.3935	0.07518
1-Way ANCOVA	-1.91 (.08)	N/A	.118 (.08)	1.3178	-0.003	0.40522	0.04764
GroupMean Center Model	-1.91 (.08)	N/A	.065 (.09)	1.31516	-0.0009	0.42521	0.00066
Traditional Compositional Effects model	-1.90 (.08)	.25 (.13)	.065 (.09)	1.32219	0.00629	0.3932	0.07589

Model	Fixed Effects			Variance Components			
CLASSSIZE	g_{00} (se)	g_{01} (se)	g_{10} (se)	s^2	t_{00}		
Unconditional	-1.91 (.08)	N/A	N/A	1.31392	(Base)	0.42549	(Base)
Means as Outcomes	-1.91 (.08)	-.004(.002)	N/A	1.31658	-0.002	0.38258	0.10085
1-Way ANCOVA	-1.9 (.08)	N/A	-.004 (.001)	1.31575	-0.0014	0.38648	0.09168
GroupMean Center Model	-1.9 (.08)	N/A	-.002 (.003)	1.316	-0.0016	0.42501	0.00113
Traditional Compositional Effects model	-1.91 (.08)	-.004 (.001)	-.002 (.003)	1.31866	-0.0036	0.38211	0.10195

Appendix C
Model-Building Details

Model Building Deviance Testing Details

			Deviance	df	p-value
Level 1 Model Building					
<u>Model</u>	<u>Level 1 Variables</u>	<u>Comments</u>			
Model 1	CLASSIZ & SUPPORT (group centered)	all slopes random at Level 2	1584.62	10	
Model 2	CLASSIZ & SUPPORT (group centered)	slope for SUPPORT random (μ_{2j}), CLASSSSIZ fixed (μ_{1j})	1588.2	5	0.611
Level 2 Model Building					
<u>Model</u>	<u>Level 1 Variables</u>	<u>Comments</u>			
Model 3	CLASSIZ & SUPPORT (group centered)	CLASSSSIZ_Mean & SUPPORT_Mean (grand centered for β_{0j} and β_{2j})	1575.63	11	
Model 4	CLASSIZ & SUPPORT (group centered)	Remove CLASSSSIZ_Mean & SUPPORT_Mean from β_{2j}	1575.75	9	0.9404
Adding Covariates					
<u>Model</u>	<u>Level 1 Variables</u>	<u>Comments</u>			
Model 5	CLASSIZ & SUPPORT (group centered)	Add SECTIONS to β_{0j} grand mean centered	1566.69	10	0.0026

Appendix D

Parameter Estimates & Model Equations

Final Estimation of Fixed Effects:

Fixed Effect	Coefficient	Standard Error	<i>t</i> -ratio	Approx. <i>df</i>	<i>p</i> -value
For INTRCPT1, β_0					
INTRCPT2, γ_{00}	-1.958325	0.072474	-27.021	154	<0.001
SECTIONS, γ_{01}	0.025163	0.007571	3.324	154	0.001
CLASSSIZ, γ_{02}	-0.00388	0.001682	-2.307	154	0.022
SUPPORT, γ_{03}	0.232043	0.116565	1.991	154	0.048
For CLASSSIZ slope, β_1					
INTRCPT2, γ_{10}	-0.001625	0.003388	-0.48	163	0.632
For SUPPORT slope, β_2					
INTRCPT2, γ_{20}	0.083439	0.093472	0.893	157	0.373

Final Estimation of Variance Components:

Random Effect	Standard Deviation	Variance Component	<i>df</i>	χ^2	<i>p</i> -value
INTRCPT1, μ_0	0.51057	0.26068	87	178.0211	<0.001
SUPPORT slope, μ_2	0.34036	0.11585	90	108.5163	0.089
level-1, <i>r</i>	1.13426	1.28655			

$$\begin{aligned} \widehat{CTP} &= \widehat{\gamma}_{00} + \widehat{\gamma}_{01} * (\overline{SECTIONS_j} - \overline{SECTIONS}) + \widehat{\gamma}_{02} * (\overline{meanCLASSSIZ_j} - \overline{meanCLASSSIZ}) + \widehat{\gamma}_{03} * \\ &(\overline{meanSUPPORT_j} - \overline{meanSUPPORT}) + \widehat{\gamma}_{10} * (\overline{CLASSIZ_{ij}} - \overline{CLASSSIZ_{.j}}) + \widehat{\gamma}_{20} * (\overline{SUPPORT_{ij}} - \overline{SUPPORT_{.j}}) \\ \widehat{CTP} &= -1.958 + .025 * (\overline{SECTIONS_j} - \overline{SECTIONS}) - .00388 * (\overline{meanCLASSSIZ_j} - \overline{meanCLASSSIZ}) + \\ &.232 * (\overline{meanSUPPORT_j} - \overline{meanSUPPORT}) - .00163 * (\overline{CLASSIZ_{ij}} - \overline{CLASSSIZ_{.j}}) + .083 * (\overline{SUPPORT_{ij}} - \overline{SUPPORT_{.j}}) \end{aligned}$$

For an instructor teaching at a school with the typical number of sections, the typical average class size, and the typical mean departmental support, this equation reduces to:

$$\begin{aligned} \widehat{CTP} &= \widehat{\gamma}_{00} + \widehat{\gamma}_{10} * (\overline{CLASSIZ_{ij}} - \overline{CLASSSIZ_{.j}}) + \widehat{\gamma}_{20} * (\overline{SUPPORT_{ij}} - \overline{SUPPORT_{.j}}) \\ \widehat{CTP} &= -1.958 - .00163 * (\overline{CLASSIZ_{ij}} - \overline{CLASSSIZ_{.j}}) + .0834 * (\overline{SUPPORT_{ij}} - \overline{SUPPORT_{.j}}) \end{aligned}$$

A Multi-Faceted and Practical Analysis of Online Courses at UHCL

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Online courses are ubiquitous, but the research findings on student learning outcomes and opinions of these courses are mixed. Therefore, this research comprehensively investigated online courses at UHCL by analyzing them from the perspective of both user groups, students who consume the courses and faculty who deliver the courses. For this study, the examination was performed through questionnaires and archival data to achieve as complete a picture of online courses at the University of Houston-Clear Lake as possible. Face-to-face courses tended to be favored in terms of both student performance measures and faculty and student opinions. However, the advantages of online courses resulted in equality in terms of student preference to take and faculty effort to teach these courses. Suggestions for supporting online students are discussed.

Online education offerings continue to expand, with nearly a third of students reporting having taken at least one online course (Online Learning Consortium, 2016). The percentage of students taking at least one online course has continued to increase, even as overall enrollments have begun to decline (Allen & Seaman, 2017). However, despite the popularity of online courses, opinions of them remain mixed. The majority of academic leaders believe that learning outcomes are equivalent or superior to face-to-face courses (Online Learning Consortium, 2016), while only about one-fourth of faculty report feeling the same way (Straumsheim, Jaschik & Lederman, 2015), perhaps stemming from a generational divide (Correa, 2010). Faculty tentativeness “is recognized as the most significant barrier to the growth of online education” (Stewart & Crone, 2016, p. 31).

Students tend to report that they take online courses because they are self-paced, flexible, and convenient (Mahoney, 2009), and satisfaction with online courses is often equal to satisfaction with face-to-face courses (Driscoll, Jicha, Hunt, Tichavsky, & Thompson, 2012). However, student expectations are often unrealistic (Bork & Rucks-Ahidiana, 2013). Some students report enrolling in online courses because they believe the course will be less difficult (Brown, 2012). Additionally, students are often unprepared for the technological skills (Bork & Rucks-Ahidiana, 2013; Correa, 2010) and level of self-directed learning required (Mahoney, 2009), leading them to become overwhelmed, frustrated, and discouraged. Bork and Rucks-Ahidiana (2013) state, “[T]he asynchronous nature of the interaction and pedagogy in online courses exacerbates the challenge of identifying and resolving misaligned expectations” (p. 1). Additionally, students who enroll in online courses are more likely to be in at-risk groups, such as employed students, non-traditional students, and part-time students (Aud et al., 2011). Indeed, students appear to withdraw from online courses much more frequently (Brown, 2012), often

citing time management as the main reason (Varner, 2013). A recent survey of institutions offering online programs found that the focus of most online programs is on enrollment growth and revenue, leading Legon and Garrett (2017) to suggest that institutions need to emphasize “strategies that increase student completion” (p. 24). It is crucial to examine performance in online courses to ensure that they are not increasing access without also advancing progress towards a degree.

Data on the learning experience of online courses is varied. A direct comparison study of online and face-to-face sociology classes found a performance difference, perhaps related to course type or structure, but likely resulting from a selection effect given that student GPA explained more of the variance than course type (Driscoll et al., 2012). Other direct comparisons have found no difference, including a study in which students willing to take an online course were randomly assigned to online or face-to-face for an Introduction to Computer Science course (Olson, 2002). However, those who wanted a face-to-face course only, which was a much larger group, performed better on weekly quizzes. Therefore, some of the difference in performance may result from self-selection into online courses and may not be a product of the courses themselves. Additionally, the course type may impact the learning experience, with some courses being easier to adapt to the online format than others are. Bennet and Green (2001) state that student learning outcomes should be examined before a new course type is offered online. However, many course types are offered online without the supporting research.

Given the increasing reliance on online courses, it is crucial to examine them from multiple angles. For this study, the examination was performed through surveys and archival data to achieve as complete a picture of online courses at the University of Houston-Clear Lake (UHCL) as possible. UHCL was exclusively an upper-level and graduate university before admitting its first freshman class in the fall of

Table 1
Percentage of Students Reporting That Their Online Courses had Each Required Quality Assurance Element

	Yes		No	
Syllabus posted	245	99.2%	2	0.8%
Course schedule posted	240	98.0%	5	2.0%
Helpful links to outside resources	195	79.3%	51	20.7%
Was course information easy to find	209	85.3%	36	14.7%
Did assignments have written learning objectives?	204	82.9%	42	17.1%
Encouraged to complete course evaluation	182	74.3%	63	25.7%

2014 (www.uhcl.edu). The student population does not match the anecdotal typical college population, with many students falling into the at-risk groups. It is a commuter campus, with 43.3% of students living over 10 miles from campus. Additionally, the student population is older, with an average student age of 29 years and with 95.0% of students age 21 or older in 2016. Therefore, students are more likely to have jobs and families, making online courses appealing for their flexibility and convenience.

UHCL has been emphasizing online courses to meet the needs of students and currently has four bachelor's and nine master's degrees completely online. Although the majority of courses at UHCL are still face-to-face (Fall 2016: 74.6%, 1159 of 1553; Spring 2017: 69.4%, 1145 of 1651), a significant amount of courses are offered as hybrids (Fall 2016: 13.1%, Spring 2017: 12.9%) or online only (Fall 2016: 12.9%, Spring 2017: 17.7%). Additionally, these numbers represent an increase over a decade ago when well over 80% of courses were face-to-face (Fall 2006: 87.1%, 1192 of 1368; Spring 2007: 84.4%, 1198 of 1420).

The current research set out to examine the quality of the course structure, student outcomes, and opinions of the both the faculty that teach the courses and the students that take them. This comprehensive analysis aims to explore online courses from the perspective of both users. Even though students are the main consumers of the online courses, it is also important to determine how accepting faculty are of online courses with their ever increasing presence. This project focused on examining opinions and implementation of online courses at UHCL.

Study 1: Quality Assurance

Methods

Participants

Participants consisted of 247 students in online classes during Fall 2015 at UHCL. Most (n=143, 58%) were undergraduates. All had taken at least one online

course, with the vast majority (71.3%) reporting having taken three or more classes. The students represented a variety of majors.

Questionnaire

The questionnaire consisted of demographic questions addressing the degree program, progress, and number of online courses taken. Additionally, there were 25 questions to assess if the course had the required elements and other aspects of the course, such as main form of communication with instructor or mode of evaluation. These questions were based on the Quality Assurance checklist used by UHCL to assess online courses before their first offerings (available at <https://www.uhcl.edu/computing/course-development/quality-assurance>). The checklist is based on the Texas Higher Education Coordination Board and Southern Association of Colleges and Schools requirements for online courses.

Procedure

The questionnaire was administered in the Fall semester of 2015. All students in online courses in Fall 2015 (n=1,974, 12.5% response rate) were recruited by email. The survey was conducted online using Qualtrics.

Results

The majority (n=155) reported that they were satisfied with the online course offerings in their program. Additionally, the majority of required elements were reported as present in their online courses (see Table 1). The majority of online courses (65.3% of 245 responses) were not based solely on test and quiz scores, with students reporting that papers, discussions, and other assignments contributing to the grade in many classes. Of the 241 students who answered about communication with their instructor, the main methods of communication were email (98.8%) and discussion board (60.2%) with face to face meetings (13.7%), phone appointments (10.4%) and chat (6.6%) used somewhat infrequently.

Study 2: Online versus face-to-face course metrics

Methods

Procedure

All courses that were offered in both online and face-to-face instruction modes from Fall 2014 through Summer 2016 were included in an analysis of withdrawal rates and overall grade point average (GPA).

Results

A total of 180 different courses were offered in both formats during the time frame analyzed. The online versions included 762 sections with 18,811 in a duplicated headcount. The face-to-face versions included 928 sections with a 20,282 duplicated headcount. In a comparison across instruction formats, GPA was higher in face-to-face courses ($M=3.21$) than online ($M=3.13$, $t_{1688}=3.03$, $p=.002$); whereas the percentage of students dropping the course was higher in online ($M=8.98\%$) than face-to-face ($M=6.14\%$, $t_{1629}=-4.65$, $p<.0001$). A paired t-test examining mean GPA and percentage drop for individual courses between instruction modes found the same pattern (pairs=180; GPA: face-to-face $M=3.35$, online $M=3.21$, $t_{179}=5.44$, $p<.001$; percentage drop: face-to-face $M=5.34\%$, online $M=7.92\%$, $t_{179}=-3.16$, $p=.002$).

Study 3: Student Opinion of Online Courses from Graduating Student Survey

Methods

Participants

Participants included 5,922 UHCL students who completed the graduating student survey between Spring 2008 and Spring 2016. The survey included a question about whether the student enrolled in online courses, as well as one assessing online course satisfaction.

Procedure

All students who submitted a degree petition were recruited to fill out the graduating student survey every semester. The survey and data are maintained by the UHCL Office of Institutional Effectiveness. Relevant data were pulled from the archives.

Results

The vast majority of participants took online courses (78.6%), with a minimum of 68.1% in the Spring of 2008 and a maximum of 84.7% in the Spring

of 2016. The majority of students rated the online course experience as excellent or good (81.4% of 4813 who rated) with a mean rating of 3.1 on a 4 point scale (range=3.01 to 3.22).

Study 4: Student Opinion of Online Courses from the Focused Survey

Methods

Participants

Participants included 462 UHCL students. Of these, 85 had not taken an online course and provided limited data. The other 377 students had taken at least one online course and completed at least 50% of the survey for inclusion in the sample. Most participants were younger than 35 (67.1%). Most participants were female (74.5%, 281 of 373), which is representative of the student population (consistently above 60% female). Additionally, most participants were full-time students (63.8%, 240 of 376). Although the majority of participants were White (52.3%), there was some diversity with representation of Hispanic or Latino (21.8%), Asian (13.8%), and Black (8.8%) students. These numbers also reflect the student population, which is mostly White (~40%), followed by Hispanic or Latino (~25%), Asian (~7%) and Black (~9%). There was also representation of Bachelor's (60.0%, 225 of 375), Master's (37.3%, 140) and even Doctoral (2.7%, 10) students. Participants reported pursuing many different majors with the most common being Psychology (49), Early Childhood Generalist (27), General Business (20), Criminology (18), and Computer Science (16).

Procedure

The survey was administered through Qualtrics from February through April 2017. Participants were recruited by an email sent to the list of current and recently graduated students maintained by University Computing and Telecommunications Department. Given the nature of this email list, a true response rate cannot be calculated. Once participants agreed to the informed consent, they answered demographic questions. Participants who answered no questions or only demographic questions were removed from the study. After the demographic questions, participants were asked how many fully online courses they have taken. If they answered none, they were asked to indicate the main reason they have chosen not to take online courses and directed to the end of the survey. If they reported that they have taken online courses, they were asked the additional questions about online courses. Students who completed the survey were eligible to be entered in a drawing for one of five gift cards valued at \$10.

Table 2
Comparison of Student Ratings of Online Courses on Several Elements by College

	College of Business			
	N	Mean	SD	Median
Online classes: more effort to learn the material	80	4.33	0.95	5.00
Online classes: more effort to earn a good grade	80	4.56	0.82	5.00
Overall, I am satisfied with my online classes	80	3.73	1.25	4.00
I prefer to take face-to-face classes	80	3.45	1.37	4.00
I prefer to take online classes	80	3.43	1.43	4.00
College of Education				
Online classes: more effort to learn the material	61	3.67	1.86	4.00
Online classes: more effort to earn a good grade	61	4.33	1.01	5.00
Overall, I am satisfied with my online classes	61	3.85	1.26	4.00
I prefer to take face-to-face classes	61	3.75	1.19	4.00
I prefer to take online classes	61	3.38	1.58	4.00
College of Human Sci & Humanities				
Online classes: more effort to learn the material	137	4.02	1.12	4.00
Online classes: more effort to earn a good grade	137	4.28	1.08	5.00
Overall, I am satisfied with my online classes	137	4.07	1.15	4.00
I prefer to take face-to-face classes	137	3.66	1.1	4.00
I prefer to take online classes	137	3.59	1.42	4.00
College of Science & Engineering				
Online classes: more effort to learn the material	86	3.35	2.29	3.00
Online classes: more effort to earn a good grade	86	3.76	2.25	4.00
Overall, I am satisfied with my online classes	86	3.77	1.33	4.00
I prefer to take face-to-face classes	86	3.9	0.97	4.00
I prefer to take online classes	86	3.49	1.36	4.00
Kruskall-Wallace				
	H	df	p	
Online classes: more effort to learn the material	27.586	3	<.001	
Online classes: more effort to earn a good grade	35.947	3	<.001	
Overall, I am satisfied with my online classes	6.374	3	0.095	
I prefer to take face-to-face classes	3.883	3	0.274	
I prefer to take online classes	1.793	3	0.617	

Each question is rated on a five-point Likert scale, with higher means indicating higher agreement. Means, medians, and standard deviations are given for each pair. Additionally, the Kruskal-Wallace test value and significance are reported.

