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Too cool for school?: The effects of gamification in an advanced interdisciplinary course

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Abstract: Educators have been attracted to gamification because of its apparent appeal to students who are digital natives, but more research is needed to evaluate the effects of gamification on student motivation, learning, and related outcomes. This article presents the results of a gamification project conducted in an upper-division interdisciplinary course and suggests that gamification is not "too cool for school" but rather, an emerging instructional tool that will need to be filtered through the complexity of student experience in order to live up to its claims.

Keywords: Gamification, instructional design, classroom assessment, student perception of learning

Understanding learning is a Gordian knot of a challenge, just the kind of intellectual exercise that tends to motivate academics. So, while there is no dearth of research and publication on learning (and teaching), whether or not we are any closer to unraveling the knot remains an open question. Certainly, we have done a better job understanding the knot itself. While learning is often associated with educational research (practice), the study has inexorably expanded to include physiological, psychological, physical, and socio-cultural-political perspectives, making the full study of learning to be very much a syncretic art. A recent contender for the attention of those interested in teaching and learning is gamification, which draws inspiration and momentum from sources not often associated with serious pedagogy (Educause, 2011). This study explores one example of the nexus between gamification and learning in an interdisciplinary college class.

Broadly speaking, the term gamification, coined in either 2005 or 2008 (depending on who you ask), refers to the use of various elements from games in non-game contexts (Deterding, Dixon, Khaled & Nacke, 2012). With origins in the technology industry, the concept quickly obtained a toehold in the business world, especially for marketing applications (Huotari & Hamari, 2012). To provide an idea of the scope of that infiltration, a 2011 Gartner report predicted that over half of all businesses would employ gamified marketing strategies by the year 2015 (Gartner, 2012) and M2 research predicts that gamification services will reach $2.8 billion in revenue by 2016 (McCormick, 2013). Some of the most commonly used examples of gamification are retail programs where participants accumulate extra savings or other rewards for continued patronage. Foursquare, Fango, and StackOverflow are popular gamification apps.

The widespread use of such techniques to engage customers in business began to catch the eye of educators who saw the potential inherent in engaging students. If the current generation of students spends a great deal of time playing online games, the reasoning goes, then why should we not harness that same kind of motivation to engage them in the classroom? Large funding agencies, such as the MacArthur and Bill and Melinda Gates Foundation, have begun

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pouring support into prototype projects that examine the application of gamification techniques at all levels of education (Landry, 2012). Advocates and pundits of gamification in education have been churning out articles, posts, and publications extolling its benefits and generating widespread publicity for successful pilot projects (Erenli, 2013; Jensen, 2012; Kapp, 2012; Smith, 2012; Yee, 2013).

If one were to see through the hype, however, questions have been raised about whether or not gamification can deliver on its early promises. Gamification often looks and sounds "sexy," in other words, highly appealing, particularly because it transforms educational opportunities into experiences that more closely resemble already popular games. That being said, most faculty do not view education as inherently a game and skeptical of so-called "edutainment." In other words, the attempted integration of gamification into higher education has produced an uneasy alliance, both philosophically and practically. A handful of studies have found issues with the depth of learning achieved through the application of gamification principles and have questioned the transfer of the primarily extrinsic rewards associated with gamification to deeper, intrinsic understandings (Deci et al., 2001; Donston-Miller, 2012; Dominguez, et al., 2013; Malone & Lepper, 1987). The emerging consensus seems to be that most students are enthusiastic to participate in gamification experiences, but whether or not their participation results in improved motivation for learning remains to be seen and the question forms the basis of the current study. To phrase it colloquially, the research at hand asks whether or not gamification is too cool for school.

Research Design and Findings

This research study was conducted on a single face-to-face class: an interdisciplinary, upper division course that is included in the general education requirements at a medium-sized, rural regional comprehensive university. This particular class was chosen because of the inter-disciplinary nature of the subject matter, i.e. capitalism and because the classroom demographics were (very roughly) representative of the undergraduate student population as a whole. Of the forty-three students enrolled in the course, 54% were female and 46% male. Approximately two-thirds of the students were upper classmen, listed as either juniors or seniors at the time of enrollment. Three were non-traditional students, ten of the students were registered in the Honors College and six were registered as varsity athletes. The class consisted of eighteen different majors, with highest numbers in history and education. In the spring of 2013, the instructor developed an extensive gamification assignment for the long-standing course, the former of which became the subject of the current research. The study asked consenting students to provide researchers with copies of all course materials related to the gamification exercise and to complete a short survey regarding their perceptions of learning through gamification.

Originally, the instructor considered a complete revision of the course design centered around gamification. Because of the paucity of research related to increased learning outcomes and gamification, the instructor chose a more conservative approach and to relegate the gamification concept to a single activity. In this case, the traditional end-of-the-semester review activity, as it was both cumulative, and thus representative of the course as a whole, and a self-directed exercise that had built-in levels of success. Rather than being instructed to complete the entire review activity, students were incentivized by being offered tiers of accomplishment where the number of review questions completed resulted in progressively higher points. This tiered technique is adapted from the gamified concept of achievements (Habgood, 2007).

The literature on gamification indicates that the technical expertise to create high-end gamification experiences serves a barrier for adoption (NMC 2013). In the case of "The Capitalism Quest for Knowledge," the researchers chose a simple, low-tech text-based format. The ancestors of today's highly-detailed graphical games, text-based gaming has a long and rich history beginning with early offerings like *Zork* (1977) and *Colossal Cave Adventure* (1976) that utilized the format primarily to take advantage of the limited capabilities of early consumer computers. Players discovered the distance between "open program" and "open dungeon door" was short enough to be conducive to intuitive gameplay (Deitz, 2010). Additionally, the nature of text-based games's verbose descriptions in lieu of digital graphics remain very similar to the popular trope of "Choose-Your-Own-Adventure" stories among youth literature (Green & Jenkins, 2014). The choice to use a text-based format bypasses the need for developing complex graphics, but the approach still necessitates the use of a gamification platform for access, navigation, and interactivity.

Rather than engineer a home-grown, text-based gaming platform, the researchers employed a hybrid model. They identified an existing, free-to-use online text-based quest platform in combination with a series of databases created and maintained by the university. The platform allowed the narrative structure and non-linear navigation desired. The limitation of this platform was that it did not allow individual responses to be tracked, accumulated, or rewarded. This feature, that was necessary to provide the motivational structures intrinsic to gamification, which was enabled through use the associated databases. Even the use of existing technological solutions required considerable time, effort, and expertise to adapt to the gamification process, and, in the end, the blend was not perfect. Those interested in gamifying their instruction should consider the investment needed to provide appropriate technology and technological support. In addition to technological adaptation, the instructor took considerable time to redesign the assignment. Along with an instructional developer, the instructor applied key aspects of gamification, including nonlinearity, achievements, and a persistent narrative structure to the redesign (Elson, Breuer, Ivory, & Quandt, 2014).

To distance the assignment from its original roots as an in-class review exercise, and to inject an atmosphere of gamification, the assignment was made entirely nonlinear. In a traditional review exercise, students begin at "Question 1" and proceed with the assignment until completing "Question 34." While there are indeed linear games, a nonlinear structure provides more opportunity for players, or in this case forty-three university students, to interact with the assignment; input and response are some of the most basic gamification attributes that can be applied. In the new, gamified version of the review, rather than being presented as a linear progression, the questions were divided into five thematic clusters of roughly six questions each for a total of 34 possible quests. Students, who in this instance additionally serve as players, were able to determine their own progression path, rather than be influenced by the linearity of a traditional assignment; students could begin and end where they chose.

One of the most distinguishing features of educational gamification practices is the provision of intangible rewards (Hsu, Chang, & Lee, 2013). Often, these rewards take the form of valueless, collectible encouragements such as badges, points, or levels of achievement. For example, modern digital games often offer achievements for a variety of activities, from simply playing for the first time, to completing a challenging task. Additionally, points awarded can accumulate into tiered levels that serve as progressive milestones of accomplishment (Zuckerman, 2014). The researchers assigned specific questions in the original review point values commensurate with their relative difficulty and time investment required. For example,

questions that required a brief, subjective response from the student/player were worth considerably fewer points than questions that required participants to produce larger creative works, to engage in higher-order thinking, or to leave the classroom on excursions around campus. Students did not have to answer all of the questions presented. They could choose to do more questions of lower point value or fewer questions with higher point value, or employ other strategies as they saw fit.

Framing the entire activity were a series of ranked achievements presented as the goal to which participants were to aspire. In order to align these levels of achievement with the course's theme of capitalism, they were given thematically appropriate designations, from "Apprentice" to "Maven." The Apprentice achievement required twenty points, while Maven was unlocked at sixty. Those three students who achieved the maximum possible points (61+) first were given an additional award. Grades can be seen as a form of tangible, extrinsic motivation. To reduce this factor, the instructor awarded all students who participated to at least the Apprentice level with a blanket participation grade, without further consideration for achievements earned. The researchers included this aspect of the gamified activity in order to observe student reaction to this gaming trope, and to evaluate the likelihood of motivation tied to intangible rewards.

In order to take advantage of gamification's concept of persistent narrative structure, and to more elegantly tie the activity to the major themes of this interdisciplinary course, the Capitalism Quest for Knowledge was couched in terms more common to games than in traditional review assignments: "questions" became "quests," "modules" of questions became "quest lobbies," each characterized with the name and visage of a luminary from the history of capitalism ("The Karl Marx Lobby," "The Adam Smith Lobby"). The researchers chose language carefully to emphasize the participants' roles as "players" rather than "students," with particular focus on points, achievements, and quests. This ensured that the verbiage reflected the assignment's status as a participatory grade, rather than a graded evaluation.

Once the Captitalism Quest for Knowledge was built, it remained to be seen whether or not it would motivate the students. All forty-three students participated in the Quest for Knowledge in some way over the course of approximately two weeks, and all but one participated both inside and outside of class. Thirty-two students completed at least the minimal level of points (1-20) to receive full credit for participating in the activity. Approximately one-third achieved scores over 60 points, thereby receiving the rank of Maven.

Table 1

Quest for Knowledge: Final Rankings

	Students	%
Level Zero (0 points)	6	16%
Level One – Novice (1-20 points)	3	8%
Level Two – Apprentice (21 – 40 points)	3	8%
Level Three – Master (41 – 60 points)	11	30%
Level Four – Maven (61+ points)	14	39%

This level of participation, particularly that above and beyond the minimal requirements, seemed to represent a considerable increase in engagement over the traditional in-class review activity, which never engaged students to this degree or depth.