Results

For the students who had not taken an online course, the only data collected were demographics and the main reason as to why they had not enrolled in an online course. Of the 85 students who had not taken an online course, the majority were in College of Science and Engineering (CSE: 49.4%), followed by College of Human Sciences and Humanities (HSH: 22.4%), College of Business (BUS: 21.2%), and College of Education (COE: 7.1%). Four individuals failed to identify a main reason they had not taken an online course. The 81 participants who did indicate a reason

reported the main ones being a lack of offerings (64.2%) followed by quality of online courses (17.3%).

For students who had taken at least one online course, most who reported a college were from HSH (38.2%, 144 of 376), followed by CSE (23.3%), BUS (21.8%) and COE (16.4%). Most participants were frequent Internet users, with 87.0% using the Internet six or more times per day. Most (67.9%) had taken less than half of their courses online. However, there was diversity in number of courses taken online, with the most frequently reported number being 2-4 (36.1%), followed by 5-9 (26.5%), 10+ (20.2%), and 1 (17.2%). The main reasons students reported taking online courses were convenience (48.3%)

and time requirements (27.9%). Additionally, many students who chose the other category (18.3%) listed convenience in the text box.

Students did not tend to believe that online courses were easier than face-to-face courses (71.8%), with most split between slight disagreement (29.3%, 110 of 376), neither agreement nor disagreement (23.9%), and strong disagreement (18.6%). There were not differences in satisfaction or preference by college, but there were differences in opinions on level of effort, with those in BUS and HSH reporting that online courses required more

effort than COE and CSE (see Table 2). There were also differences by number of courses taken, with reported difficulty of, preference for, and satisfaction with online courses increasing with number of courses taken (see Table 3).

Students tended to believe that online courses could achieve student learning outcomes at least equivalent to face-to-face courses (see Table 4) with the mean percentage of agreement (strongly or somewhat) across course types being 55.3% (SD=7.13) and a mean value across course types of 3.53 (SD=1.023) on the five-point Likert scale.

Table 3
Comparison of Student Ratings of Online Courses on Several Elements by Number of Online Courses Taken

	1 Online Course			
	N	Mean	SD	Median
Online classes: more effort to learn the material	64	3.47	1.18	4.00
Online classes: more effort to earn a good grade	64	3.81	1.18	4.00
Overall, I am satisfied with my online classes	64	3.59	1.28	4.00
I prefer to take face-to-face classes	64	4.17	0.81	4.00
I prefer to take online classes	64	3.23	1.40	3.00
2-4 Online Courses				
Online classes: more effort to learn the material	127	3.83	1.2	4.00
Online classes: more effort to earn a good grade	127	4.28	1.07	5.00
Overall, I am satisfied with my online classes	127	3.61	1.3	4.00
I prefer to take face-to-face classes	127	3.95	1.05	4.00
I prefer to take online classes	127	3.09	1.54	3.00
5-9 Online Courses				
Online classes: more effort to learn the material	100	4.06	1.135	4.00
Online classes: more effort to earn a good grade	100	4.38	0.95	5.00
Overall, I am satisfied with my online classes	100	4.23	1.06	5.00
I prefer to take face-to-face classes	100	3.54	1.13	4.00
I prefer to take online classes	100	3.76	1.26	4.00
10+ Online Courses				
Online classes: more effort to learn the material	74	4.04	1.21	4.00
Online classes: more effort to earn a good grade	74	4.3	1.15	5.00
Overall, I am satisfied with my online classes	74	4.16	1.17	5.00
I prefer to take face-to-face classes	74	2.97	1.29	3.00
I prefer to take online classes	74	4.08	1.23	5.00
Distribution				
	H	df	p	
Online classes: more effort to learn the material	0.167	369	0.001	
Online classes: more effort to earn a good grade	0.187	369	<.001	
Overall, I am satisfied with my online classes	0.22	368	<.001	
I prefer to take face-to-face classes	-0.327	368	<.001	
I prefer to take online classes	0.247	368	<.001	

Each question is rated on a five-point Likert scale, with higher means indicating higher agreement. Means, medians, and standard deviations are given for each pair. Additionally, the Spearman rho test value and significance are reported.

Table 4
Percentage of Student Responses for Each Answer Choice by Course Types

	General Education	Upper level undergraduate	Graduate
<u>In general</u>			
strongly disagree	5.82	6.94	8.67
somewhat disagree	11.08	10.83	10.03
neither agree nor disagree	18.84	20.56	31.98
somewhat agree	32.96	34.17	26.29
strongly agree	31.30	27.50	23.04
<u>At UHCL</u>			
strongly disagree	5.34	6.96	9.04
somewhat disagree	9.55	11.70	12.05
neither agree nor disagree	25.00	22.56	33.42
somewhat agree	30.34	31.48	21.37
strongly agree	29.78	27.30	24.11
<u>In my department or discipline</u>			
strongly disagree	7.02	9.52	11.78
somewhat disagree	11.52	13.73	11.78
neither agree nor disagree	23.88	21.01	31.78
somewhat agree	30.90	30.81	20.55
strongly agree	26.69	24.93	24.11

The question addressed whether online courses can achieve student learning outcomes that are at least equivalent to those of face-to-face courses.

There were no differences by college ($H_3=3.877$, $p=.275$) or age category ($H_4=3.792$, $p=.435$) for opinions of student learning outcomes. However, there was a difference based on numbers of online courses taken ($H_3=19.441$, $p<.001$), with those having taken 10+ courses having higher agreement ($Mdn=4.00$, $M=3.98$, $SD=0.875$, $N=76$) than those having taken 1 (Mdn=3.44, $M=3.41$, $SD=1.003$, $N=65$; Dunn $p=.018$), 2-4 (Mdn=3.44, $M=3.34$, $SD=1.077$, $N=136$; Dunn $p=.012$), or 5-9 (Mdn=3.67, $M=3.55$, $SD=0.973$, $N=100$; Dunn $p=.019$). Students reported slightly preferring online courses for general education ($M=2.87$, $SD=1.541$) and slightly preferring face-to-face courses for upper-level undergraduate ($M=3.22$, $SD=1.451$) and graduate courses ($M=3.30$, $SD=1.435$).

Overall, students had more favorable opinions of face-to-face classes than online classes. Face-to-face courses were rated as better in interaction level with instructors, availability of instructors, delivery of material, ability to participate and contribute to class, assessment difficulty, ease of cheating, instructor preparation, instructor effort to teach, student effort to learn the material, student effort to earn a good grade, ability of instructors to reach at-risk students, ability of instructors to reach exceptional students, preparation for additional classes in the fields, and overall satisfaction (see Table 5). However, the two formats were rated as equivalent in terms of preference to take.

Study 5: Faculty Opinions of Online Courses

Method

Participants

Participants included 87 Instructors at UHCL. Participants were almost equally split between male (47.1%) and females (49.4%) and diverse across ages with most (79.3%) between 35 and 65. They were predominately White (75.9%). Most (89.6%) had a PhD or similar (EdD, JD). Respondents included tenured (52.9%), tenure track (25.3%), and non-tenure track (18.4%) instructors, but most were full-time (94.3%). Most had been teaching more than 10 years (62.1%), followed by 5-10 years (18.4%), 3-5 years (8.0%), 6 months-3 years (5.7%), and less than 6 months (1.1%). Specialties were also diverse, with each of UHCL's four colleges represented: College of Business (25.3%), College of Education (13.8%), College of Human Science and Humanities (36.8%), and College of Science and Engineering (19.5%). Just under a quarter (24.1%) had taken an online course as a student for credit.

Questionnaire

The questionnaire consisted of demographic questions, questions about their online teaching

Table 5
Comparison of Student Ratings of Online and Face-To-Face Courses on Several Elements

	N	Online			Face-to-face			Wilcoxon signed rank		
		Mean	SD	Median	Mean	SD	Median	Z	df	p
Interaction level satisfactory	373	3.57	1.267	4.00	4.36	0.862	5.00	-8.846	372	<.001
Instructors are available	373	3.86	1.182	4.00	4.34	0.847	5.00	-6.278	372	<.001
Instructors able to deliver material	372	4.04	1.132	4.00	4.46	0.792	5.00	-5.934	371	<.001
Able to fully participate and contribute to class	371	4.04	1.132	4.00	4.44	0.824	5.00	-4.601	370	<.001
Assessments are of appropriate difficulty	370	3.97	1.180	4.00	4.24	0.944	4.00	-3.861	369	<.001
Easy for students to cheat	368	2.76	1.294	3.00	2.20	1.096	2.00	-6.466	367	<.001
Require more effort for instructors to prepare	369	3.16	1.183	3.00	3.54	0.980	4.00	-4.339	368	<.001
Require more effort for instructors to teach	367	2.74	1.173	3.00	3.73	1.015	4.00	-9.574	366	<.001
More effort for students to learn material	367	4.21	1.103	5.00	3.21	1.044	3.00	-10.613	366	<.001
More effort for students to earn a good grade	367	3.87	1.194	4.00	3.46	0.996	4.00	-5.176	366	<.001
Allow instructors to reach at-risk students	368	3.10	1.171	3.00	3.62	0.911	4.00	-5.809	367	<.001
Allow instructors to reach exceptional students	366	3.31	1.123	3.00	3.77	0.904	4.00	-6.460	365	<.001
Prepare students for additional classes in that field	365	3.72	1.202	4.00	4.19	0.865	4.00	-6.726	364	<.001
Overall, satisfied with my classes	366	3.90	1.236	4.00	4.25	0.847	4.00	-4.260	365	<.001
Prefer to take	368	3.50	1.431	4.00	3.68	1.165	4.00	-1.547	367	<.001

Each question is rated on a five-point Likert scale, with higher means indicating higher agreement. Means, medians, and standard deviations are given for each pair. Additionally, the Wilcoxon signed rank test value and significance are reported.

experience, questions about their opinions of online versus face-to-face courses, and questions about their opinions on the use of technology in online courses. All opinion questions used a five-point Likert scale.

Procedure

A recruitment email was sent to 339 Instructors in the faculty email list, and the response rate was 26%. The survey was administered through Qualtrics in November through December 2016. Once participants agreed to the informed consent, they answered demographic questions. Participants who answered no questions or only demographic questions were removed from the study. After the demographic questions, participants were asked how frequently they teach online. If they answered never, they were asked to indicate the main reason they have chosen not to teach online and directed to the end of the survey. If they reported that they do teach online, they were asked the additional questions about online courses.

Results

One-third of participants (n=29) had never taught online, with the main reason reported being quality of online courses (55.2%). Several reported other reasons, including technology issues, the effort, lack of opportunity, and lack of a fit for their department or the courses they teach. For the 56 who reported teaching online, most teach every semester including summers (48.2%), followed by occasionally (21.4%), nearly every semester excluding summer (16.1%), and about once a year (14.3%). The types of courses include undergraduate only (18 out of 52, 34.6%), graduate only (11.5%), and both (53.8%). The majority (56.4%) reported feeling very or extremely prepared to teach their first online course; however, extensive training was reported by only 14 participants, whereas 16 reported no training and 19 reported receiving only Blackboard (or equivalent) platform training.

Faculty tended to believe that online courses could achieve student learning outcomes at least equivalent to face-to-face courses (see Table 6) with the mean

Table 6
Percentage of Faculty Responses for Each Answer Choice by Course Types

	General Education	Upper level undergraduate	Graduate
<u>In general</u>			
strongly disagree	7.69	9.62	9.43
somewhat disagree	26.92	19.23	18.87
neither agree nor disagree	9.62	5.77	11.32
somewhat agree	38.46	38.46	33.96
strongly agree	17.31	26.92	26.42
<u>At UHCL</u>			
strongly disagree	7.84	11.76	13.73
somewhat disagree	25.49	17.65	19.61
neither agree nor disagree	13.73	5.88	9.80
somewhat agree	35.29	35.29	27.45
strongly agree	17.65	29.41	29.41
<u>In my department or discipline</u>			
strongly disagree	14.00	7.84	11.76
somewhat disagree	22.00	19.61	19.61
neither agree nor disagree	14.00	5.88	7.84
somewhat agree	34.00	37.25	29.41
strongly agree	16.00	29.41	31.37

The question addressed whether online courses can achieve student learning outcomes that are at least equivalent to those of face-to-face courses.

Table 7
Comparison of Faculty Ratings of Online and Face-To-Face Courses on Several Elements

	N	Online			Face-to-face			Wilcoxon signed rank		
		Mean	SD	Median	Mean	SD	Median	Z	df	p
Interaction level	50	3.26	1.322	4.00	4.52	0.762	5.00	-5.021	49	<.001
satisfactory										
Can be available	50	4.40	1.107	5.00	4.78	0.507	5.00	-2.830	49	0.017
Able to deliver material	49	4.10	1.177	5.00	4.90	0.306	5.00	-4.077	48	<.001
Assessments are of	49	4.41	1.019	5.00	4.82	0.391	5.00	-3.079	48	0.002
appropriate difficulty										
Easy for students to cheat	48	3.60	1.106	4.00	2.54	0.988	2.00	-4.169	47	<.001
Require more effort to	47	4.26	0.871	4.00	2.74	0.966	3.00	-4.715	46	<.001
prepare										
Require more effort to	47	3.55	1.265	4.00	3.36	1.131	3.50	-0.708	46	0.479
teach										
More effort for students to	46	4.15	0.965	4.00	2.83	0.851	3.00	-4.493	45	<.001
learn material										
More effort for students to	48	3.65	1.120	4.00	2.90	0.905	3.00	-3.086	47	0.002
earn a good grade										
Allow instructors to reach	45	2.67	1.225	2.00	3.91	0.848	4.00	-4.486	44	<.001
at-risk students										
Allow instructors to reach	45	3.27	1.136	3.00	4.11	0.910	4.00	-3.640	44	<.001
exceptional students										
Prepare students for	46	3.33	1.076	4.00	4.15	0.788	4.00	-3.878	45	<.001
additional classes in that										
field										
Overall, satisfied with my	44	3.45	1.210	5.00	4.55	0.627	4.00	-4.642	43	<.001
classes										
Prefer to teach	47	2.85	1.142	3.00	3.57	0.994	3.50	-2.406	46	0.016

Each question is rated on a five-point Likert scale, with higher means indicating higher agreement. Means and standard deviations are given for each pair. Additionally, the paired t-test value and significance are reported.

percentage of agreement (strongly or somewhat) across course types being 59.3% (SD=5.80) and a mean value across course types of 3.38 (SD=1.189) on the five-point Likert scale. There were differences by gender with women (Mdn=4.00, M=3.76, SD=.995, N=32) more likely to agree that online courses are equivalent than men (Mdn=2.67, M=2.89, SD=1.236, N=18; $H_1=9.974$, $p=.019$). There were no differences by college ($H_3=6.729$, $p=.081$), age category ($H_4=4.323$, $p=.364$), tenure status ($H_2=3.27$, $p=.195$), previous experience as an online student ($H_2=4.944$, $p=.084$), or frequency of teaching online ($H_4=3.537$, $p=.472$). Faculty reported preferring face-to-face courses for general education (M=3.94, SD=1.019), upper-level undergraduate courses (M=3.96, SD=.932), and graduate courses (M=3.70, SD=1.196).

Overall, faculty had more favorable opinions of face-to-face classes than online classes. Face-to-face courses were rated as better in interaction level, availability, delivery of material, assessment difficulty, ease of cheating, preparation effort, student effort to learn the material, student effort to earn a good grade, ability to reach at-risk students, ability to reach exceptional students, preparation for additional classes in the field, overall satisfaction, and preference of teaching (see Table 7). The two formats were rated as equivalent in terms of effort to teach.

General Discussion

Overall, online courses are widespread at UHCL, increasing the availability of courses to the non-traditional student population. Most online courses appear to be taught in a way that meets the standards of UHCL, which are based on the THECB and SACS Quality Assurance requirements. Because the courses tend to follow best practices, they are able to reach the level of equivalency seen in this study. Satisfaction with online courses tends to be high. Additionally, both students and faculty tend to agree that online courses can meet the same student learning outcomes of face-to-face courses. However, with student outcomes (withdrawal rates and grades) and preference mostly favoring face-to-face courses, convenience and other demands on time may be driving their course selection. Online courses have many advantages, including time independence, location independence, and the inclusion of self-paced and active learning. However, many of those advantageous aspects can become disadvantages if students are not prepared and motivated to tackle the course demands, suggesting that students may need more support to succeed in online courses (Legon & Garrett, 2017).

Faculty tend to judge faculty-student interactions inferior in online courses. If interactions are limited, it can be more difficult to support struggling students (Straumsheim et al., 2015). For the UHCL students, it is

unclear from this analysis if the students who withdrew or performed poorly in the online courses were more frequently from at-risk groups, such as employed students, non-traditional students, and part-time students (Aud et al., 2011). However, the difference in performance between formats suggests that providing additional interventions, better promoting current resources, or requiring the use of the provided resources might improve preparation and completion of online courses (Bork & Rucks-Ahidiana, 2013). This conclusion is substantiated by the data concluding that students adjust to online courses because their satisfaction and preference for online courses increases as they take more courses. However, their reported difficulty level also increases, suggesting that although support before their first online course is most crucial, students may need support even after they have taken several online courses. UHCL has been offering Writing Center and Student Success Center tutoring online, and it began a Math Center help online in Fall 2017. Student resources prior to their first online course should be expanded and required prior to registration. This requirement would better prepare students for the computer knowledge and independent learning requirements of online classes, enhancing their chances for success because the first online course can be an overwhelming experience.

Online courses by their nature have less student-faculty interaction, an issue exacerbated by the trend of requiring much higher class sizes in online courses (Tomei, 2004). Although many successful online educators attempt interaction through email, discussion boards, and online chats, the limitations of these avenues may be heightened if the courses have large class sizes. This trend is also disturbing because larger online courses were found to be less rigorous, even in upper level courses (Stewart & Crone, 2016). The lack of interaction and lack of higher level student learning outcomes may interact with student and faculty considerations to impact the equivalency of online courses. Instructional interventions may help bridge this potential gap. Providing faculty with better learner management skills may help provide better guidance to at-risk students, thus increasing retention and student success.

Instructors may also need to be given better support for teaching online. Being a successful face-to-face instructor does not automatically transfer to an online format. Beginning to teach online requires a time investment and adjustment by the faculty and can be demanding (Stewart & Crone, 2016). A larger class size puts greater demands on the faculty member and reduces his ability to foster student engagement, which has been linked to retention in online courses (Estes, 2016). Bennet and Green (2001) point out that technology will not fix a poorly designed course and can make well-designed courses worse as instructors

are often forced to make their curriculum fit the technology available rather than choosing the technology that best delivers their course. It may be that additional technology is needed, or it could be that the technology is available, but not understood. Faculty should take better advantage of various provided pedagogical and technology trainings offered to overcome some of these deficiencies and concerns. Additionally, administrators should not force faculty to teach online if it is not a preferred format, but they should support faculty who do prefer online formats, especially if the flexibility of the courses enhances work-life balance.

Although this study is an in-depth analysis of online courses, it is limited to one university, which is a non-traditional campus. However, it is quite likely that many of these findings are at least somewhat universal, especially given the ubiquitous nature and generalized benefits of online courses. This work adds to the corpus of work on online courses by examining several aspects of online courses in one study. This work does highlight significant research needs. A deeper analysis of the students withdrawing or performing poorly to determine if they are in the at-risk groups or if other factors—such as lack of faculty presence in online courses, student work load, cost of books, work/life balance of students, affordability of classes (in terms of tuition), and accessibility—are driving the higher drop-out rates in online courses would be beneficial. This analysis would better inform future interventions to help students in online classes.

Claiming that online courses increase access to education is only a reality if students are able to complete the courses and advance in their progress towards a degree. If the drop-out rate is driven mainly by the students who cannot enroll in face-to-face courses, those students may need interventions to utilize the potential offered by online courses and provide them with genuine access. Additionally, it would be beneficial to explore ways in which students can be better supported in choosing their preferred class. UHCL already offers evening classes to allow non-traditional students to enroll, but perhaps a more systematic review of the scheduling choices would allow students who are employed or raising families to enroll in face-to-face courses if they would prefer those to online courses. Future studies should also examine student learning outcomes through a true assessment of knowledge and not just grades in a course. Although some work has been done in this area, it tends to be case studies of individual courses and often focuses only on grades from comprehensive finals or similar artifacts (see McFarland & Hamilton, 2006). More work needs to be done that assesses learning across multiple course types.

The complexity of online course development is not inherently negative, but it requires careful investigation and analysis. There are significant costs and benefits to both students and instructors found in our research and the literature (for example, Li & Irby, 2008). However, even potential difficulties, such as the challenge to convert face-to-face teaching styles to online, and thus requiring a mediation through the technology's limitations (Correa, 2010; McShane, 2004; Smith, Ferguson, & Carris, 2001), do not limit the potential impact and value of online instruction. Rather, online course offerings must be carefully designed and structured to operate in an individualized and specific niche, which will not only be affected by the student and faculty populations, but also the university's mission. Careful design and structure not only amplify the benefits of online offerings for students, such as creating enhanced scheduling flexibility, but also ameliorate the potential negatives, such as the higher course drop-out rates and lower GPAs identified in this sample. These are crucial endeavors as online courses become even more ubiquitous.

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The Continuous Case Study: Designing a Unique Assessment of Student Learning

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The case study approach is one form of problem-based learning (PBL) that results in deeper understanding of content, and it involves pushing students to think beyond the answers appropriate for class (Hmelo-Silver, 2004; Nilson, 2010, 2013). Case studies prompt students to consider the realistic implications of how they use course content in realistic scenarios that are relevant to their future practice. According to Nilson (2010), continuous case studies are one form of case-based learning that often leads to a uniquely deeper learning experience for students. This paper describes the design of a continuous case study assignment for use in the classroom—as an interactive lecture or independent assignment—and as a data collection tool. Continuous case studies are useful at both the undergraduate and graduate levels and are highly adaptable across disciplines. The focuses of this paper are a) to define and describe the continuous case study, including the evidence-driven design process, and b) to offer practical examples of how to implement the design for classroom or scholarly use.

It is not uncommon to find faculty and students who are frustrated with the lack of variety in their courses. Ambrose, Bridges, DiPietro, Lovett, and Norman (2010) advised college instructors to put time, effort, and imagination into their courses—such as developing course activities based in real-world application—to provide a more engaging learning environment. Nilson (2010) suggested that case studies provide students with a different form of coursework that often holds their attention more effectively due to its realism, relevance, and (when done well) direct connection to course objectives. When students have the opportunity to learn through case-based instructional strategies, they not only perform at a high level, but also enjoy course content (Albanese & Mitchell, 1993).

There are a number of multidisciplinary examples of how case-based instructional strategies can prove effective in helping students develop valuable skillsets. In teacher education, Koehler (2002) explicated the value of using a narrative approach to provide rich descriptions of teaching and learning in classrooms that led to enhanced applications of learned content. Chaplin (2009) showed that using case studies to assess student learning in an undergraduate biology course (vs. traditional, lecture-based methods) resulted in higher critical thinking skills and increases in academic performance. In leadership studies, Atkinson (2014) found that using case studies as teaching tools resulted in Ph.D. students' increased creativity. Raju and Sankar (1999) explained how case studies in engineering courses help connect student learning to real-world scenarios, resulting in their further development of essential skills like problem solving and critical thinking. In an intriguing and unique instance, Eggleston (2013) developed an "interactive, progressive case study" that helps instructors avoid repeated (and at times plagiarized) case responses, as well as leads students toward more comprehensive learning experience.

While existing literature is clear that instructional strategies employing realistic scenarios and real-world learning opportunities lead to positive outcomes in student learning, why are there so few evidence-based procedures for designing such activities? Most examples in existing literature are to establish how using a standard case study design in instruction is an effective departure from traditional instructional methods. So, maybe a better question is: Where is the variety within case-based instructional strategies intended to engage students in important, evidence-based learning?

It is safe to assert that case-based learning is effective, but is there a way to effectively design a more progressive format for the standard case-based assignment? Nilson (2010) explained the continuous case as presenting "an unfolding story in segments over real or condensed time" (p. 183). A continuous case study is intentionally segmented to gradually reveal a story that maintains the essential components necessary in case study design.

The purpose of this paper is to describe the process of designing a progressive version of the standard case study: that is, the continuous case study. Continuous case studies are effective as assignments, in-class activities, or as data collection tools to assess student learning. This paper begins with an evidence-based account of relevant scholarship that supports the case study as an effective instructional approach. Next, the paper presents a walkthrough of the continuous case study design process. This paper concludes with some practical examples of how this design adds wonderful and welcomed variety to the classroom that deeply engages students in learning course content.

The Scholarly Roots of Case-based Design

In designing a curriculum, instructors have a responsibility to ensure that the methods used are both relevant and effective in guiding students toward

specific learning outcomes, which often include application of course content (Nilson, 2010). Curricular alignment includes developing activities that effectively connect learning outcomes with assessment of those outcomes (Gareis & Grant, 2015). One such instructional activity involves using problem-based learning as a mechanism to encourage real world, applicable learning. Included in the broader family of problem-based learning instructional strategies are case studies, which engage students using realistic scenarios that require experiential problem solving and decision making, as well as critical thinking skills (Hmelo-Silver, 2004). Before detailing continuous case design, it is important to explore its roots in problem-based learning scholarship.

Problem-based learning. Problem-based learning (PBL) was introduced in the mid-20th century as a learning method used in medical education to enhance reasoning and problem solving (Barrows & Tamblyn, 1980). PBL has expanded across disciplines and in a tremendous variety, in most instances centered on fostering deeper learning, as well as problem-solving and reasoning skills (Barrows, 1996; Kim & Kee, 2013). PBL has also shown to reduce the time learners spend attempting to focus on the inundation of information and instead points them toward what is relevant to creating a solution (Nilson, 2013).

PBL involves meaningful, experiential, and reflective learning practices (Hmelo-Silver, 2004). By situating learning in realistic problem-solving scenarios, PBL encourages learners to be active in the learning process and to take responsibility for their own learning. Barrows and Tamblyn (1980) developed a student-led PBL process that included two critical elements: a richly designed problem for learners to consider and a student-centered problem solving procedure.

Hmelo-Silver (2004) has since added to the scholarship on PBL with two equally critical elements: an active and collaborative construction of knowledge and students taking responsibility for their own learning. It is important for students to experience self-generated inquiry as this level of responsibility contributes to a learning environment that is both experiential and learner-centered. Learning through case studies produces students who better understand the process of problem-solving in a given context. In fact, understanding the problem-solving process might be a more important learning outcome than is achieving the perfect solution to a given problem (Nilson, 2013).

Case studies. Case studies are one type of PBL that focuses on presenting students with difficult decision-making and problem-solving dilemmas that course content can help clarify how course content may translate into the real world (Stanford Center for Teaching and Learning, 1994). There are many benefits of using case studies to reinforce course content. Case studies can help

add variety to the typical course content delivery in a course (Foran, 2001). A simple change of pace can help students re-focus—or focus more deeply—on paying attention and retaining course knowledge. Case studies also offer active learning, a key component to instructional innovations in any classroom format (Herreid & Schiller, 2013). Cases can be designed as individual or group activities, which makes them highly adaptable to whatever course or course setting (e.g., in-person, online, or a hybrid), and highly customizable to nearly any discipline (Nilson, 2013).

Case studies give instructors the freedom to specify discipline-relevant content; that is, no matter the course, an instructor can write a relevant narrative to engage students in using whatever competencies are necessary to progress toward the course learning outcomes. Well-designed case studies often challenge students' preconceptions about how learning happens (Nilson, 2013) and present opportunities for students' realistic applications of content, resulting in a higher likelihood for learning transfer (Perkins & Salomon, 1992). In a more traditional, transmission-of-knowledge instructional method, students learn to wait until information is presented to them, and they then attempt to remember it when prompted to do so. Case studies push students to think about problems with unclear answers, devise their own process for learning content, and guide themselves rather than rely on instructor guidance.

The continuous case study. Nilson (2010) offered a unique approach to case-based assignment development called the continuous case study. In a continuous case, the narrative developed is still a story, but it is revealed in segments. A practical example could be comparing different children's books along the developmental timeline. In Pre-K and primary grades, a ten-page story is likely developmentally appropriate as it contains a singular theme or lesson. However, once children approach and enter adolescence, they are ready for chapter books, which provide more richness and detail, deeper storylines, and a longer narrative.

The continuous case offers a format that follows a similar pattern as do chapter-books. The segmented narrative deepens the student learning experience by presenting complexities that require advanced cognitive engagement. First, the continuous case adds increasingly realistic scenarios that often increase in depth of content. Second, the continuous case builds on the uncertainty of good case design by creating an ongoing plot ripe for cliffhangers meant to encourage a sense of urgency in students as they advance through the story. While students are aware that new information is coming or may change, they remain uncertain as to the future of the story. It is critical to develop a well-designed continuous case that meets a number of criteria. The next section of this paper details one such design process.

Designing a Continuous Case Study

While case study use is well documented in existing scholarship, and across a wide variety of disciplines, there is little to no evidence of a “how to” for designing a continuous case study. This section presents one such “how to” as a process for designing an evidence-based continuous case study.

Effective case-based design. Designing case studies to facilitate and assess student learning involves more than just writing a story. According to Nilson (2013), case studies relevant to course content can be found or adapted from other sources or created from scratch. As with any course activity, it is important for case studies to meet the established learning outcomes of the course. In designing a continuous case study, instructors can purposefully select the most appropriate course content to include. Additionally, instructors can more easily incorporate continuous case studies as a formative assessment of learning that follows the natural flow of the course. By scaffolding the course content over time (as opposed to a singular, summative case study), instructors can more accurately provide students with specific, attainable learning goals that align with the broader collection of course learning outcomes.

Nilson (2010) described four, must-have components of good case design. First, a case must be realistic. Students will be able to better identify with case content that has lifelike characters, historical context, and details relevant to their lives. Next, a case should prompt students to draw on prior knowledge, preferably using course content familiar to them. Then, a case needs enough ambiguity for students to create their own unique problem-solving processes and solutions. Without a unique process or result, students are less likely to remain attentive and engaged in the task. Finally, a case must rouse a sense of urgency in students. Although students will know that the case is merely illustrative of something real, stimulating their responses to time-sensitive and/or serious solutions is more likely to capture their attention.

Writing a case story. Atkinson (2008) described the creative writing elements that strengthen case study content, including setting, plot, characters, conflict, and a fitting conclusion. Writing an effective story takes time (Egleston, 2013; Nilson, 2010). However, by using creative writing techniques, instructors can integrate course content into the broader scope of the detail necessary for a highly realistic scenario. Additionally, and maybe most critically, time spent writing a case study with rich detail and intentional curricular alignment means that instructors are prepared to effectively assess student learning.

Selecting course content. It is important to select course content that will contribute to students’ knowledge bases from which to draw as they respond to the case

study (Nilson, 2010). A good, two-pronged approach to selecting course content is guided by two questions:

1. What course content is already segmented? In other words: Do I already have some course content that would be more effectively presented over time rather than in one chunk? For example, if one course objective in a course for pre-service teachers is to introduce sources of classroom motivation and engagement, the MUSIC Model of Academic Motivations (Jones, 2009) is already segmented into five essential elements of academic motivation.
2. What course content is most critical for my students to apply in a real-world setting? Using the same example of a course for pre-service teachers, it is absolutely essential that they understand the various standards, codes of ethics, and principles of good teaching that exist in educational practice. Realistic scenarios depicting events that require a strong knowledge base would help pre-service teachers develop a deeper understanding of, and practice applying, critical concepts before entering the field.

Regardless of the discipline, it is important to be intentional in selecting course content that ensures applicability and alignment with course learning outcomes.

Aligning with course learning outcomes. Because any case-based learning should support the intended course curriculum (Nilson, 2013), it is critical that an instructor aligns course content with relevant course learning outcomes. Often, learning outcomes are explicitly aligned with course content. However, some learning outcomes are broken down into more detailed objectives, competencies, or skillsets that create a more indirect link to the broader curriculum. In this case, an instructor should consider two factors:

1. Will using a continuous case study effectively measure key learning concepts or competencies associated with the course learning outcomes? In a graduate-level course on assessing and evaluating student learning, a measurable learning outcome might involve students understanding the difference between the terms “assessment” and “evaluation.” If so, designing a continuous case study that offers a realistic narrative depicting a teacher’s curriculum planning to highlight the succinct differences between when and why the processes associated with each term is most effective.
2. Will using a continuous case study effectively measure multiple components associated with the course learning outcomes? Remember: A

continuous case means developing a segmented story over time. If time is going to be set aside for a continuous case study, then it is more likely time well spent if the activity covers multiple course learning outcomes. In the same graduate-level course on assessing and evaluating student learning, a series of segmented scenarios could target independent concepts in individual segments—e.g., reliability and validity of assessments—alongside broader concepts that offer a multi-segment narrative, such as why teachers might need to know whether or not their course activities are both reliable and valid.

Once an instructor has determined the course content, and that the content aligns with the intended course learning outcomes, it is time to design the continuous case study.

The continuous case study design process. There are many examples of already developed case studies and PBL problems in a variety of disciplines (see Nilson, 2013, pp. 49-50). However, there are few examples of the guidelines for the case writing process. Nilson's (2010) guidelines for creating original case studies provided a "must-include" framework for case design. Atkinson (2008) offered key creative writing components for establishing compelling characters, setting, and plot that support the purpose of the case and invoke a high level of urgency in students' responses to the case. The Global Travel and Tourism Partnership (2015) recommended some of the research, analytical, and writing processes necessary to writing effective case studies. Informed by the aforementioned sources, the following are the recommended steps for designing an effective continuous case study:

1. Identify the course content to use in the case. The course content should support the course learning outcomes and a progressively revealed storyline.
2. Develop an overall story that is compelling and realistic. Ensure that the setting, characters, plot, and conflict are realistic and relevant to the learner and that the organization of the story makes sense sequentially.
3. Divide the story into the number of segments necessary to both adapt it to a continuous case format and to remain consistent with course content. Be sure to open with an introduction, which includes a clear indication of the most relevant course content, and close with a conclusion. Closure is critical to serve as a way to summarize key concepts one final time and to provide a concise summary of remaining problem(s) to solve.
4. Consider each segment of the case separately to ensure that segments function independently

as well as collectively. Each segment will directly mention critical course content, but it must first provide a sense of urgency that compels the reader to be prepared to explore new information. The "flow" of the story is critical to student engagement.