In studies of educational gamification, one of the primary assumptions made is that students will find gamified instruction attractive, because it mimics online games already popular with this generation of digital natives. As part of the Quest for Knowledge, the instructor surveyed students on prior experience with online gaming. 56% of the responses indicated considerable experience with online games, from one responder who said he played "a lot, a lot a lot" to another who indicated earlier use as a small child. What was perhaps more surprising is that a significant portion of the responses (28%) indicated that they had not participated in online games prior to the exercise, citing them as "irrelevant", "pointless", and "a waste of time." Certainly not all of these students came to the exercise with an established fondness and familiarity with the structures and norms of gaming.

Gamification also rests on the assumption that competitive reward structures, such as those found in games, can fuel motivation. While the number of students who participated in the Quest for Capitalism suggests strong motivation, the survey responses are more skeptical and show a much more mixed response by students. The research survey (included as a "quest" for 1 point) asked two open-ended questions about student perceptions of gamification. The first question asked students to relate the reward structure to their motivation.

Table 2

Motivation Assessment

The Quest for Knowledge is based on motivational practices from the concept of gamification. What effect did the use of badges, points, and prizes, have on your motivation to participate?

Question 1:	% Positive	% Negative	Other/Mixed
	48%	49%	3%

On the positive side, students most often stated that the competitive nature of the exercise was a strong motivator. On the other hand, the negative responses suggested both that other rewards (money, grades, peer pressure, success in major) were equal to or more powerful at motivating them to learn. Motivation is a key attribute of gamification, but one that requires further exploration in the higher education environment (Hamari, 2013).

Critics of gamification have suggested that student engagement is superficial—it may seem cool to do, in other words, but it does not positively affect learning outcomes. The second survey question asked students about their perceptions of the connection between gamification and learning outcomes, in this case, a review of the course material prior to the final examination. Despite their skepticism about gamification and motivation, the students participating in this study did perceive that the exercise positively affected their learning (90%).

Students indicated that the quests pushed them to apply the knowledge that they had obtained in the course in new ways, particularly in those quests that required them to teach or communicate ideas to others. As one respondent stated, " Very effective. It makes me think about what I learned in class and apply it to my everyday life. Very cool."

Table 3

Efficacy Assessment

Question 2: How effective was the Quest for Knowledge in bringing together themes of the course for you?

Question 2:	% Positive	% Negative	Other/Mixed
	16	1	1

Other researchers have shown, however, that student perception of learning is not a reliable yardstick for assessment of actual learning outcomes (Clauss & Gedey, 2010). In other words, what students learn and what students think they learn can be two very different animals. Perception of learning has suffered in the literature to the point that some editors do not accept scholarship of teaching and learning studies based only on learner perception, even with validated instruments (DiPiro, 2010). Because the Quest for Knowledge was a review exercise, the degree of student learning from the exercise itself, as distinct from the cumulative knowledge of the non-gamified remainder of the course, is particularly difficult to disentangle. That being said, the researchers did discern patterns to the responses that shed some light on the quest to reach learning outcomes.

One of the criticisms of gamified instruction is that it is better suited for lower-level learning outcomes, such as basic understanding, than for higher-level learning outcomes, such as those related to critical evaluation or creative thought (Dominguez, et al., 2013). The activities designed for Quest for Knowledge were intentionally created to provide a continuum of learning outcomes, and so it is possible to track how many students chose to do those quests associated with lower-order thinking and those with higher-order thinking, as articulated by the Bloom taxonomy.

Interestingly, the students seemed to respond roughly equally to the lower and higher order thinking questions. The instructor did not grade individual quests, but, in spite of this fact, most students participated seriously and provided meaningful responses to all of those quests in which they participated. From the instructor's perspective, Quest 11, in which students had to draw, or otherwise create, an allegory for their ideological perspective on the course themes, was perhaps the most challenging. Not only did nine students tackle this question, they did so at a level of depth and diversity that well exceeded expectations. It would appear from this pattern of responses that students did not shy away from higher-order thinking when choosing their Quests for Knowledge.

The pattern of choices the student players made is perhaps more reflective of other contextual factors. While Quest 1, a simple application exercise called "Who's Speaking," received the highest number of responses, it should be noted this quest was also the first quest to appear on each student's screen. In general, those questions with an experiential component, such as Quest 2a, which required students to leave the classroom and take photos that displayed positive and negative aspects of capitalism, or Quest 27, which required students to purchase fast food, tended to draw higher numbers than those requiring specialized skills, such as Quest 30 which involved quantitative analysis, or the availability of specialized materials, such as Quest 10, which involved contributing a slogan to a "graffiti wall" located in the physical classroom.

Table 4

Quest for Knowledge Activities Ranked by Bloom's Taxomomy

Lower Order Quest Numbers	Responses	Higher Order Quest Numbers	Responses
1	27	2a	18
		2b	5
3	20	6	11
5	13	8	7
7	8	11	9
9	4	15	17
10	3	22	15
12	1	23	15
13	6	24	12
14	21	26	14
16	11	29	12
17	6	30	6
18	14	31	14
19	11	32	1
20	12	34	15
21	10		
25	10		
27	20		
28	8		
34	15		

Students also struggled with questions that required them to form groups, such as Quest 12, which involved setting up a race to complete a structure built from plastic bricks, or Quest 9, which required students to get others to respond to an online poll that they created. Because students completed most of their quests outside of the classroom and all hours of the day, this made the process, perhaps by necessity, much more solitary than it had been as a fully classroom-based exercise. This correlates with the literature on self-paced or competency–based pedagogy, which calls for the need to recreate community outside of the classroom in order to compensate for declining social interaction within it and with the gaming literature that emphasizes the need for social structures in gaming (Hamari & Koivisto, 2013; Petrovic, 2012). In some ways, the students on the Capitalism Quest for Knowledge re-created their own community using social media. Several students created, on their own volition, a Facebook page for the course, which included links, discussions, news postings, and more. On that page, they discussed the Quest for Knowledge extensively with each other (over 150 posts), evaluating its benefits and drawbacks, and providing the instructor with a set of recommendations for the next iteration of the exercise.