5. Formulate the problem(s). The problem(s) should be clear and concise, and they should prompt students to access their prior knowledge of course content, and possibly of their own lived experiences, as appropriate.
6. Identify the content that will be included in the case, as well as the content that will not be included in the case. Because a case should maintain some ambiguity, it is important to decide what content students need (or do not need) in order to work toward solving the case.
7. Revise the case segments (as necessary) to best represent the course content and still fit the overall storyline.
 - a. In a continuous case, each segment should be able to stand independently and fit into the overall story (see Step 3).
 - b. After writing the overall case story, it is essential to re-read the story to determine whether or not it flows well (see Step 4).
8. Design prompts that explicitly instructs students on the format and content expected in their case responses. Prompts should follow each segment of the case. A good practice for writing the prompts for each case segment is to use question-based or action-based statements.
 - a. A good question-based prompt might read: "Using (course content), how could (character or characters) respond to (clear, restating of the problem presented) most effectively?"
 - b. A good action-based prompt might read: "Create a (something to be created) that uses (course content) to respond to (clear, restating of the problem)."

In both instances, students are encouraged to engage in what Bloom's Taxonomy (revised; Anderson & Krathwohl, 2001) considers more advanced cognitive behavior. Student would be moving beyond more basic cognitive activities like remembering and understanding, and they would have to apply, analyze, evaluate, and create to best respond to the given scenario.

9. To determine some sense of the reliability of your continuous case, ask people with at least

baseline knowledge of the course content to complete all, or at least a few segments of, the case. This is particularly critical if the case responses are part of a research-driven data collection process. A good practice would be using an inter-rater comparison of at least three trusted colleagues' completed responses.

10. Facilitate (if the design is for an in-person or online, synchronous activity) or administer (if the design is for an individual or group assignment, outside of class, or as an online, asynchronous activity) the continuous case study.

While following these steps will not guarantee a successful implementation, the intentionality of the design will most certainly offer a much higher likelihood that the continuous case study itself is content-driven and effectively constructed.

Assessing student learning using a continuous case assignment. After receiving responses, use the case responses provided by students who completed the case to assess student learning. Assessment is important to understand the extent to which students have learned course content, what they are able to do with what they learned, and the cognitive processes in which they engaged during the assignment. Some principles of good learning assessment include exploring whether or not students are integrating new concepts with their prior knowledge bases, to what extent their progress is indicative of course outcomes, and, directly linked to case-based learning, how self-directed students are during the learning process.

Regardless as to the method of learning assessment, it is critical to offer students clear and direct feedback. Offering ongoing feedback is one way to increase the likelihood that student responses will be more complete and in-depth in subsequent segments (Ambrose et al, 2010). In continuous case studies, instructors must offer feedback after each segment completed. Otherwise, instructors should expect to see similar patterns in students' expressions of learning, and students will rely on a routine response format instead of treating each segment as an opportunity for a novel response.

While the design of the continuous case study is the central focus of this paper, an essential question remains. In what ways can instructors use continuous case studies to better understand student learning? The next section of this paper details three exemplars from the college classroom, including models of content application.

Exemplars of the Continuous Case Study in Practice

The following section of the paper shifts gears from an evidence-based step-by-step guide into three exemplars of continuous case studies in practice. Each exemplar is from the perspective of the instructor and

offers both observational and experiential accounts of the benefits and challenges of using continuous case studies in a classroom setting.

Exemplar 1: The continuous case as an in-class, instructor facilitated activity. Midterms offer a unique opportunity for instructors to gather information about their students' progress at or near the halfway point of a course. In an introductory course in a teacher education program at a regional, comprehensive university, students are required to learn about U.S. education through its history, philosophical underpinnings, theoretical frameworks, and effective teaching and learning practices.

To avoid what students often described as what "all the other professors do," I decided to incorporate a continuous case study as an in-class activity to better understand how my students were remembering, understanding, and applying the concepts we covered over the first half of the fall semester. As the midterm fell close to Halloween, I designed a case story using well-known monsters and stories of the macabre. I decided to present the continuous case by using a slideshow and by placing students in teams to solve problems as they arose in the case. I created a sense of urgency, not only by nature of the characters included, but also by designing an overall theme of behavioral issues throughout an imaginary school year.

I facilitated the activity as Professor Van Helsing and offered segmented scenarios about challenging parents originally from Transylvania (and who could only attend parent-teacher meetings after dark), excessively hairy students with anger issues, and an interesting little boy named Damien. I connected the segments to course outcomes focused on understanding the typical structure of school administration and classroom management techniques, as well as on applying various educational philosophies and approaches in the classroom.

Challenges of the in-class, instructor facilitated method. It took a long time to prepare for that day of class. For many years, I spent maybe two-to-three hours preparing selected-response midterms for previous courses. Designing a constructed-response mid-term activity that needed to last most, if not all of my 150 minute class was very time-consuming. Moreover, as was evidenced by what I might label students "running out of gas," my students' engagement and attention began to wane after about 90 minutes.

Benefits of the in-class, instructor facilitated method. Students loved the wordplay and creativity in the case story. It was clear that team-based problem-solving helped many of the students develop more comprehensive solutions, as well as unique methods for researching course and external content to use in those solutions. Additionally, the lighthearted tone that accompanied the midterm was, as one

student put it, “way less stressful” than the other mid-terms they were taking.

Exemplar 2: The continuous case as a progressive, out-of-class assignment. In a hybrid course (partially online and asynchronous and partially an in-person class), students need a healthy balance of self-driven work and facilitated activity. In an intermediate peer leadership course at a large research institution, students are required to learn about how to apply leadership theory in practice which, in the case of this course, involved each student having an actual peer leadership position at the institution.

To understand how students’ experiences were helping them learn about the relevant components of peer leadership from the course content, a colleague and I used the institution’s online course delivery system to design a connected series of discussion forums to serve as our continuous case study assignment. The story was directly applicable to the students as it was surrounding the fictional (but quite realistic) portrayal of a leadership team for a highly involved student organization. Each student completed the case study from the perspective of a member of the student organization’s leadership team with a variety of time-sensitive decisions to make.

Students engaged in the forums during the week of a directly connected course reading about a specific peer leadership practice. Each segment offered a unique problem carefully woven into the previous and subsequent segments. Additionally, students were required to read and respond to their peers’ forum responses to encourage interaction and debate in the virtual classroom.

Challenges of the progressive, out-of-class assignment. Using the online course delivery system was not always easy. The specific tools the system included were challenging, and we had to adapt our design to fit those tools. In addition, the peer-to-peer interaction was only somewhat successful. It was more frequent to read discussion that included comments similar to “What a great idea!” and “Your response is perfect!” than it was discussion that involved rigorous, intellectual debate.

Benefits of the progressive, out-of-class assignment. It was very easy to track the extent to which students were a) connecting and applying course content as peer leaders, and b) able to use their own peer leadership roles as exemplars in their responses. The online format offered a unique, saved collection of responses for future use in a variety of ways, as well as for easy comparison of aggregate progress. The interactive component of the discussion forums not only allowed for peer-to-peer discussion, but for instructors’ collaborative engagements with students during the problem-solving process. Instructors found the consistent engagement alongside students and

within the forums quite beneficial to their observations of students’ progressive learning.

Exemplar 3: The continuous case as a method for data collection. In the aforementioned peer leadership course (see Exemplar 2), I obtained the appropriate institutional review board approvals and participants’ consents to use students’ responses to collect data. I used DiSessa’s (1988) knowledge-in-pieces framework as the scholarly context for the study. Because the results of the study are as yet unpublished, I will offer a condensed overview of how the continuous case study assignment was designed to produce relevant data.

If properly designed, the responses to a continuous case offer a unique opportunity for data collection. Using a qualitative methodology, I connected each segment to a specific piece of course content. Each piece of course content tied to a larger conceptual framework that contributed to principles of effective leadership. I was able to view students’ responses within and across segments, and in the aggregate, to discover emergent themes, unique methods of application, and patterns of responses.

Challenges of using the continuous case as a method for data collection. While the idea of collecting data over time is beneficial in many ways, it does require an extensive amount of time, as well as multiple instances of data collection. Because the continuous case method is not well documented in existing scholarship, it is challenging to examine how valid or reliable it is. In order to ensure some sense of reliability, multiple colleagues lent their time and efforts to review the method, as well as participate in a somewhat rigorous process to train reviewers on the study’s procedure.

Benefits of using the continuous case as a method for data collection. As a unique course activity, the continuous case is also a unique format to collect and analyze data for evidence of a wide variety of types of learning, cognitive progress, curricular alignment, and lived experiences. In addition, by collecting data across time, the results were more comprehensive than a one-time study would have provided.

Conclusion

The design and use of continuous case studies offers a unique, adaptable instructional strategy to encourage and assess student learning. While a litany of examples of methodologies involving case studies is found throughout existing scholarship, the continuous case study is an emergent practice with the potential to meet the instructional needs of faculty across education levels. At the college level, continuous case studies provide faculty both instructional (in- and out-of-class) and scholarly (a method for data collection) applications.

Regardless of how they are applied, continuous case studies must at minimum follow two critical rules. First, the continuous case study must involve compelling storytelling to engage reader's interest and generate the sense of urgency that increases the likelihood of student engagement in solving the problem(s) at the center of the case. Additionally, the continuous case study should not only be entrenched in relevant course content (and be explicitly connected to learning outcomes), but also incite a progression of learner behaviors that moves from straightforward recall of information to more complex cognitive activities such as integrating seemingly disparate pieces of knowledge into self-generated, comprehensive solutions.

I encourage both practical and scholarly uses of the continuous case. Additionally, I would be pleased to collaborate on any future endeavors involving the continuous case method. The benefits of student learning and engagement that I have observed using continuous cases in my classroom far outweigh any challenges, and the continuous case study will continue to be a mainstay in my future lesson planning and research agenda.

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Partnering for a Field-Based Residency: Challenges and Possibilities

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Much effective teacher education literature supports engaging pre-service teacher candidates (PST's) in a process of learning about teaching by preparing for and rehearsing the practice with guided instruction, implementing the practice with students in a classroom, and analyzing the experience to better understand ways to improve and become more effective moving forward (McDonald, Kazemi, & Schneider Kavanagh, 2013). To achieve this, there is a need for continuing collaboration with a partner school to provide candidates with mentoring and supervision. This article presents information about the successful implementation of the first two years of a re-designed field-based residency model aimed at increasing positive student outcomes for Hispanic and other historically marginalized students in teacher education. Reflective data from faculty, teacher candidates, and school administrators provide insight into ways partnerships can be reciprocal for both candidates and mentor teachers. Data also reveal gaps in our initial planning and the need for greater understanding of the complexities of building relationships. Information includes lessons learned and insights that have informed plans for change moving forward as we have gained deeper understanding of partnering with elementary schools, as well as ways to structure teaching and professional preparation to best support PST candidates.

Best practices about teaching and learning emphasize immersion in a range of meaningful experiences rather than passively observing, listening, and repeating information that has been transmitted by an “expert”. Elementary education pre-service teacher candidates (PST's) are required to participate in field experiences to fulfill Illinois state requirements for teacher licensure. It is critical that candidates spend as much time as possible in classrooms with excellent mentor teachers actively engaged in teaching with informed supervision (Badiali & Titus, 2010). In 2014, a small group of education faculty at Dominican University began redesigning the undergraduate elementary education program. Dominican University is a co-educational, Catholic institution of higher education and research in River Forest, Illinois, located 10 miles west of downtown Chicago. The redesign of the elementary education program was inspired and grounded by high impact educational practices (Kuh, 2008) and core teaching practices (Ball & Forzani, 2011) situated in a field-based residency model. The program is anchored by four guiding principles: core teaching practices, a commitment to social justice, immersion in liberal arts and sciences foundations, and an emphasis on clinically-based experiences. It provides a move to a new teacher education paradigm requiring that all students meet a set of learning outcomes relevant to the knowledge, skills, values, and dispositions that emanate from the university vision for undergraduate learning and also align with state and national teacher licensure standards. Additionally, the newly designed program addressed the fulfillment of field hour requirements for Illinois state teacher licensure by including intentionally planned, supported time spent in elementary classrooms from the beginning of the teacher education courses. To implement this as

part of a residency model, significant course instructional time had to be spent in a partner school, immersing the candidates in scaffolded, field-based clinical practice experiences throughout the program and culminating in student teaching. This model was a monumental departure from the traditional teacher preparation courses which required numerous hours of field experiences in random, unconnected placements, and as the professors who designed and advocated for this new program, we knew there was a lot at stake in making sure it was a success. The purpose of this article is to describe our study and present information about the successful implementation of the first two years of our Dominican University School of Education field-based residency model. In addition, we also share lessons learned and plans for change, including early assumptions about partnerships, and insights that have informed our plans for moving forward.

The Issues

Several issues became apparent as we planned to implement this model. First, developing a reciprocal, sustainable partnership requires supportive policies at the university level. Second, we are a proud Hispanic-Serving institution in a suburb close to urban, multicultural communities in the city of Chicago. Although we have a sizeable Hispanic population, there is a serious equity gap in the retention and performance of Hispanic and first generation students. With over 54% Hispanic freshman and 74% of them first generation college students, we have challenges in retaining and sustaining these minority students. Third, although there is a growing regional need for Hispanic teachers, teacher education is a low-status field in universities, and many minority students do not regard the teaching profession as a viable career (White

House Hispanic Teacher Initiative, 2016). Among those students who do want to become teachers, there is a struggle to achieve passing scores on the first gateway standardized test. According to the Dominican University Office of Institutional Effectiveness (DOIE), approximately 50% of candidates enrolled in EDUC 200 Foundations of Education, the first course in the program, do not meet test metrics. Since 2013, of those who hope to major in education, a serious equity gap exists: 62% of Hispanic freshmen and 37% of white freshmen fall below this qualification. Thus, they discontinue coursework as the Test of Academic Proficiency (TAP) or the ACT Plus Writing, in lieu of the TAP, the first gateway-standardized test required for entry into a teacher preparation program by the State of Illinois, closes their access toward licensure (DOIE, 10-1-17).

Fourth, university education faculty often lack recent teaching experience and have insufficient contact with schools, too often providing academic instruction without the application of theories in active learning classroom practice (Levine, 2011). Additionally, a practical issue has been finding ways to help our students pass the state content test requirements as they juggle five or six undergraduate courses each semester while often working more than one job to pay tuition. Another issue has been convincing the Liberal Arts and Sciences faculty that students should be able to select education as a viable major rather than having to choose to complete a double major. Once this hurdle was overcome, there was the critical issue of growing the program to make it financially viable to the university. In the first year of this study, 10 students comprised a cohort group and provided data through focus group interviews and reflective comments. Because of the opportunity to complete the program with a teaching license in four years and the possibility of increasing job opportunities in the Chicago area, the teacher education program started to grow. In the second year of our study, there were 14 students, with prospective students continuing to enroll in the program. Although the numbers are not huge, there has been a steady increase in student interest, especially with assistance provided in learning about test-taking strategies support in order to meet the Illinois state requirements.

Finding a willing and collaborative partner school was another obstacle to overcome. We were fortunate that a nearby public school has a very progressive and visionary principal whose commitment to continuing teacher education and mentoring new teachers provided the connection we were seeking. The principal was enthusiastic, supportive of our program, responsive to our request for instructional space, and helpful in providing teachers to mentor our candidates. The principal also expressed interest in a reciprocal relationship that could provide opportunities for university faculty to engage in professional development for the mentor teachers and staff as a way

of becoming a collaborative community of educators. The elementary school demographic consisted of 95% African-American students and 5% Hispanic students. This seemed to be a perfect opportunity to ensure that our students would experience highly regarded literacy practices implemented in urban field experience classrooms with experienced mentor teachers. We felt confident that our redesigned residency model would provide the students with immersion in core practices, experience with current pedagogy and course content, and practical experience working with children in urban elementary classrooms in a welcoming partner school.

One last challenge was to implement a way to evaluate the PST's teaching proficiencies and dispositions in the field. The program was designed around modules that included field-based courses and strands that supported the School of Education proficiencies and dispositions woven throughout the program, culminating in an assessment that would reveal candidates' teaching abilities, as well as foundational knowledge focused on student learning. To assess this learning and preparedness for teaching, we designed an Appraisal Center to be held at the end of the junior and senior years. We believe strongly in developing a culture of shared learning with numerous opportunities for reflection and collaborative engagement to support the pre-service teachers' stances as life-long learners. The Appraisal Center provides an opportunity for students and faculty to participate in a community of practice through which the collective work and learning of the group can enhance individual learning and move forward (Wenger, 1998). This Appraisal Center is designed as a way to formatively assess students' proficiencies and dispositions at critical points throughout the program and to provide any potential interventions before candidates enter into their student teaching or clinical practice experience. It is considered an opportunity for candidates to demonstrate their learning and to receive professional feedback from the faculty evaluators, as well as responses from classmates participating in the Appraisal Center experience. All participants know they have a responsibility to provide professional feedback for each other and to use the experience to improve their craft. Results from the first year of this Appraisal Center assessment process were very positive. Comments from the teacher candidates included, "I really felt like a professional when I got such good feedback and supportive comments from peers and faculty," and, "Now I feel ready to start to student teach and take on the responsibility of teaching and managing a classroom of students" (Student reflections, 2017-18).

Theoretical Perspectives that Informed Our Work

Multiple theoretical perspectives provide insight into the development and implementation of a field-based

model. A key assumption framing this work is that learning is inherently social and that effective communication requires a dialogic relationship with a shared and evolving knowledge base grounded in effective teaching pedagogy (Barnes, 1976; Halliday, 1978; Vygotsky, 1986). This community of practice (Wenger, 1998) has been shown to be an effective way to bring about greater understanding as participants discuss, inquire, and share in the act of teaching each other and learning as a group as well as individually. The sociocultural perspective aligns with the notion of “partnership literacies” described as including “traditional ones such as reading, writing, speaking, and listening, as well as other literacies such as those necessary for the engagement and well-being of our students, citizens, and societies – that are best developed through partnerships of school and community constituents” (Zenkov et. al., 2016). An important understanding is that significant learning occurs when there is an emphasis on applying knowledge in action: in the classroom (Wells, 2001; Zeichner, 2012).

Our work is also informed by a growing body of evidence showing that effective teacher education supports candidates in a cycle of learning about teaching by preparing for and rehearsing the practice with guided instruction, implementing the practice with students in a classroom, and analyzing the experience to better understand ways to improve and become more effective moving forward (McDonald et al., 2013). To achieve this, there is a need for continuing collaboration with a partner school to provide candidates with mentoring and supervision. To ensure that the candidates develop content expertise, university faculty in Arts and Sciences and School of Education need to collaborate and provide opportunities to model, observe, and explicitly explain content in the disciplines, as well as instructional pedagogy. In addition, there should be careful oversight of the quality of all student experiences culminating in student teaching and their practicum to ensure that students are applying theories into practice as they learn to teach (Boyd, Grossman, Lankford, Loeb, & Wyckoff, 2008). The teacher education pipeline improves with strong school partnerships, supported student field experiences, culturally responsive teaching, and sustained opportunities for active learning in college classrooms. (Villegas & Lucas, 2007). In our program redesign, our aim has been to increase student outcomes and success in teacher education for all students and increase the proportion of diverse students, especially Hispanic, in teacher education. We focus on several strategies, including beneficial outreach to schools, support of our students to increase the pass rate on the state standardized gateway exam and content tests qualifiers, implementation of mentoring summer workshops, and enabling of faculty to be up to date on

culturally responsive, active learning methods. (Gandara & Maxwell-Jolly, 2019).

Assumptions, Challenges, and Small Changes

We entered into a relationship with our urban, elementary school partner knowing that we had to consider the needs and perspectives of all the stakeholders, including teacher candidates, mentor teachers, children in the partner school, administrators, and the professors. Of great importance in our partnership was our keen awareness of the ethical obligations of stewardship for the children and the school community. As the school year proceeded, we learned many lessons and began to ask new and more insightful questions. Reflecting on the different experiences and situations that occurred in our first year of the partnership, we learned that relationships have to be built on trust and that the school, teachers, faculty, and PST candidates need to prove worthy of the collaborative partnership and the right to be called “partner.” The classroom teachers needed to get to know us and understand the focus and scope of our program through the excellent participation of the PST’s in their classrooms. However, as important as this was to us, we still needed to remember that our coursework, assignments, and PST experiences were not a priority for the classroom teachers and that the needs of their children always came first!

The questions that guided our inquiry focused on ways the residency model could better prepare our PST’s for teaching in the future. We wanted to be clear about the advantages and possible problems of this residency model, and also to make changes as we moved forward that would benefit the university and students as well as the partner school. When school started in the fall of our first year, we felt ready and prepared to begin. Looking back, there were aspects of this partnership that we had not considered and assumptions that needed re-thinking to make the program more successful. Reflecting on our progress, we created a list of successes and some of the assumptions and issues that needed more careful consideration. (See Figure 1).

Analyzing these assumptions and expectations in retrospect, it is clear that more communication between the university professors and the partner school was needed. We assumed the classroom mentor teachers would be willing to provide teaching time, co-planning, collaboration, and critique for our PST’s. However, we were not clear about our students’ requirements and needed to provide more explicit direction about assignments and what PST’s were expected to do while in the classroom. Some of the classroom teachers were more willing than others to explain their practice; others felt their teaching time was too valuable to relinquish, or they had student teachers who did most of the

Figure 1

Assumptions and expectations (university, instructor, and partner school)

Assumptions/Expectations	Issues	Solutions
Co-Planning time with Mentor teacher and student	<ul style="list-style-type: none"> *Mentor teachers did not allow time for co-planning *University instructor did not specify the need for time to co-plan 	<ul style="list-style-type: none"> *Provide syllabus and university expectations
Classroom participation of university student	<ul style="list-style-type: none"> *University student was given a small group to work with in the hall *PST spent too much time observing instead of interacting with students *Teachers unwilling to give up teaching time for PST to teach a lesson 	<ul style="list-style-type: none"> *Make expectations and assignments known *Provide a checklist of PST learning needs (e.g. classroom management strategies; differentiation)
Developing a shared professional language of classroom practices	<ul style="list-style-type: none"> *Classroom teachers used unfamiliar vocabulary pertaining to assessments, student levels, materials, or pedagogy 	<ul style="list-style-type: none"> *Student keeps list of unfamiliar vocabulary and discusses them with mentor teacher during co-planning *Student is coached to ask relevant questions *Student is provided with these terms before classes begin
Student teacher already placed in mentor teacher's classroom	<ul style="list-style-type: none"> *Classroom teachers have student teachers all year long but PST's need to see mentor teachers teach 	<ul style="list-style-type: none"> *Arrange a time for PST's to be in classroom when mentor teacher is teaching. *Provide university schedule and ask that mentor teachers teach during these days/times if possible
Dedicated space for course instruction during the day	<ul style="list-style-type: none"> *Request that a room or office be available when PST's and instructor are in the school 	<ul style="list-style-type: none"> *Provide dates and a schedule of attendance for the semester *Arrange for an alternative room or space if the designated space is occupied (e.g. for meetings or testing)
Communicate school schedule and events in advance	<ul style="list-style-type: none"> *Special events, assemblies, and testing days need to be communicated to university instructor in advance 	<ul style="list-style-type: none"> *School needs to provide calendar for PST's and instructor
Assign PST's to master teachers	<ul style="list-style-type: none"> *Some PST's assigned to teachers who needed help or were new teachers rather than the "best" or experienced teachers 	<ul style="list-style-type: none"> *Discuss teacher choices with principal and agree on placement of PST's in accomplished/experienced teachers' classrooms
Integrate technology into the curriculum	<ul style="list-style-type: none"> *Technology too often used as digital worksheet *Minimal instruction of students using computer programs 	<ul style="list-style-type: none"> *Discuss ways to use technology creatively across the curriculum *Offer professional development workshops to support teachers' use of technology in classrooms

teaching, thus limiting the opportunity for PST's to learn from master teachers. A big lesson learned was that, although the principal was very eager to have us at his school, the classroom teachers needed to learn more about us, our program, and ways we could help them rather than viewing us as "experts" coming into their classrooms to "show" them new ways of teaching. We knew we had to earn their respect by first meeting them at one of their professional development days, but we did not take enough time to discuss, and really listen to, their comments about curriculum and instructional goals, as well as classroom and student issues. Since we did not know the teachers early on, it felt intrusive to engage in conversations about where and how we could support them. Instead, we looked for opportunities to seamlessly demonstrate teaching strategies while participating in the classroom without disrupting their daily routines. For example, one professor noticed two young students reading a favorite book and quietly went over to them, listened to them read, and offered to video them and share it with the class. Soon after, other students wanted to also record their reading and make videos and book trailers. With the classroom teacher's permission, the PST's were able to function as teacher assistants and help students use the available technology to practice and share their reading with others.

At the end of the first year, the cohort group of ten primarily Hispanic PST candidates (8 Hispanic, 2 Caucasian) met at the university as a focus group to discuss their residency experience. The professors were also part of the group. Everyone felt that it had been a positive experience in spite of the challenges. PST's acknowledged that the assignments were appropriate and prepared them for their future student teaching experience. They were able to implement read-alouds, student assessments, lesson planning, and individual and small group instruction. However, they were not able to teach more than one small mini-lesson, and they found it difficult to get the teacher to schedule the time for them to teach at all. Some students felt they were being used as aides to copy papers or monitor students going to and from the bathrooms. Other PST's were continually asked to work with small groups doing on-line learning out in the hall rather than directly teaching. We learned that we needed to be more explicit in informing the mentor teachers about these issues. We also realized the importance of spending designated time each week in every classroom to monitor the PST's participation and student interactions. Although some teaching tips and feedback were provided by the mentor teachers, the PST learning and success in the classroom was ultimately our responsibility as their university professors.

In reflective logs, our PST's often mentioned the benefit of learning classroom management routines, but

they did not always understand reasons for the mentor teacher's grouping, curricular decisions, or instructional strategies. Our students needed debriefing opportunities when we met for class time, and by being present in the classrooms, we professors were able to help the PST's analyze those experiences with an emphasis on the children's learning rather than only focusing on the development of a good lesson created for a course assignment. Reflective comments also related to the importance of managing time, handling constant interruptions during instruction (for specials, fire drills, announcements, etc.), and recognizing the importance of differentiated planning to meet the various students' needs in an inclusive classroom. During our class time discussions, the PST's were able to focus on ways to create classroom environments that supported engaged learning while honoring balanced literacy. In addition to teaching strategies and classroom management, the PST logs included reflective comments on ways to use technology for learning rather than as merely a classroom management tool to keep students quiet, ways to design and implement learning centers focused on content as well as reinforcing skills through practice, and the grouping of students based on interests and inquiries as well as learning needs.

By the end of the first year, our PST's had learned many reading strategies and had been able to try some of them in their classrooms. As a way of thanking the teachers and as part of the final "appraisal" of the candidates, we offered a reading strategy workshop for the school whereby the PST's would demonstrate some of what they had learned and share some new strategies with the teachers. Although the principal was appreciative and welcomed this reciprocal participation, he could not accept the offer as all the professional development (PD) time had already been planned and contract regulations prevented him from asking the teachers to stay (or come to school) after hours. Through these experiences, we all learned about the realities of public school life, and we also learned that we needed to be specific about our instructional needs and expectations right from the start. Moving forward, we are now planning ways to share new learning with the mentor teachers while working in their classrooms instead of providing collaboration as an "extra." For example, when a PST gives a lesson, he/she will intentionally include a demonstration of a reading strategy for a particular topic or subject and provide the mentor teacher with a handout about the strategy or a list of references for further information. When the PSTs research and present a "Hot Topic" for an assignment, they will provide their mentor teacher with a copy of their information and PowerPoint as a way for the mentor teacher to see what the PST is learning, to give feedback and comment on the content, and to learn a little more about a topic, if interested.

Next Steps Moving Forward

In the second year, we made a logistical decision to provide a second school experience for the PST's mid-year during the second semester. We wanted them to experience both a public school and a faith-based, private school with the same African-American demographic in a different urban neighborhood. After hearing the PSTs' concerns about driving to a neighborhood perceived to be "dangerous," we provided the Dominican University van to transport them every week. Pedagogically, the school switch made sense, but we found that we needed to provide more scaffolding, preparation, and support for the PST's to help them become more culturally responsive and understanding of the realities of life for the students in their second placement. With the full cooperation of the teachers and principal, the second placement proved to be a positive learning experience helping the PST's work side by side with master teachers devoted to ensuring the success of all their students by engaging them in meaningful, relevant learning experiences. Both of the partner schools were considered top tier with excellent student scores, and our PST's were able to experience two different school cultures, leadership styles, and learning outcomes with the same demographic, thereby honing their skills and understanding of ways to engage all students in meaningful learning, whether in public or private schools.

During this second year of our program, we were also more intentional about asking for the most experienced mentor teachers in both of our partner schools, identifying what our expectations were for the students and mentor teachers, and offering professional development meeting times for the teachers also to be attended by the PST's. One other way of forging a positive partner relationship was by inviting the principal of the first school to speak at the student teaching dinner hosted by the university, as well as by providing "mock interviews" with teacher candidates to help them prepare for future job interviews after graduation. Overall, we found the experience of partnering with two different schools to be significant for the PST's learning in ways that broadened their perspectives and introduced them to different models of education. It provided them with hands-on opportunities to participate in public and private urban schools and communities with the same demographic but very different approaches to teaching content, classroom management, and academic expectations.

This experience reminds us that, far from being "blank slates" waiting to accumulate pieces of information, learners actively construct their own knowledge in different ways depending on what they already know or understand to be true, what they have experienced, and how they perceive and interpret new information. To foster meaningful learning, students need consistent opportunities to create bridges between

their individual learning and broader professional goals. By providing these intentional, supported field-based experiences, we aim to encourage our pre-service teachers to develop a deeper sense of care and responsibility for themselves, for the students in their classrooms, and for the wider communities they serve beyond the school walls.

Conclusion

Our experience provides qualitative evidence of our successful implementation of the field-based residency model. Reflective data from faculty, teacher candidates, and school administrators provide insight into ways the partnership can be reciprocal for both candidates and mentor teachers. It also reveals gaps in our planning and the need for greater understanding of the complexities of building relationships, as well as the positive outcomes and ideas for next steps in growing the program. Through analysis and reflection, we have a deeper awareness of the expectations and needs of the candidates and the mentor teachers that will guide our continuing work in the future. Our field-based work has generated a deeper understanding of partnering with elementary schools and ways to structure teaching and professional preparation to best support our PST candidates. This is especially critical if we hope to improve outcomes for our teacher candidates, especially those who have been historically marginalized or who are first generation students. We know that successful collaboration requires the best mentor teachers and administrators and also that all participants must be willing to work together to help the next generation of teachers, as well as to make school more equitable and successful for all students at every level. As the American Association of Colleges for Teacher Education reports (AACTE, 2010), there is a great need for schools and schools of education to be thoughtfully redesigned and transformed. We think our program and all that we have learned in the first two years of our field-based residency model can provide insight into ways this can be accomplished. We hope that our experiences in implementing a field-based residency model of teacher education can inform and support other programs and PST candidates on their journeys to becoming our future teachers and educational leaders.

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Shifting Schemas: Perspectives and Practice in a Learner-Centered Course

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As a profession, we must have a shift in both perspective and practice to transform teaching at all levels. Are pre-service education classrooms preparing students to be flexible, adapt to new situations, and rely on their own expertise and understanding while seeking support when needed? Lieberman and Miller (2004) identify the following shifts for transforming the social realities of teaching: from individualism to professional community; from teaching at the center to learning at the center and from technical and managed work to inquiry and leadership (p. 11). The authors seek to critically examine the perspectives of pre-service teachers participating in a social studies methods course using constructivist practices.

Because of the demands on today's classroom teachers, pre-service teachers need to be exposed to instructional strategies that will assist them in the future (Van-Tassel-Baska & Stambaugh, 2005). Strong understanding and application of general pedagogical knowledge is the foundation upon which all other types of content and pedagogical content knowledge rest (Ball & Bass, 2000). As a profession, we must have a shift in both perspective and practice to transform teaching at all levels. Are pre-service education classrooms preparing students to be flexible, adapt to new situations, and rely on their own expertise and understanding while seeking support when needed? The following is an excerpt taken from a final reflection for a student enrolled in a learner-centered, constructivist course:

As a student I have organized my life with lists, lots and lots of lists. Lists give me a sense of control and accomplishment, but on day one of our class I was thrown for a loop. This is my sixteenth year as a student, so I've come to expect a syllabus explaining what I'm going to learn, how I'm going to learn, and what I need to do to pass the class; however, this was not the case with this class, and it made me a little anxious. With that being said I can honestly say I have learned far more in this class than I have in any other class I have taken in the past sixteen years of my schooling.

This perspective indicates a revelation in the learning process and common expectations of college students (Arum & Roksa, 2011). Based on this and similar responses, the author wanted to delve more into why the student felt she learned "far more in this class" than others taken in her schooling experience. What components of the course were beneficial, and in what ways could it be improved?

Purpose

The purpose of this paper is to critically examine the perspectives of the university instructor and pre-

service teachers participating in a social studies methods course using constructivist practices. Students are provided a syllabus outlining course topics and learning goals devised by the instructor based on the National Social Studies Standards. With the help of the instructor, students develop a learning contract outlining products, rubrics, and reflections that demonstrate their mastery and understanding of the course objectives. In lieu of a final exam, students must also complete a final reflection paper which outlines their experience in this learner-centered course. There are no attendance requirements or other formal assessments used to calculate their final grade. There is a pre-assessment given on the first day of class which is used to develop the learning contract. The same assessment is given as a post-assessment on the last day of class to provide evidence of growth and aid in writing the final reflection.

Theoretical Perspective

The shifts and reform in the field of education require students to take more responsibility for their learning (Moran & Gardner, 2007). As such, the development of one's executive function can serve as a component of the learning process. Moran and Gardner (2007) define executive function as "a cognitive process involved in controlling behavior and readying the person for situations" (p. 22). The ability to be mentally and behaviorally flexible in real-life decision making and everyday reasoning is part of the development of this process (Moran & Gardner, 2007). Two stages of executive function are apprentice, relying on an ideological and cognitive control system, and master, developing an idiosyncratic control system. At the apprentice level, one keeps in line with expectations, specifically cultural norms and institutions, establishing appropriately cultural goals with the ability to "delay gratification, inhibit his or her automatic responses, and adapt to rules" (Moran & Gardner, 2007, p. 27). In contrast, at the master level, one's culture is an important point of reference, but masters "increasingly demonstrate

the ability to posit and pursue individually conceived goals” (p. 29). In essence, the master takes initiative to make personal change.