Discussion and Implications

One, and perhaps the only, central conclusion that seems to characterize all pedagogical studies is that certain teaching methods or approaches may be better suited for particular disciplinary, institutional, demographic, or individual contexts. In this case, the success of even a limited run of gamified instruction may be due, at least in part, to the interdisciplinary nature of the course. As a subject of study, capitalism is inherently interdisciplinary, integrating elements of history, economics, sociology, cultural studies, ethics, political science, law, and other fields

(Muller, 2003). And that integration is proving to be increasingly popular, and courses in the history of capitalism are on the rise across the United States (Schuessler, 2013).

Interdisciplinary studies, by definition, do not "lay claim to a universally-recognized core of knowledge" but rather seek to draw on disciplinary knowledge while at the time "transcending it via integration" (Repko, 2012). For the gamified course, integration of the diverse disciplinary perspectives is achieved through the persistent narrative structure. Further, the fact that this course is not embedded in a particular disciplinary structure, makes it especially conducive to divergent, constructivist, and non-linear outcomes, also often associated with interdisciplinary teaching (Davies & Devlin, 2006). Whether or not this association with interdisciplinary studies helps or hurts the potential adoption of the pedagogy of gamification is not clear, however, as interdisciplinarity continues to find considerable resistance in U.S. higher education, though there is some evidence that this resistance is waning and more institutions are looking to adopt interdisciplinary approaches, particularly in the general education curriculum.

The researchers gleaned some evidence that the interdisciplinary nature of the course contributed to the success of the Capitalism Quest for Knowledge. In their survey responses, students highlighted the ability to navigate their own paths through the quests, which allowed them to choose those quests that fit best with their major, their interests, or their skills. Some questions or themes were more conducive to those with business majors, for example, while others were more suited to those in the social sciences. With no grade expectation, the exercise allowed students to experiment with perspectives outside of their comfort zone, and to engage in ways of thinking that were new to them, a factor several students highlighted as beneficial. This plasticity may also help to explain the variation in choice of quests. In some ways, it could be said that the gamified quest structure transformed what can be a liability in upper division general education courses, i.e the array of majors and background knowledge, into a strength. Additionally, the survey results showed little to no evidence of student resistance to extreme changes in instructional delivery, a factor often cited in other studies of radical redesigns (Nijhuis, 2005). This is perhaps attributable to the interdisciplinary mixture in the course, so that students did not have a single pedagogical convention from which to form a basis of resistance.

Gamification advocates highlight increased engagement as one of the primary benefits of the approach. Students play online games for hours, and gamification aims to tap into that same deep and persistent motivation. In the case of this class, the findings suggest that this assumption may be an overgeneralization. Most students did participate eagerly in the exercise, but several students, declined to pursue the quests fully. Interestingly, three of these non-participants were among the highest-performing students in the class otherwise, and they could afford to not receive the participation grade associated with the exercise. Each cited lack of interest, particularly in the competitive aspect, as their reason for non-participation. The fourth student who declined to participate simply chose other priorities at the end of the semester. Several students (four) also participated in only the most superficial way, providing only cursory responses, often not even tied to the quest. Across the board, these were all students who had been consistently under-performing throughout the semester. On a more positive note, several other under-performing students showed renewed interest in the course and its material through the exercise and became some of its highest scorers, so the effect was not consistent across the board. These results do seem to be consistent with those associated with other forms of self-directed or competency-based learning (Liaw, 2008; Reeboy & Semb, 1991). Despite the ambiguity of some of these results, the researchers do intent for next iteration of this course to include more, not fewer, gamified elements.

The purpose of this study was to provide evidence regarding the efficacy of gamification in instructional design. It is intended to be part of a larger quest to gather evidence for continued practice. The study is limited in scope, reflecting one group of students, one course, and one institution. This singularity seems likely to play a role in one of the more surprising results of this study, which shows that 28% of the students in the course had not participated in online gaming previously, a statistic that controverts national studies. The institution is located in a very rural area, and it is possible that students growing up in the region did not have access to high-speed internet until very recently. In fact, two respondents specifically state that their homes did not have computers or internet when they were younger.

This sobering reality should remind us, then, that no single form of instructional design or delivery is likely to serve as a panacea, but rather it underscores the complex, extensive, and diverse nature of the Gordian knot that is student learning and motivation. The phrase "too cool for school" has two possible meanings—first, someone who thinks they are superior to others or second, someone who is separate, i.e. part of a culture external to the institution. This study argues that gamification is neither superior nor separate. Based on the experience of this one interdisciplinary course, the evidence suggests that gamification may work very well for some students, some subjects, some institutions, and some instructors, but not everyone will buy into its apparent coolness. Under the right circumstances and with the right design elements, gamification is not a red herring, a flash in the pan, nor a fifth column, but rather can represent a significant tool in a growing instructional toolbox.