Framework of Instruction and Practice

Piaget and Vygotsky, semiotic interactionists, believed that because humans continually transform and reconstruct reality as well as ourselves, then we cannot have an objective view of reality (Fosnot, 1996). As a result of his study of reasoning processes, Piaget “defined intelligence as an individual’s ability to cope with the changing world through continuous organization and reorganization of experience” (Singer & Revinson, 1996, p. 13). Through these experiences cognitive development is amassed as one begins to understand a new experience based on what was learned previously (Singer & Revinson, 1996). Schema combines knowledge with the process of acquiring knowledge, thereby developing new schemas and modifying or changing existing schemas (Piaget, 1951).

According to Weimer (2002), students do not have to possess mastery of a subject, but instead are “encouraged to explore it, handle it, relate it to their own experience, and challenge it whatever their level of expertise” (p. 13). The *Principles of Engagement* (Cambourne, 2002) framework supports this task whereby learners are more likely to deeply engage with demonstrations if they believe they are capable of doing what is demonstrated, it is authentic and applicable, the task is not anxiety provoking, and the demonstration is given by someone they respect. Teachers are persons whose confidence is trusted as mentors and counselors (Ericksen, 1984).

Problem-based learning (PBL) is an instructional framework which coincides with many of the principles of constructivism. The problem-based learning model originated and was primarily utilized in medical schools. Barrows (1986) outlines six characteristics for the problem-based model: learning is student centered, it occurs in small student groups, teachers serve as facilitators, problems serve as both the original focus and learning stimulus, problems lead to the development of problem solving skills, and new knowledge is attained through self-directed learning. In their research exploring theoretical principles of constructivism, instructional design and the practice of teaching, Savery and Duffy (2001) identify self-directed learning, absorbing content knowledge, and problem solving as explicit learning goals related to problem-based learning.

Method

Utilizing an interpretive epistemology, this study used qualitative measures to consider the perspectives of undergraduate students enrolled in a social studies

methods course. Data include observations by the instructor, focus group responses, final reflections, and course evaluations. Data was analyzed using document analysis (Bowen, 2009).

Data Sources

Participants

Students enrolled in the social studies methods course were sophomores, juniors, or seniors and may or may not have been formally accepted into the Teacher Education program. The course has one pre-requisite: students were required to create their own independent learning contract to demonstrate ways they would demonstrate mastery of ten course objectives based on the National Social Studies Standards. Each product was submitted with a student designed rubric which the instructor would use for evaluation of the product and self-reflection. This process of self-selected learning requires students to “generate useful schemes for organizing knowledge in their own heads” (Ericksen, 1984, p. 91), establish meaning, and consider their individual aptitudes, interests, and learning styles. This period of processing information provides students experiences, cognitive and affective, with learning how to learn independently (Ericksen, 1984).

Course Design

Based on the constructivist frameworks of Weimer (2002) and Cambourne (2002), the course was intentionally designed to include opportunities for students to explore, engage, and connect with new information related to the pedagogy of social studies in the elementary school. Knowledge, understanding, and application of the ten course objectives were the focus of the learning contract, products, rubrics, and material being delivered each week during class. The syllabus provided an outline of topics to be discussed (Appendix A), but it was flexible in its design. There was a statement on the syllabus in the assessment strategies column, “Teach/Practice Challenge,” which referred to what students needed based on the results of their pre-assessment given on the first day of class. This allowed the instructor to tailor the class to specific student needs based on their prior knowledge, as well as to employ methods related to problem-based learning.

Students were expected to have completed prepared readings in advance, as well as any questions related to the product design, which was to be created to demonstrate their mastery of the course objective. These readings may have been provided by the instructor or other members of the class. During the scheduled class time, the instructor presented information in the form of articles, videos, presentations through direct instruction,

and/or class discussions. Class time was also devoted to sharing ideas and presentations of products in order to receive feedback if changes were necessary. The instructor served as a guide rather than the expert. Students were encouraged to bring in their own supplementary materials to aid in their learning and understanding of the course material. There was no set structure to how the class time was spent as it depended on the topic of discussion, the needs of the students, and the feedback from the instructor based on student performance. In this way, the course was collaborative with everyone contributing to the presentation and exploration of the course topics.

Data Collection

This study collected data from Fall 2011 through Spring 2015. Data collection included focus group responses, final reflections, and course evaluations.

Focus group responses. At the conclusion of each semester, students were invited to participate in a focus group conducted by another member of the education department. This was optional for students to participate and not associated with grading for the course. The facilitator posed questions and recorded the responses anonymously. The information was shared via electronic file with the instructor of the course.

Final reflections. Students were required to complete a written reflection as their final component of the course in lieu of a traditional course exam. Guiding questions and prompts were provided to students, but they could include additional personal experiences, suggestions, or comments.

Course evaluations. The institution sends course evaluations to students at the conclusion of each semester. Data were collected from the narrative section of the course evaluations.

Results

Students enrolled in the course are faced with a period of change and uncertainty from the first day of the course. Through his experiences, Johnson (2011) identified three types of responses to uncertainty: being comfortable, being uncomfortable, or being irritated with uncertainty. Usually students enrolled in this course have responded in one of these three manners, with very few of them expressing comfort. Through the analysis of the data, the following themes emerged.

Schema

Typically, the first day of a college course is dedicated to reviewing the syllabus, answering questions, participating in “getting to know you” activities, and possibly an introductory lecture on the topic. Over many

years of school, students have expected to find on a syllabus the rules and regulations of the classroom teacher, the attendance policy, and the due dates of each assignment; in essence, “what I’m going to learn, how I’m going to learn, and what I need to do to pass the class.” Students are comfortable with this design because of its familiarity and predictability with what to do next in order to be successful in the course. However, the syllabus used in this course consistently caused the majority of the students to initially feel either uncertain or uncomfortable with the course design.

The syllabus only listed the course objectives without reference to how and/or when they would be assessed. The syllabus also stated that there was no attendance policy, which is very uncommon within the institution. The course best reflects the flipped classroom as a constructivist teaching method. Flipped Learning Network (2014) defines this method as the following:

[A] pedagogical approach in which direct instruction moves from the group learning space to the individual learning space, and the resulting group space is transformed into a dynamic, interactive learning environment where the educator guides students as they apply concepts and engage creatively in the subject matter (p. 1).

Therefore, if a student does not need help with the content she is working on with the resources the teacher has already provided, then she need not come to class. This is not only beneficial for the student’s time, but the teacher’s as well. The constructivist method of flipping the classroom allows the student to self-assess her own learning and decide when and where she needs guidance with the content. This also ensures that the teacher is not wasting time by re-teaching the content in which the students feel confident. No attendance policy also releases responsibility onto the student because she is in charge of coming to class when she finds herself confused or unclear of content, replicating decision making skills to be used in the future.

In the student’s current schema, the teachers are responsible for choosing how the content will be learned, assessed, and completed. Students often struggled in the beginning with scheduling and long term planning. For example, a student’s early reflection lamented, “I have been used to having deadlines and having a set day for things due so it is a little difficult for me to come up with a date for an assignment to be turned in.” Being immersed in a traditional learning style of direct instruction has caused students to experience anxiety when introduced to any other teaching method. Most of the student reflections of the course mentioned that clarity of the course structure came with time, and the purpose of the course structure was to “make it a learner centered course.”

The first assignment of the course, given on the first day of class, was a pre-assessment of K-6 social studies content knowledge. This pre-assessment was not for a grade, but it was used instead as a baseline for students to be aware of their knowledge on the subject and course objectives prior to designing the learning contract. Additionally, if students were successful on the pre-assessment and demonstrated proficiency of the objective, then she could place out of that objective without completing a product. This opportunity for differentiation reflects best instructional practices and demonstrates the importance of using pre-assessments in the classroom (Tomlinson & Moon, 2013, p. 1). If students are knowledgeable in a certain content area, then there should be opportunities for enrichment and challenge. Every student reflection referenced feelings of nervousness over taking this test. The pre-service teachers were appalled at how little they remembered about K-6 social studies, reinforcing the idea there is not enough emphasis in today's schools on social studies content (Ahrari et al. 2013, p. 1).

At the conclusion of the semester, students were given the identical test as a post-assessment. Nearly all of the students were eager to take the final assessment as most were excited to show how much they had learned through creating and constructing their own learning. The post-assessment was not graded, so the motivation to do their best on the test was determined by the pre-service teachers' actions throughout the course. Whether it was an immense improvement between tests, or a miniscule growth, each pre-service teacher experienced personal growth. For example as one student shared, "This pre and post assessment allowed my professor and me to see growth, strengths, and weaknesses." This success in the course was more rewarding to the pre-service teachers because the learning was autonomous, meaningful, and effective. Everything they learned in this course, academically or psychologically, prepared them to educate their students using constructivist methods in the classroom.

In the pre-service teachers' reflections, there was an overwhelming trend on how beneficial the power of choice was in their learning. The power of choice was to decide when a product was due, how they would present that they knew the content, and how they would be graded. This put the pre-service teachers in full control of their learning, allowing them to demonstrate their knowledge while exploring their strengths and strengthening their weaknesses in social studies content. The instructor found that the freedom provided to students in their product of choice resulted in more creative and meaningful submissions. Sample products included bulletin board designs, interviews with teachers and experts in the field, development of integrated units and lesson plans, poems, story books, songs, brochures, and presentations. Furthermore, there was an increase in

the exploration of technology tools such as podcasts, Google docs, livebinders, Prezi, blogs, website design, and the incorporation of social media, which could all be utilized in the future classroom.

The majority of pre-service teachers who took this course believed that they were achieving mastery of the course objectives through the products they were creating because they were able to work at their own pace and create products that enhanced their own personal growth. The main aspect of this course, that success or failure is determined upon them and their actions, was not realized by most of the pre-service teachers until the end of the course. The sense of control was an important component as well: "I felt in charge of my own grade because I was creating my own activities, and basically I am deciding my own grade for the course."

Motivation

Gillard (2015) discusses that teachers can no longer be dispensers of knowledge nor can they solely serve as facilitators. She states, "[T]eachers must become motivators of purpose," meaning that they are no longer in control of "what or how a student learns. Control must be given...to the student so that he/she is freely able to master that knowledge important to his/her own purpose" (p. 4). In general, students are motivated by the calendar. They have planned their learning contracts and set dates according to when they can complete the product. Because this is a learner-centered course, students are allowed to revise contracts as much as needed. Some students create one contract and follow it through the entire semester, while others change their contract nearly every other week. Often class discussions revolve around priorities and how that can impact where this class falls on their list of priorities and the level of importance it receives. If students make their learning purposeful, then their intrinsic motivation is stimulated (Gillard, 2015, p. 2). No two students have the same learning patterns or intelligences, so educators must motivate students toward personal growth. The mental goal to do better today than yesterday is a great intrinsic motivation for students to have not just toward academics, but in everything they do.

Constructivism is active learning in which the learner is the constructor or creator of his/her own learning (Weimer, 2002). The motivation to complete a task, academic or other, is usually extrinsic; there is a reward or grade earned for completing the task proficiently (Gillard, 2015, p. 2). The assignments in the course being studied were self-rewarded and intrinsically motivated. The student constructs the rubric for each assignment, and the teacher grades each product based on the student's rubric (Appendix B). Therefore, it is up to the student to decide if she will complete each assignment to decide how she will demonstrate that she knows the content. In the student

reflections there was no mention of grades being the motivation for completing the assignments. Students mentioned that they felt motivated to complete the products because they wanted to reach their full potential and get as much out of the learning experience as possible. For example, one student wrote, “The classroom setting is very relaxed, and I feel very comfortable, which makes me more motivated to learn.” With this intrinsic motivation driving the student’s learning, the exploration into the academic topics was deeper and more thorough, and students “became more self-motivated” in their learning. This course has also motivated these pre-service teachers to explore how to use constructivist methods in other content areas to benefit their future students; “I hope that one day in my own classroom I can reinforce this constructivist attitude so that my students will feel confident in the face of uncertainty, and feel prepared.”

While some students did thrive through intrinsic motivation, others struggled with motivation as a result of what they perceived as extrinsic motivation in the form of direction and expectation from the professor. One student stated, “There definitely should be some type of consequence for not turning in products on time. I feel this is why I didn’t always turn them in on time.” It can be assumed that because there were no penalties for a late submission that the responsibility for her procrastination in completing the assignments at the end of the semester is on the instructor rather than herself. Furthermore, this student expressed her frustration with the course design at the conclusion of the semester:

I believe I have not changed as a learner. I found the particular teaching style extremely hard to navigate through. The learning style that was used just does not work for me. I need to have a structured classroom with set rules, directions, and due dates. This class provided none of these things for me.

When responding to whether the class experience was positive or negative, one student stated, “[T]his was a very negative experience for me because I had very little structure. I feel that I should have had more guidance at the beginning of the semester.” Each semester the instructor reviews the course evaluations and reflections and has continued to make changes in the facilitation of the class in order to scaffold students who struggle with the perceived lack of structure when they are ultimately in control of the learning process. Constructivism lends itself well to the principles of differentiation to allow for all students to be successful.

Collaboration

Friend and Cook (2013) contend that, in order to ensure high quality education occurs, teachers need to

work together now more than ever before to create a school culture of collaboration. According to the researchers, “Interpersonal collaboration is a style for direct instruction between at least two co-equal parties voluntarily engaged in shared decision making as they work toward a common goal” (p. 6). We must aid our students in developing an understanding of working together for the benefit of all students, not only of their individual class of students. This process of development was highlighted through this reflective response:

After experiencing this course in the future I will approach challenges with an open mind. Challenges are oftentimes a great chance for collaboration and growth, and it is always interesting to hear how several different people come up with numerous solutions to one issue. This course has also shown me that keeping an open mind is important and that thinking creatively is rewarded. A solution that may work best for one person may not work for another, so having the opportunity to expand and grow is one that should be explored.

Lieberman and Miller (2004) identify the following shifts for transforming the social realities of teaching: from individualism to professional community, from teaching at the center to learning at the center, from technical and managed work to inquiry and leadership (p. 11). Through these transformative shifts, teachers can begin participating in an authentic professional community where their work takes place both within and beyond their own classrooms (Lieberman & Miller, 2004). Moreover, teachers look collaboratively at student work and curriculum design to co-construct alternatives to standardization (Lieberman & Miller, 2004). According to Katzenmeyer and Moller (2009), “developing skills in working effectively on teams, carrying out various roles in groups, and working together with others to solve classroom problems to improve instruction” (p. 50) are prerequisite to working successfully in school cultures where collective inquiry should be the norm.

Students may work on their submissions individually, with partners, and/or with the larger group. They are responsible for making this decision and are encouraged to collaborate with one another to show their understanding of course content (Smart, Witt, & Scott, 2012). Again, teachers regularly co-teach and plan together on grade level teams, so pre-service teachers in this course have experiences which replicate their future. As one student reflected, “When working with a group, it allowed me to see how I work with others and take in consideration others’ ideas and opinions.” Students share their products each week and are encouraged to provide feedback, both positive and constructively, for ways to strengthen connections to

the standards and/or more clearly articulate an idea. In this design, peer feedback has both encouraged and challenged the students to consider their products more deeply and reflectively. This was one student's response: "It was valuable to create my own lessons and present it to the class to receive feedback without judgment." This response highlights the safety of the classroom environment when taking a risk with a new product design.

Elementary teachers possessing this foundational and strong knowledge of general pedagogy have "knowledge and skill beyond what is visible from an examination of the curriculum" (Ball & Bass, 2000, p. 2). Pre-service teachers must move beyond individualism and embrace the spirit of collegiality to effectively "guide their practice toward working collaboratively with others" (Katzenmeyer & Moller, 2009, p. 49). The role that students play in their own learning through developing products, lesson plans, and reflections about their personal growth is an important component to gaining confidence in the classroom.

Connection to the Profession

Gillard (2015) states that we need to make the education of pre-service teachers "meaningful by relating them to applications in a typical classroom and to develop an appreciation for the value of reflection in the teaching/ learning process" (p. 2). So much of the education career is reflecting on past work and deciding on what was done well and what needs to be improved. In the course being studied, after each product was completed the students were asked to write a reflection on whether their method for learning the content was productive and effective, and if not, what could have been changed in the future. Having each pre-service teacher construct how he would learn the content and then reflecting on those methods to evaluate his effectiveness is exactly what educators do for their students every single day in the classroom. Students in classrooms today are "learning differently, and are accessing information differently" (Gillard, 2015, p. 3) and teachers must be able to adapt to their students' learning every day. One student elaborated:

This class prepared me to teach elementary social studies, because even though I will have the guidelines, ultimately it is up to me the way I teach my students. This class allowed me to be in full control, similar to a classroom setting. Through social studies methods I was able to research resources for social studies, locate the standards, and develop lesson plans. The product I created in this course will be able to benefit my future class, parents of students, and future colleagues.

The open-ended freedom to design products and the rubric used for evaluation is overwhelming for many students. As they discover their metacognitive skills and preferences as learners over the course of the semester, a newfound freedom to design lesson plans and units related to their future careers begins to emerge. One goal of the instructor is to scaffold them through this process since this replicates what teachers do in the classroom on a daily basis. A student reflected, "This class was a great experience for me to learn and understand how other styles of teaching other than lectures can be successful." It is also a way to ensure the course objectives are meaningful and relevant with each assignment submission, as shared by one student: "Looking back over the semester, completing the products has helped me to remember and learn the objectives. When thinking of the five themes of geography, I think back to the Prezi that I created and the information then quickly comes to me." Meaningful connections allow for improved recall.