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Using student feedback and professor-developed multimedia to improve instructor presence and student learning

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Abstract: This paper explores the use of Professor-Developed Multimedia Content (PDMC) in online, distance education to build a community of inquiry (CoI) through enhanced social presence and real-time, student-driven, adaption of the learning content. The foundation of higher education has long been, developing curriculum to meet educational objectives. Most often faculty relies on assessment information gained at the end of each course. Then assessments, formative and summative, are re-designed based on student feedback/data from end of course surveys and educational materials such as textbooks, articles, and test banks are updated with newer editions. In the distance-learning environment, PDMC provides a creative, innovative, and interactive ways to engage the student for real-time learning. Still, the ability to target PDMC materials to the correct sub-sections of our classroom cohort can produce a richer, more immerse learning experience and perhaps become the closet recreation of in-seat, traditional classroom learning in a distance/online environment. By using PDMC with corresponding surveys, educators can obtain real-time data and metrics to alter content in the classroom immediately, and develop media content welcoming sub-sets of learners with desired content based on learning needs, desires, and feedback.

Keywords: community of inquiry, social, cognitive, and teaching presence, distance education

Introduction

Based on Dewey's work (1933; 1967), Garrison, Anderson, and Archer (2000) introduced Community of Inquiry (CoI) as a framework for collaboration and learning transactions in computer-mediated higher-education environments. Strongly based in constructivism, CoI presents *presences (social, cognitive and teaching)* used to identify learner and educator behaviors that are widely accepted as central to productive online learning.

Garrison (2007) discusses the power of social, cognitive, and teaching presences in an online community of inquiry. In addition, Garrison examines some of the early challenges in creating and maintaining social, cognitive, and teaching presence in an online community of inquiry as well as the methodological validity associated with the CoI framework. Garrison refers back to the work of Dewey (1933), which suggests some of the elements of cognitive presence for learning. The authors of this paper focus on the CoI elements, to create exploration

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and integration, as well as risk-free expression and information exchange (student to professor/professor to student) for connecting and applying new ideas in an online course.

Using Professor-Developed Multimedia Content (PDMC) along with end of content surveys, professors can collect data to create a dashboard of student learning experiences. This dashboard helps professors modify existing content near-real-time; change content; offer content in a different form (e.g., step-by-step modeling, lecture material, or interactive practice/application); and target, through time stamps, announcements and *triggers* to students about new content available in the classroom. The authors believe that student feedback and PDMC greatly enhance student learning by providing a dynamic environment; one where students have *control* over their learning experience, and are more involved through increased engagement and investment in the learning process. In addition, by using end-of-content surveys, instructors can reduce the influence of irrelevant information as well as present a mastery-approach orientation in an online, graduate course (Adams, et al., 2008; Crippen, Biesinger, Muis, & Orgill, 2009).

In this paper, the authors provide examples of how teaching presence though PDMC and student surveys improved student learning outcomes (cognitive presence), as well as increased student engagement and feelings of connectedness (social presence) to course concepts and learning objectives. The authors present (a) examples, (b) student feedback, and (c) data analysis demonstrating the positive influence of PDMC on students' learning experiences.

Literature Review

The focus of the research presented in this paper is CoI and PDMC. Literature older than 2000 or conducted exclusively on traditional, classroom-based learning was excluded from the review of literature. With one exception, research older than 2000 was allowed strictly for reinforcement, background, or historical context of learning research methods and findings. Any studies researching blended learning, focused specifically on the in-person aspect were eliminated from consideration because of the author's belief that PDMC is most effective in predominately remote teaching arrangements where students are geographically dispersed with minimal, if any, face-to-face interaction with educators. In addition, by eliminating this aspect of blended courses, this paper encourages low-bandwidth, and ADA compliant PDMC for engagement of a larger audience of the student cohort.

Defining Distance Education and Online Learning

Distance education has come to be known by many names, "These include distance learning, open learning, networked learning, flexible learning, distributed learning, independent study, learning in connected space and, today, on-line learning is common (Tracey & Richey, 2005, p. 17)." Tabata, and Johnsrud (2008, p. 26) identify distance education as a method that "uses technology to deliver instruction and learning freed from the geographical and time constraints associated with face-to-face instruction."

Kiryakova (2009, p. 29) suggests, "distance education is a form of education in which the participants in educational process – teacher and learners are physically separated and communicate by different means and at different times." This later was incorporated into the work by Moore's (2013, p. 68) Transactional Theory in which "transaction in distance education

is the interplay of teachers and learners in environments that have the special characteristic of their being spatially separate from one another."

Online learning readily fits this definition of distance education as the courses use the Internet as the classroom, all activities including content and collaboration are online, teachers and student discuss and interact with each other and the content without being in the same place and same time (Paulsen, 2002). With the increased number of online courses, programs and degrees, many now consider online learning as a modified version of distance education (Benson, 2002). This paper focuses on online learning occurring at a distance, in which a course designed using PDMC is delivering content using a theoretical framework of community of inquiry in an attempt to meet the needs of students separated from the instructor through distance and time.

Benefits to Online Learning

There are many reasons why students prefer online courses as these courses have the advantage of flexibility of learning on a 24/7 schedule, providing diverse learning environments, communicating with instructors frequently and outside of office hours, and allowing work and education to co-exist (Vansickle, 2003; Farzaneh, 2011). Large class size can also be used in online learning to allow for economy of scale when teaching entry level or survey types of courses (Kiryakova, 2009). One study indicates that online learning "is a suitable means for learners who have a preference of doing individual work rather than collaborative work, and a good way to improve critical thinking as well as reducing *peer distraction"* (Lei & Gupta, 2010). Li and Irby (2008) note that shy students and limited English speaking students are more able to participate in discussion online. The lack of face-to-face contact can be a motivator for these students and reduce the fear of engaging in discussion in face-of-face classes allowing them to collaborate with their peers and build collaboration skills. Salmon (2004, p. 18) suggests, "Although many people find the lack of visual clues strange, messages are 'neutral' since you cannot see whether the sender is young or old nor need to consider their appearance or race." Students preferring individual work as opposed to collaborative work may also gravitate toward online learning (Lei & Gupta, 2010).

Community of Inquiry (CoI)

To support the development of a sense of community, being part of a group and *belonging,* higher education has become interested in the levels of interaction between and among students as a means of increasing learning. In an examination of community and *belonging*, Garrison et al. (2000) developed the Community of Inquiry framework which has evolved to focus on cognitive, social, and teaching presence (2007) for building that sense of *belonging* in online learning environments. Kupczynski, Ice, Wiesenmayer, and McCluskey (2010, p. 23) state CoI is "a theoretical framework that explains the online learning experience in terms of interactions between three overlapping presences: Teaching, Social, and Cognitive."

Alman, Frey and Tomer (2012) and Annand (2011) state in their research that these three presences (cognitive, social, teaching) overlap and interact providing a better understanding for the learning online. Swan and Shih (2005) note a strong association with teaching presence and social presence and the perceived learning in an online course. Kang, Liew, Kim, & Jung (2011) in studying the three elements of CoI determined that a "high level of perceived presence should

lead to successful learning." Nyachae (2011, p. 21) adds "The Community of Inquiry (COI) framework is a model that shows the process and theory of research behind online learning and instruction." Educators can take advantage of the CoI by through course design with implementation of collaborative activities to build a community of learning that increases student learning (Jinks, 2009). Also, Jinks (2009, p. 31) suggests that "social presence and teaching presence are more critical for establishing, supporting, and enhancing the educational experience."

Cognitive, Social, and Teaching Presence

Cognitive presence is often defined as "the extent to which online learners are able to construct meaning and critical thinking through sustained communication" (Ke, 2010, p. 809). Garrison (2009, p. 355) in his later work defined cognitive presence as "A process of practical inquiry distinguished by discourse and reflection for the purpose of constructing meaning and confirming understanding." Garrison added that assuring appropriate course design and facilitating activities and discussion could play a role in influencing cognitive presence

Jinks (2009, p. 30) supported this with, "The cognitive presence of a student may be affected by their peers' interactions (social presence) or may be affected by the design or facilitation of the course (teaching presence)."

Social presence and teaching presence are essential concepts in online courses (Picciano, 2002). Social presence is the more frequently of the *presences* compared with teaching and cognitive presence. Social presence has a strong impact on student learning outcomes and satisfaction (Noteboom & Claywell, 2010). The success of an online course and the quality of the learning experience by a student can be influenced by social presence and increase collaboration allowing a student to feel connected to others (Sung & Mayer, 2012).

Teaching presence is often stated as, "the ability of a teacher or teachers to support and enhance social and cognitive presence through instructional management, building understanding, and direct instruction (Dunlap & Lowenthal, 2009, p. 133)." "Teaching presence includes subject matter expertise and the design, management and facilitation of learning (Greyling & Wentzel, 2007, p. 656)." Bangert (2008, p. 40) identifies teaching presence "as the 'methods' that instructors use to create quality online instructional experiences that support and sustain productive communities of inquiry.". There is a strong correlation between students' satisfaction and instructors' presence in providing clear expectations, timely responses, and engagement (Jackson, Jones, & Rodriguez, 2010) .

The role of the instructor in the instructional design and organization, facilitating discourse, feedback and evaluation, building the course materials, planning for individual and group activities, planning the timeframe, and guiding students through net etiquette and technology use, can build student satisfaction and connection to the content (Anderson, Rourke, Garrison, & Archer, 2001). "When discussing the benefits of teaching presence, a study by (Mayne & Wu, 2011) suggested that teaching presence compared with the two other elements of community of inquiry, social and cognitive presence, is more powerful and its existence has an influence in facilitating interaction among students (p. 57)." Teacher presence is a better predictor of the perceived interaction in a course than social presence as teacher presence explained twice the variance in the outcome variable in a study by Swan & Shih (2005).

While outside factors such as course completers, online, non-completes, and student demographics carry tremendous influence on student success, this paper focuses on engagement

when the student is 'present' and not whether PDMC could be a sole determinant of student success, but a contributor to a larger process of engagement (Garrison D. , 2007; Traver, Volchok, Bidjerano, & Shea, 2014).

Student Satisfaction

Student satisfaction is the centerpiece to effective education. This is especially important in a distance-learning environment because student satisfaction is influenced by relationships and academic success (Maceli, Fogliasso, & Baack, 2011). An additional concern for online education is the increased opportunity for students to feel disconnected and isolated from other members of their cohort and their educator. PDMC helps reduce student isolation by providing dynamic content through instructional videos, live and recording professor lectures, and how-to demonstration videos. PDMC increases learner-content interaction which has been found to be the ". . . largest unique variance in student satisfaction (Kuo, Walker, Belland, & Schroder, 2013, p. 16)."