There are curriculum standards set forth by the state and pacing guides provided by the district, but the administration will not be there to write plans for future teachers. They have spent years of academic schooling waiting to be given the rules to follow and tasks to complete. This constructivist learning style sparks the initiative for them to begin making the decisions about their own mastery of content, thus shifting their role from learner to teacher. For example, one student commented, "A major plus of this course is that I felt that I was able to start thinking in more teacher mode instead of student mode." The following are excerpts from final reflections which speak to the strong connections students are making between the course design and their careers:

I feel that I have changed as a teacher. At first, I thought I would teach the same way my teachers taught. Now, after experiencing this class, I feel that student choice and student directed learning is a great way to structure a classroom. I feel that this class has in a sense changed my philosophy of teaching.

I have learned a lot more than just Social Studies in this class, such as how to conduct myself as a teacher and some of the more important ideas (respect, diversity) that should be incorporated into every classroom.

I think more than anything, this course design is preparing us for our roles as a teacher in the classroom. As a teacher, we will choose (for the most part) what our students learn, how they are going to learn it, and how they are going to prove

to me that they have learned it. Is this the method behind your madness?

Specific teaching strategies that enhance executive function processes include “goal-setting, planning, organizing, prioritizing, shifting strategies flexibly, and self-checking” (Meltzer, Pollica, & Barzillai, 2007, p. 166). Going through the learning process allows students to develop an understanding of how to learn as they begin to recognize their own personal strengths and the impact the executive function process has on their academic success. The process can also highlight areas of improvement which may have not been as prominent. For example, this student who struggled greatly with the course design stated, “I still feel confused, and the class was extremely frustrating and stressful for me due to how it was set up and run. This class made me question whether or not teaching elementary school is the right fit for me.” A similar response from another student regarding the class structure: “This class structure is not my forte and nothing I will bring into my [future] classroom, no offense. I don’t know too many people who are not extremely stressed in a classroom that is structured like this one”. While the intention is not to bring students to the point of abandonment through constructivist learning, the course structure does replicate what will be expected of them as first year teachers. They will not have someone to tell them how to design lesson plans, manage their classrooms of young learners, and navigate the curriculum. Over the years the course has helped students identify with the realities of teaching elementary school and evaluate whether or not this is the career path they would like to continue to take.

Scholarly Significance

The role that students play in their own learning through developing products, lesson plans, and reflections about their personal growth is an important component to gaining confidence in the classroom. The teacher’s responsibility is to “help students advance from dependent memorizing to independent thinking and problem solving” (Ericksen, 1984, p. 83). The ideas presented by Ericksen are not limited to the field of education and could be replicated in other fields of study. The premise is to find ways to present course content in such a way that the responsibility of learning and control shifts from the instructor to the students. The following is an excerpt from a student’s final reflection and captures this personal growth perspective:

...[A]s a result of feeling uneasy and vulnerable I was opened up to an enlightening experience. I hope that one day in my own classroom I can reinforce this constructivist attitude so that my students will feel confident in the face of uncertainty...

However, not all students will embrace this idea of shifting the responsibility of learning from the teacher to themselves. Because most students experience years of traditional education through direct instruction and teacher designed learning, they continue to remain uncertain of what they have learned, or not learned, from this course. The following are student excerpts from course evaluations which all feature similar themes on the focus of responsibility for learning:

I would like more structure. I like being able to choose what we wanted to due but I think some structure should have been given. I think a timeline of what you are going to teach is something that would have been useful.

More guidance with the contract and meeting each objective. You need to provide this without expecting people to ask because I did not know how to ask for assistance with this. It would have been good to provide examples from past students on how they met the objectives and possibly limiting our options for a few of them just so that we have somewhere to start from. I have a much better idea of how to approach this class now, but unfortunately the class is nearly over.

There is one MAJOR improvement that needs to be made to this course. There needs to be a structured syllabus. I am not a fan of the student-made syllabus. I feel that I did not learn anything in this class that I will carry on with me into my teaching career. If I did learn anything, I taught myself. I feel that this is no way to teach an undergraduate class; The learning contract idea needs to be improved. I do not particularly like this idea. I think there needs to be more guidance and actual teaching in the classroom. I do not feel that I have learned anything in this class. I don't like standard syllabi, but I feel that this class needs to go back to a traditional one. I think the students would learn more with a traditional syllabus.

As an instructor, it is not easy to read such criticisms of a course, particularly when students feel that they did not learn anything over a 16-week period. However, taking their critiques and making changes each semester allows for professional growth and opportunities for change to ensure more students have a positive learning experience which is meaningful and relevant to their future career in education.

Modeling constructivist teaching practices and allowing pre-service teachers to experience this type of learning environment is imperative in order to give them the confidence to be advocates and leaders in the field upon graduation (Barth, 2001; Kosnik, 2009).

Building teachers' skills to become highly qualified leaders is not an easy task; it requires, "complex approaches that will increase their knowledge that will, in turn, alter their teaching" (Katzenmeyer & Moller, 2009, p. 46). In order to meet this challenge, there is a need for increasing opportunities for teaching and learning from the beginning of their career to the end (Katzenmeyer & Moller, 2009). Pre-service teachers need to be prepared to deal positively with the freedom and professional autonomy involved in teaching in the classroom (Kosnik, 2009).

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Appendix A
Sample Syllabus Outline

Class (Date)	Course Objective	Content	Assessment Strategies
1 8/21/14	4. Describe key ideas from the K-6 national standards in art, dance, theater, and music. 5. Describe key ideas from the K-6 national standards in social studies, as well as, K-6 North Carolina Standard Course of Study (NCSCOS) goals and objectives.	Setting and Achieving Social Studies Standards Reviewing Social Studies Standards Learning Contracts	Ch. 4 Introduction/Goal Setting Pre-Assessment
2 8/28/14	1. Understand the benefits of interdisciplinary instruction. 4. Describe key ideas from the K-6 national standards in art, dance, theater, and music. 5. Describe key ideas from the K-6 national standards in social studies, as well as, K-6 North Carolina Standard Course of Study (NCSCOS) goals and objectives.	Social Studies: Definitions and Rationale Social Studies and the Literacy Connection	Ch. 13 Formal Learning Contract DRAFT DUE/Product Decisions Meet w/ Dr. Duncan SMARTBoard
3 9/4/14	1. Understand the benefits and describe key features of interdisciplinary instruction and learning experiences. 5. Describe key ideas from the K-6 national standards in art, dance, theater, and music. 6. Describe key ideas from the K-6 national standards in social studies, as well as, K-6 North Carolina Standard Course of Study (NCSCOS) goals and objectives.	What is Social Studies? Constructivist Teaching Practices Differentiation Rubric Design	Ch. 1; Rubistar; technology Teach/Practice/Challenge Create rubrics for products

Appendix B Sample Rubrics

Objective 5: To describe key ideas from the K-6 national standards in social studies, as well as K-6 North Carolina Standard Course of Study goals and objectives.

Comments:

TOTAL SCORE: ____/10

Objective 6: Learn to make and read various types of maps

Map bulletin Board and Reflection Rubric

Category	Exemplary (2.5)	Proficient (1.5)	Developing (0)
Category	Exemplary (2)	Proficient (1.5)	Developing (1)
Content (Objective 5)	Demonstrated full understanding of the key ideas from the K-6 national standards in social studies, as well as the K-6 NC Standard Course of Study goals and objectives.	Demonstrated vague understanding of key ideas from the K-6 national standards in social studies, as well as the K-6 NC Standard Course of Study goals and objectives.	Demonstrated a number of misunderstandings of the K-6 national standards of social studies and the K-6 NC Standard goals and objectives.
Mechanics/Grammar	There are one or less mechanical and/or grammatical mistakes.	There are few mechanical and/or grammatical mistakes.	There are more than four mechanical and/or grammatical mistakes.
Product	My detailed knowledge on both aspects of this objective is shown in a PowerPoint presentation.	My small amount of knowledge on both aspects of this objective is shown in a PowerPoint presentation.	My lack of knowledge on both aspects of this objective is shown in a PowerPoint presentation.
Standards	Deep connections are shown between the NC essential standards and the NCSS Standards and the content of the lesson plan, presentation, and/or reflection.	Some connections are shown between the NC essential standards and NCSS Standards.	No relationship between the standards and the content of the lesson plan.
Reflection	Thorough reflection of the process and product, and expansion on any information that was no included in the product but is essential to fulfill the objective. Sources are cited when applicable.	Brief reflection on the process and product, and little expansion on information no included in the product. Some sources are cited.	Reflection incomplete or inaccurate to objective 1. No sources are cited if applicable.
Learn to make and read various types of maps	Through participating in this bulletin board, students are able to show they can make and read various types of maps.	Through participating in this bulletin board, students are only somewhat able to show that they can make and read various types of maps.	Through participating in this bulletin board, students are not able to show that they can make and read various types of maps.
Product	The bulletin board is neatly presented, is interactive and	The bulletin board is neat, but is only somewhat	The bulletin board is not neatly presented, is not interactive or

	appropriate for elementary students, and the questions included reflect the objective.	interactive for the students. The questions included somewhat reflect the objective.	appropriate for elementary students. The questions included on the bulletin board do not reflect the objective.
Mechanical/ Grammar	The learner had 0-1 grammatical errors on the bulletin board and in her reflection paper. If needed, proper APA 6th edition citation is used appropriately and correctly	The learner had 2-3 grammatical errors on the bulletin board and in her reflection paper. If needed, 2-3 incorrect APA 6th edition citations.	The learner had 4-5 grammatical errors in her paper. If needed, 4-5 incorrect APA 6th edition citations.
Reflection	The reflection showed student's full consideration of the project. The student discussed why the product selected was chosen, how course objectives were met, what was learned while completing the product, and included classroom implications.	Reflection showed some of the student's thought process. All of the components of the reflection are present but several do not show thoughtful consideration.	Little to no consideration was given to the project. Little consideration was given to the different components of the reflection.

Total: ____/10

Comments:

Cohort Learning: Supporting Transdisciplinary Communication and Problem-solving Skills in Graduate STEM Researchers

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The 21st century STEM researcher is increasingly called upon to work collaboratively on large-scale societal challenges. In this setting, disciplinary methods and methodologies may function as starting points, but they lack a focus on the metacognition and inquiry-based thinking required to analyze, evaluate, and synthesize diverse global problems. Transdisciplinary theories of learning push researchers and students to make just such a move beyond the boundaries of disciplinarity and toward the co-creation and co-use of knowledge that is the result of interactions between the academic disciplines and society: government, industry, and civil society. For graduate programs with limited financial resources, faculty resources, and collaborative working spaces, cohort learning models may ameliorate the practical “costs” of transdisciplinary research and education while providing precisely the environment in which it may flourish. This article presents the rationale, structure, and assessment plan for one such STEM cohort learning community.

The 21st century STEM researcher is increasingly called upon to work collaboratively on large-scale societal challenges such as providing access to clean water and making renewable energy economical, both recognized as grand challenges by the National Academy of Engineering (National Academy of Engineering, 2017). In this setting, disciplinary methods and methodologies may function as starting points, but they lack a focus on the metacognition and inquiry-based thinking required to analyze, evaluate, and synthesize diverse, global problems. In particular, disciplinarity's emphasis on knowledge reproduction may trap researchers in a feedback loop that limits their abilities to redesign the research process, both practically and theoretically, and to ask and answer new types of questions.

What are the Limitations of Disciplinarity?

Traditional academic disciplines are deeply embedded in the American academy, both as an organizational tool for intellectual work and a structural tool for the institution itself (Frodeman, 2017; Gibbons et al., 1994; Graff, 2015; Klein, 2017). Operationally, the academy functions on the tacit assumption that disciplinary frameworks are already optimal. Additionally, accepted theories of situated knowledge (that knowledge is always the product of the context and culture in which it was created) lend support to the idea that disciplines function as an essential means of analyzing, evaluating, and disseminating research and scholarship (Apostel, Berger, & Briggs, 1972; Brown, Collins, & Duguid, 1989; Crow & Dabars, 2017). At the same time, these traditional means of knowledge production operate on researchers to shape the very types of questions they may ask, as

well as the types of theories and methods they use to answer these questions. Fortunate students, as S.L.T. McGregor notes (2017), will be exposed to more than disciplinary thinking. They will most likely be encouraged to explore multidisciplinary learning (more than one discipline with no integration) and interdisciplinary learning (between disciplines and with integration). While more diverse models of thinking and learning, these models still assume the primacy of established academic institutional structures for creating, using, and evaluating knowledge. The current need of researchers to move outside of higher education's structures, both practically and theoretically, necessitates the development of new modes of knowledge creation.

As such, transdisciplinary theories of learning push researchers and students to make just such a move beyond the boundaries of disciplinarity and toward the co-creation and co-use of knowledge that is the result of interactions between the academic disciplines and society: government, industry, and civil society. More specifically, theories of transdisciplinary learning are characterized by four features: (1) it relates to contemporary social issues and challenges, (2) it involves those stakeholders who are affected by such problems, (3) it transcends and integrates disciplinary structures, and (4) it involves a deep search for a unity of knowledge (McGregor, 2017; Pohl 2011). Additionally, its emphasis on the co-creation of knowledge requires students to develop collaborative problem solving skills, an understanding of their own positionality and the positionality of their collaborators, and reflexive, open communication strategies (McGregor, 2017; Park & Son, 2010; Stahl et al., 2011).

What Does this Mean for How We Teach?

Theories of transdisciplinarity offer innovative solutions to many of the challenges that manifest themselves in traditional disciplinary environments, yet contemporary research on collaborative, innovative pedagogical practices is still rooted in disciplinary structures. In undergraduate education, methods to teach and assess interdisciplinary learning are supported by the Association of American Colleges and Universities' LEAP Initiative's emphasis on integrative learning. Defined by the Carnegie Foundation as "an understanding and a disposition that a student builds across the curriculum and co-curriculum, from making simple connections among ideas and experiences to synthesizing and transferring learning to new, complex situations within and beyond campus," integrative learning provides faculty with a framework to structure student learning outcomes and corresponding activities for active learning (AAC&U, 2005). Integrative learning asks for students to bring established disciplinary perspectives together to develop new solutions. More recently, the call for T-shaped professionals, or individuals who have deep disciplinary knowledge coupled with the ability to collaborate across a variety of disciplines, embodies the challenges of teaching transdisciplinary skills: how can we create transdisciplinary STEM researchers when students are constantly defined by, and grounded in, their "home" disciplines (Austin et al., 2018)?

One such solution has been the creation of new locations of research and scholarship. The National Academies report *Facilitating Interdisciplinary Research* (2005) highlights the value of transdisciplinarity specifically for applied research initiatives. The report suggests a research model of "scientists, engineers, social scientists, and the humanities... addressing complex problems that must be attacked simultaneously with deep knowledge from different perspectives." Major universities have traditionally implemented this model in two ways: the development of entirely new stand-alone transdisciplinary schools, or the development of transdisciplinary research centers. Recent examples of such institutional structures include the School of Earth and Space Exploration at Arizona State, the Center for Human-Computer Interaction at Virginia Tech, the Institute for Information Security and Privacy at Georgia Tech, and the Center for the Prevention of Obesity Diseases at the University of Nebraska – Lincoln. All of the previously mentioned institutions are classified as Highest Research Activity by the Carnegie Classification of Institutions. Often, resources for such initiatives come from budget reallocations in response to a university's strategic plan, a partnership with an external business or corporation, or a specific endowment. As such, these models of transdisciplinary research are most often well-

funded and central to the university's public face and mission. Additionally, multiple universities often pool together their resources to form transdisciplinary centers. One example of such a center is the Transdisciplinary Research on Energetics and Cancer Center (TREC Center) where UC San Diego, University of Pennsylvania, Harvard University, and Washington University in St. Louis work collaboratively on multiple cancer research projects. Similarly, the Center for Structured Organic Particulate Systems (C-SOPS), headquartered at Rutgers University and partnered with Purdue University, NJIT and the University of Puerto Rico at Mayaguez, investigates the ways pharmaceuticals, foods, and agriculture products are manufactured. These centers provide opportunities for new and established scientists who can carry out integrative research on the specific problem but do not have formal training programs for graduate students. Additionally, these programs are generally limited to specific research topics and, as such, are not available for the general graduate student population.

Such university research centers and stand-alone schools are the cornerstones of transdisciplinarity at major research institutions. Students in these programs are given opportunities to participate in innovative, funded research, partnering with established mentors in academia and industry, to develop specific, yet adaptive, problem-solving strategies. These students are given the opportunity to not just find answers to problems from different areas of expertise but re-define the problems themselves through a transdisciplinary lens.

What about Schools That Cannot Create Such New Locations?

Importantly, researchers and scholars must note that STEM graduate researchers are educated at a variety of types of institutions. Institutions classified as having higher research activity may have individual projects that are transdisciplinary in nature, but do not have resources (location, personnel, space, etc.) that can support broad-based transdisciplinary skill education centers. As an example, the Otto H. York Center for Environmental Engineering and Science at NJIT is a central facility for material characterization, which can be utilized as a transdisciplinary learning space, but it is not currently providing any training for graduate students to tackle transdisciplinary problems. This phenomenon is common in many universities, especially the ones that are not listed as having the highest research activities.

At the same time, STEM graduate researchers from schools classified as having high or mid-level research activity will be just as likely to face the types of large-scale societal challenges as their peers at the highest-research university. The need for these students to learn

transdisciplinary problem solving, collaboration, and communication still exists. In many ways, the need is even greater: at our mid-sized, high research level institution, over 90% graduates go into research and development in industry while less than 10% of them hold academic positions. In effect, such graduate students are more likely than others to find themselves working outside traditional academic disciplinary structures and on problems with multiple, diverse stakeholders. Hence, they need more exposure in solving transdisciplinary problems in order to be successful in their careers, especially in an ever-changing world.