Student learning styles vary greatly, therefore creative and interactive methods of teaching are needed in order to increase theoretical, affective, and perceptual skills required in an educational program (McDonough & Osterbrink, 2005; Brannan, White, & Bezanson, 2008; Melrose, 2004; Rassool & Rawaf, 2007; Rothgeb, 2008). Today's adult learners are digital natives born after 1980. For these learners, technology has become a lifestyle (Hawranik & Thorpe, 2008). These learners embrace technology, and as such, distance education should emulate this environment by providing dynamic, high fidelity content that allows students to apply theoretical knowledge in real time (Curtin & Dupuis, 2008; Fountain & Alfred, 2009).

Online multimedia

Students believe that multimedia content enhances learning in distance-based courses, especially when content is linked to specific course needs (Chrisfield, Cosgrove, & Stinson, 2000). PDMC is most effective at building students' skill using a Do-It-Yourself (DIY) or follow-along format because it provides the appropriate conditions to understand, remember, and apply instructions (Brinkmanc, Buil, Cullen, Gobits, & Van Nes, 2001). DIY PMDC is more effective when instructions are short and clear with four-to-five steps per completion step, which helps memory when switching between instructional PDMC and the actual task (i.e., constructing a gains and loss, financial spreadsheet) required (Brinkmanc, Buil, Cullen, Gobits, & Van Nes, 2001).

PDMC provides formative evaluation processes to distance education which allows the " … systematic collection of information for the purpose of informing decisions to design …" thus creating product improvements (Flagg, 1990, pp. 1-2). PDMC using DIY content provides gradual improvement of students' design from rounds of evaluation and feedback (steps in the process, a 'completed' example from the instructor, and grading feedback); in other words, a heuristic evaluation (Nielsen, 2005). Through this process, PDMC is vital to the establishing of experiential learning theory where "Knowledge results from the combination of grasping experience and transforming it (Kolb, 1984, p. 41)."

Coupling PDMC with end of content surveys increases the students' and the instructor's control over content and allows content to be altered within days of feedback being received. Chen, Moore, & Vo (2012) discussed the need to provide students with incentives to complete

surveys through the awarding of extra points, but that new methods of incentive may be needed to improve the amount of and criticalness of student feedback. For this study, all student responses were anonymous, thus challenging the validity of awarding points for responses as these may skew results creating false-positive responses.

In addition, PDMC helps online learning move towards embracing synchronous communication, virtual reality, and mobility (Salmon, 2004; Dirckinck-Holmfeld, 2002). Finally, the move towards mobility may be the single-most important priority for distance education because hand-held instructional media provides incentives to online students to increase their willingness to engage in learning activities through method and media effect, without adding extraneous points to established, tested, and proven grading rubrics and assessments (Sung & Mayer, 2013).

Case Study

This case study consists of a course offered as part of an online Master of Business Administration (OMBA) program from a large, mid-west university located in the United States. The course content relates to data analysis used in business. Although many topics were covered in the course, the primary learning outcomes of the course included (a) data management; (b) data modeling; and (c) business applications of probability and statistics. To study the effectiveness of PDMC, the results of two course offerings were compared within the 2013-2014 academic year. Both course offerings (111 students in the fall and 83 students in the spring) were held to the same academic rigor.

Four questions were analyzed for this specific research involving PDMC that pertained to student satisfaction. These questions were:

1. *The course materials effectively stimulated my interest in the subject/content.*
2. *The course materials (e.g. textbook, readings, website links, etc.) enhanced my learning and helped me to achieve the learning outcomes.*
3. *The narrated lectures and interactive presentations enhanced my learning and helped me to achieve the learning outcomes.*
4. *The virtual classroom sessions enhanced my learning and helped me to achieve the learning outcomes.*

The course and designed learning content, including PDMC was initially designed in TechSmith's Camtasia® the summer before the 2013-2014 offerings. The PDMC consisted of (a) voice-over Microsoft PowerPoint®; and (b) voice-over Microsoft Excel® with add-in features chosen based on the assignment's learning objective(s). In general, the course's instructional delivery method was 'learning by doing' or Do-It-Yourself (DIY). Simply stated, students watch PDMC (videos) and follow along with instructions narrated by the instructor as they work to solve business-case problems. In addition, the business-case problems were described in an accompanying course video; a purely descriptive session covering learning objective(s) without step-by-step instructions. PDMC videos ranged from 10- to 30-minutes depending on the complexity of the teaching-topic. Because the case study focuses on students in a distance, Master of Business Administration (MBA) program, it is worth noting that Evans (2006, p. 32) stated, "[Business students] must learn the skills of the future, not necessarily the skills of today." PDMC allows instructors to tailor content 'today' and ensure pedagogy methods teach current, relevant skills for business professionals.

For example, *Figure 1* shows an example of PDMC for a module titled "*Visualizing Data.*" For this particular activity, students begin with an Excel® spreadsheet consisting of sales and demographic information related to the customer transactions of blockbuster movies in the form of DVDs. The students are introduced to the problem at the beginning of the video, where the learning objectives/outcomes are stated. For this particular example, the learning activity video walks a student through the process of turning the raw data into a visual dashboard via Excel® Pivot Tables, Charts, and Slicers. By the end of the video, students walk through several scenarios in an attempt to understand the raw data through the use of the dashboard created. As a result of the exercise, students answer questions related to movies purchased by gender or age demographics.