We Believe Cohort Learning is the Answer.

For graduate programs like ours—those with limited financial resources, faculty resources, and collaborative working spaces—cohort learning models may ameliorate the practical “costs” of transdisciplinary research and education while providing precisely the environment in which they may flourish. Learning cohorts facilitate collaboration, investigate problems from multiple perspectives, and focus on individual and group transformation (Donoldson & Peterson, 2007; Holms et al. 2010).

Building on theories of social constructivism and “communities of practice,” cohort style learning operates on the assumption of the benefits of cooperative, immersive, and recursive learning. Generally, a cohort shares five characteristics:

- They have a defined, long-term membership who commence and complete together.
- They share a common goal that can best be achieved when members are academically and emotionally supportive of each other.
- They engage in a common series of learning experience.
- They follow a highly structured and intense meeting schedule.
- They form a network of synergistic learning relationships that are developed and shared among members (Imel, 2002).

These characteristics help facilitate not only individual learning, but also learning among group members and among members and their advisors/mentors. In graduate education, these cohorts usually take one of two forms:

- A cohort-with-one, or a group of students sharing a common research area or theory and assigned to a single supervisor with expertise in the research topic, theory or methodology; or cohort-with-team, or

- A group of students assigned to a team of advisors whose complementary expertise in the research topic, relevant theory or methodology broaden the scope of support for the group (Glover, 2010; Holms et al., 2010).

As such, a transdisciplinary cohort both builds on and disrupts these two models. Traditionally, a successful cohort requires a recognizable structure, a shared set of goals, and an understanding of disciplinary norms. In a transdisciplinary cohort, graduate STEM researchers from multiple fields work with the mentor and advisors from multiple fields, necessitating the creation of new, collaborative working structures, goals, and norms. Instead of requiring new locations of research and significant additional financial resources and human capital, such a transdisciplinary cohort would happen in already established locations: the face-to-face graduate classroom.

The Cohort Learning Program

Cohort Program Objectives

Because of these practical and theoretical issues in graduate education our university is piloting a cohort learning program for graduate students. More specifically, we are investigating the effectiveness of cohort learning on the graduate researcher competencies transdisciplinary communication and transdisciplinary problem solving. We believe that transdisciplinary communication skills are vitally important to the next generation of graduate students for continued innovation. When researchers move outside of academia they must be able to work with, listen to, and address multiple stakeholders, as well as convey information in a public or alternative setting. This emphasis on communicating in new environments, along with a focus on critical argumentation and multidisciplinary perspectives, will create researchers with better developed critical thinking skills (Dezure, 2017; Hayne, 2014). Additionally, we believe that a pedagogical focus on transdisciplinary problem-solving skills will provide researchers with new strategies for practicing and revising disciplinary methods and methodologies. By combining established interdisciplinary problem-solving practices like Repko's (2012) model of integrated research with a focus on contemporary social challenges and diverse audiences, transdisciplinary problem-solving strategies will allow STEM graduate researchers to succeed beyond the academy.

The planned Transdisciplinary Learning Cohort will provide vital data on the ability of a well-organized cohort learning program to support and improve transdisciplinary research and communication skill development in graduate students. As such, our work has been broken down into four tasks: 1) university transdisciplinary research and communication skills needs assessment, 2) development

and implementation of the transdisciplinary learning cohort, 3) program assessment, and 4) development of guidelines and information for transference of program to other universities.

Task 1: University Transdisciplinary Research and Communication Skills Needs Assessment

In order to properly develop and support the cohort, the project has begun with a series of needs assessment surveys to provide baseline information. We are using this to understand the following: (1) student and faculty knowledge of how transdisciplinary research differs from inter- or multidisciplinary research, (2) faculty needs for graduate student transdisciplinary problem solving and communication skills, and (3) employer needs for new transdisciplinary problem solving and communication skills. This needs assessment takes the form of a series of surveys, focus groups, and panel discussions, thus taking advantage of our existing relationships with companies and industry advisory boards that hire and employ our graduate students.

Task 2: Development of the Transdisciplinary Learning Cohort (TLC)

The TLC will be a cohort-based program where students will work together, along with faculty facilitators and their faculty advisors, to develop transdisciplinary research skills and communication skills. This program will be administered as a combined effort through our Engineering College and our College of Science and Liberal Arts but will be open to students across the university. An outline of the TLC program is presented below.

TLC Program student and faculty recruitment. Students will be recruited through active and regular contact with college deans, department chairs, and university faculty. The TLC administrators will ask these stakeholders to identify highly motivated, inquisitive, and interested students across our graduate programs who have at least two years remaining in their graduate programs. Many of these stakeholders have already agreed to participate in this aspect of the TLC program. From recommendations and research areas, a cohort of no larger than 20 students will be chosen by a review panel. We are seeking a balance between different disciplines, backgrounds, and genders to enhance the access to transdisciplinary learning for a diverse group of students.

TLC Program organization and structure. The TLC program will be centered around cohort learning activities in which the students help to lead the activities with the support of faculty facilitators, and this will enhance their transdisciplinary learning skills. In addition to cohort learning activities, the TLC

students' dissertation advisors will be actively engaged with the program administrators to help facilitate transdisciplinary research skill development in their individual research projects. Students will participate in the program on a two-year cycle. Specific cohort learning activities will be:

- **Weekly Seminar:** Students will be required to attend weekly seminars that are facilitated by the TLC program administrators. These seminars will focus on basic interdisciplinary communication skills including presentations, writing, and conversations. Students will focus on the metacognitive styles of each of their own disciplines and discuss how these styles differ among disciplines. Students will explore how to communicate their methodologies, results, and thought processes to people outside of their discipline.
- **Lunch-and-Learn:** Lunchtime meetings will also be provided, and transdisciplinary researchers working on a variety of topics will be invited to discuss their research, as well as their process for developing appropriate methodologies, their learning of new techniques, and their challenges and techniques for communicating their research to multidisciplinary audiences.
- **Transdisciplinary Research Symposium:** We are planning a yearly research symposium, hosted by the TLC. All students participating in the TLC will be required to present their research through a poster and in written conference proceedings that will be published by the university. The second-year students will be selected to give oral presentations at the symposium. Other students and faculty who are also working on transdisciplinary projects at our or nearby universities will be invited to participate. Researchers from local universities, as well as government agency and industry professionals, will be invited to attend. Students will be able to use this symposium as a way to showcase their communication skills, as well as to learn new techniques and ideas from other disciplines.
- **Conference Attendance and Publishing:** Several scholarships to attend and present at conferences will be provided each year by the TLC administrators¹. Scholarships will be awarded to students who have presentations or

¹ Student travel will be funded through a mix of internal (the graduate school) and external (STEM funding agencies currently working with affiliated program faculty) programs.

Figure 1
Outcomes map for TLC program

		Transdisciplinary Learning Cohort Learning Outcomes			
		Write effectively for transdisciplinary audiences	Present effectively to broad audiences	Apply leadership skills, take initiative, and exhibit motivation	Demonstrate the use of research methods from other discipline
Transdisciplinary Learning Cohort Activities	Weekly seminar				
	Lunch-and-learn meetings				
	NJIT transdisciplinary research symposium				
	Conference attendance and publishing				
	TLC Mentors				
	Committee organization				
	Thesis advisor collaboration and training				

papers accepted at a conference outside of their specific discipline, but still within their particular research topic. This will provide students with the ability to learn from other disciplines as well as put their communication skills to work. Beyond presentations, students will be encouraged and supported in publishing their work in journals that may not be typical to their field.

- **TLC Mentors:** Each second-year TLC student will be paired up with a student from the new cohort of first year TLC students as a transdisciplinary mentor (for the first year of the program, the TLC administrators will pair the cohort with a separate faculty mentor). Students will form a writing and research group. They will be expected to meet regularly, discuss their research and its processes, and both support each other and hold each other accountable throughout the graduate school process. This will help facilitate connections between each cohort year, as well as support transdisciplinary learning by providing opportunities for each student to teach a fellow student directly.
- **Committee Organization:** Students who participate in the TLC will be required to have one committee member from outside of their home department that can help to improve hypothesis development, provide outside methodologies, and enhance the transdisciplinary nature of their research project. Students will

work with TLC facilitators and their thesis advisor to identify a good candidate for this position on their committee.

- **Thesis Advisor Training and Collaboration:** Training on transdisciplinarity will also be provided to the thesis advisors of the graduate students in the TLC program. These workshops will discuss the concept of transdisciplinary research, its relation to interdisciplinary and multidisciplinary work, and methods to incorporate transdisciplinary concepts within their own projects. Additionally, the thesis advisors will be part of the team that reviews the TLC students' progress and learning.

Task 3: Program Assessment

Student learning outcomes. The TLC program structure is designed to help students reach four main learning outcomes. By the end of the program, students will be expected to be able to do the following: 1) write effectively for transdisciplinary audiences; 2) present effectively to broad audiences; 3) apply leadership skills, take initiative, and exhibit motivation; and 4) demonstrate the use of research methods from other disciplines. The program activities map directly to these learning outcomes, as is shown in Figure 1, which shows that there is significant overlap between the types of activities that will support students meeting each outcome. This will support student engagement with program initiatives through a variety of methods and techniques.

Student Learning Outcome 1: Write effectively for transdisciplinary audiences. First and foremost, students in this cohort program are required to learn how write effectively for transdisciplinary and multidisciplinary audiences. In order to assess this outcome, each student will first work with their research advisor to identify a topic that is transdisciplinary in nature or a portion of their research that may benefit from transdisciplinary research skills. Each student will read articles related to the topic from journals in various fields and write a review paper. Workshops on writing as a process will be provided to enhance students' writing skills, as well as to allow them to reflect on their writing processes. During these workshops, students will also read each other's papers and write in groups to improve their writing skills and to develop strategies that work best for them. TLC facilitators will lead the discussions of writing as a process, and students' thesis advisors will provide feedback to the students' writings. The program will also invite mentors whose research is transdisciplinary in nature to discuss what are the challenges they face when they communicate with a broader audience, how those challenges can be addressed, and how best to communicate across disciplines. These activities will be structured with student reading and writing groups, faculty feedback session, and short reflective essays and discussions.

Student Learning Outcome 2: Present effectively to broad audiences. Second, students in the cohort will be educated on effective methods to present their research to broad transdisciplinary audiences. Specific activities include attending conferences and presenting to peers in the cohort and beyond, as well as participating in group/lunch meeting presentations. These activities will be structured such that feedback is given by the faculty involved, the cohort, and any general audience members that are willing and able. In addition to this, the TLC program will host a yearly research seminar where the students will present to the university, industry partners, and a broad group of peers. During this seminar they will be asked to present not only on how their research can be impactful for their specific topic, but also on how the methods and tools they are using or developing may have a broad impact across disciplines, as well as how they may be able to apply this work to other transdisciplinary problems.

Student Learning Outcome 3: Apply leadership skills, take initiative, and exhibit motivation. Third, students in the cohort will be encouraged to take on leadership roles, to maintain their initiative, and to keep motivated through their time in graduate school. Specific activities include having the students organize the workshops and lunch meetings noted in Outcome 2, send abstracts for presentations at conferences,

communicate their results to the broader public, and devise plans to manage and publish on their research projects. These activities will be structured around lunch meetings, networking sessions, and outreach activities with the local community.

Student Learning Outcome 4: Demonstrate the use of research methods from other disciplines. Lastly, students in the cohort will be evaluated on their ability to work in a transdisciplinary manner. Specific activities will include having members of the cohort identify a knowledge gap in a different discipline for which their discipline specific research methods may help, solving complex problems collaboratively, and developing the ability to spin off their research into new areas. These activities will be structured around group discussions involving all members of the cohort and collaborative proposals with their respective advisors. Students will also be encouraged to publish their work in peer reviewed journals that are outside of their discipline, to find areas where they can publish or present on techniques with a cohort member of a different discipline, and to include a faculty member from outside of their discipline on their thesis committee whose methods may be valuable to creating a transdisciplinary project.

Assessment of students. A variety of tools will be used to assess each student's ability to meet the learning outcomes. These will include written artifacts, presentation artifacts, reflective essays, peer-reviewed journal paper and presentation acceptances, student self-assessment surveys, and faculty advisor assessment surveys. Assessment will occur continuously throughout the program on individual artifacts, as well as at the end of each term and after the two-year-long program cycle through assessment surveys.

The TLC Seminar Facilitators will be responsible each term to assess the written and presentation artifacts for each student. A performance rubric will be created that will support this assessment. Self-assessment surveys will be created and administered to the students each term, and we will track how students feel about their ability in each skill throughout the course of the program. TLC mentors and mentees will also be asked to provide assessments on how well the mentorship progressed and the value it added for them individually. Assessment surveys will also be distributed to faculty thesis advisors at the beginning, after the first year, and after the second year of the students' involvement in the TLC program to assess the impact of the transdisciplinary research and communication skills developed, as well as how well the student has been able to incorporate them, within their own work.

Assessment of the Cohort Program. For programmatic evaluation, an emphasis will be placed on a continuous evaluation cycle, including both formative and summative assessment methods

Table 1
TLC Assessment Matrix

Activities	Performance Criteria	Evaluation Methods
<u>Student Learning Outcome 1: Write effectively for transdisciplinary audience</u>		
Read articles	Trainees are published authors	Annual trainee pre and post survey
Writing with peers	Trainees and faculty report growing	Number of papers published in high
Writing as a process	skill development and familiarity	impact journals
Reflection on the writing process	with the field	Writing rubrics
		Annual trainee focus group
		Reflective writings
<u>Student Learning Outcome 2: Present effectively to broad audiences</u>		
Attend conferences	Trainees present at conferences	Annual trainee pre and post survey
Present to peers	Trainees, peers, and faculty will	Number of international conferences
Present at group/lunch meetings	report satisfaction with presentation	attended and presented
	skills at group meetings	Presentation rubrics
		Reflective exit interviews with
		trainees
<u>Student Learning Outcome 3: Apply leadership skills, take initiative, and exhibit motivation</u>		
Organize workshops	Trainees will take initiative to foster	Annual trainee leadership skills pre,
Organize lunch meetings	a diverse collaborative research	mid and post survey
Project management	community	Annual trainee focus group
	Trainee project will be successfully	Exit interviews with trainees
	managed to completion	Diversity counts
<u>Student Learning Outcome 4: Demonstrate the use of research methods in other areas</u>		
Identify a knowledge gap you can fill	Trainees and faculty report growing	Annual trainee pre and post survey
Problem solving assignments	scientific skills that can be applied in	Counts of Intellectual property and
Spin off research into new areas	a transdisciplinary fashion	new ideas split off from PhD (Patents
	Trainees report satisfaction with	files)
	career advising and placement	Job attainment in STEM
		Exit interviews with trainees
		Annual trainee focus group
		Faculty workshop rubrics
		Reflective writing

developed and adapted from skills-based research with quantitative and qualitative tools employed to assess the cohort project's success in meeting its goals and objectives (Gredler, 2009). Quantitative methods will include rubrics, pre-and post-surveys of expected outcomes, graduate trainee performance/testing data, and counts of relevant program data (Hernon, 2004). Qualitative assessment methods will include focus groups and advisory committee reviews (Krueger, 2000; Mabry, 2003; Olds & Miller, 2005).

Data will be collected from TLC faculty, trainees, committee members, staff, and associated participants. Data collection includes a specified timeline with annual pre- and post-assessments. Table 1 provides the assessment matrix with an overview of outcomes, performance criteria, and assessment tools (Lopez, 2006).

In addition, we plan to measure the effect of the TLC program on the doctoral completion rate. According to the Ph.D. Completion Project run by the Council of Graduate Schools (2008), previous studies suggest that no more than 56% of students who enter STEM doctoral programs at public universities complete their degrees in spite of having adequate academic abilities and highly favorable conditions. Six institutional and program characteristics are identified as key factors that affect the likelihood that a particular student will complete a Ph.D. program: (1) selection, (2) mentoring and advising, (3) financial support, (4) program environment, (5) research mode of the field, and (6) processes and procedures. Summative program assessment will include surveys and focus group data collection on the cohort's effect

on these key factors. Corresponding data will also be collected from the research advisors of the students participating in the TLC program.

Task 4: Development of Guidelines and Information for Transference of TLC Program

One important additional goal of the project will be to provide a transferrable program that can be implemented at other universities. Our team hopes to develop a set of guidelines and information on how to successfully implement a similar program at other schools. As such, the TLC program will be used as a case study for the guidelines. We hope our experiences will allow us to make program modules, assessment surveys, and example artifacts available to other universities.

Conclusions

Many institutions of higher education have limited opportunities for students to gain exposure to transdisciplinary learning and research activities. Such institutions have multi- and transdisciplinary research centers and other large-scale initiatives that would typically be used to foster transdisciplinary learning environments. The proposed cohort learning program aims to create an environment for graduate students to learn how to solve problems and communicate across traditionally discipline specific boundaries.

We believe this program will transform graduate student education at our university by providing avenues for students to explore research topics in a transdisciplinary context and to communicate effectively to a broad group of researchers with diverse backgrounds. Additionally, the hope is that the TLC program concept can be readily translated to other institutions with limited resources and that do not have large multi- and transdisciplinary research and education centers. Thus, this program has the potential to impact graduate students across a range of universities that do not have the resources to foster transdisciplinary centers in the traditional context.

Additionally, the research project will provide insight on how cohort learning programs can develop transdisciplinary research and communication skills. Beyond determining how well cohort learning can impact transdisciplinary skills, this research will add valuable information on the impact of cohort learning at the graduate level in general and provide a set of tested educational tools that universities can access nationwide for graduate program development.

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