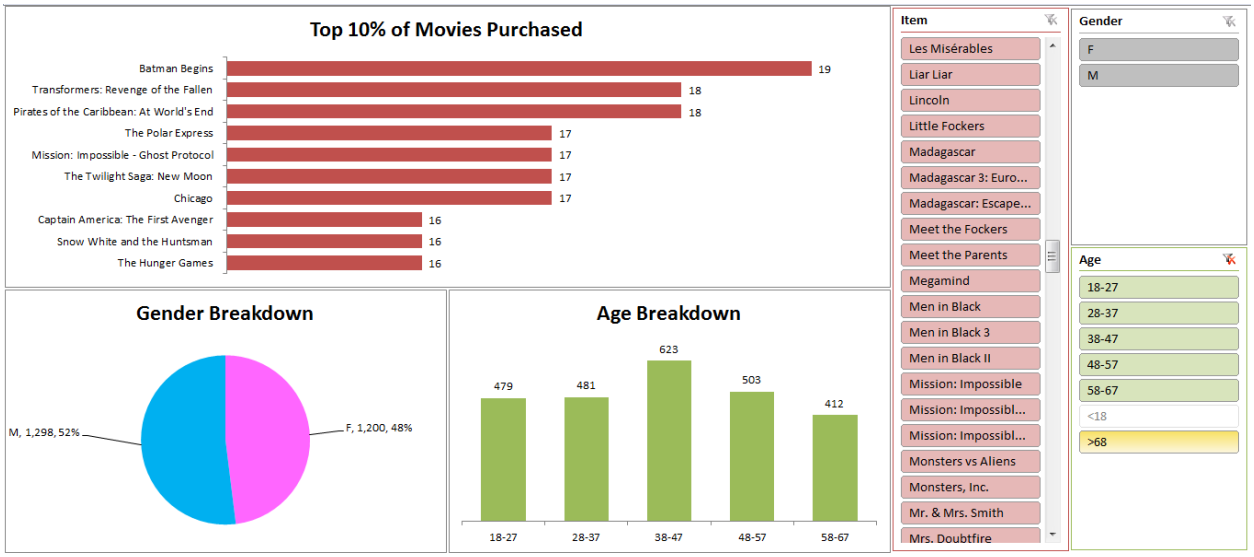


Figure 1. Example of PDMC

It is important to note that the spring version of the course started with the content that was used in the fall offering. However, there was one difference with the addition of relevant embedded code within video files created with TechSmith's Camtasia® that after completion of the video-play, the code directed students to a (free) Google Forum® with three end-of-content questions. The instructor of the PDMC sought to reduce the number of questions in order to promote more responses from the students in the course (social presence) and to (a) capture the value of the PDMC instructionally (cognitive presence); (b) reduce extraneous data that might cause confusion (cognitive presence), and (c) focus the faculty's efforts on improving student engagement (teaching presence).

The survey, which is shown in *Figure 2*, is presented to the students in their web-browsers after the video is over. The first question states, "*This video taught the identified learning objectives well*," and the second states, "*I will be able to apply what I learned from this video to my profession*." For these two required questions, a linear, 5-point Likert scale was used, ranging from Strongly Disagree to Strongly Agree. The final optional question was open-ended, where students could leave additional, free-text comments, which would be the primary source of information used by the instructor to modify course content in near-real-time.

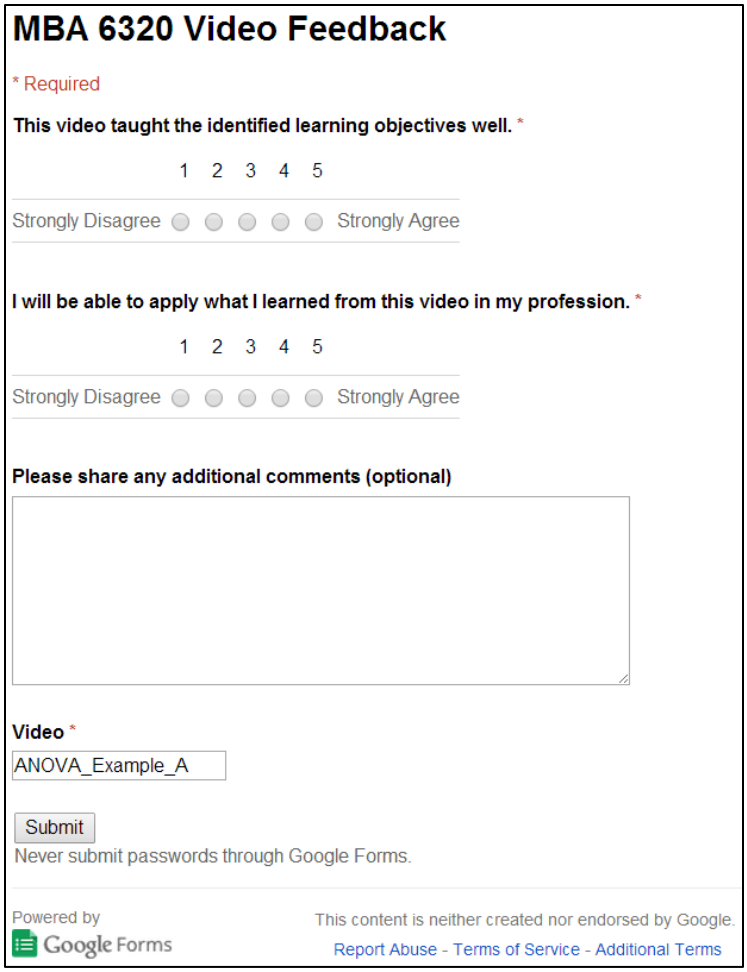
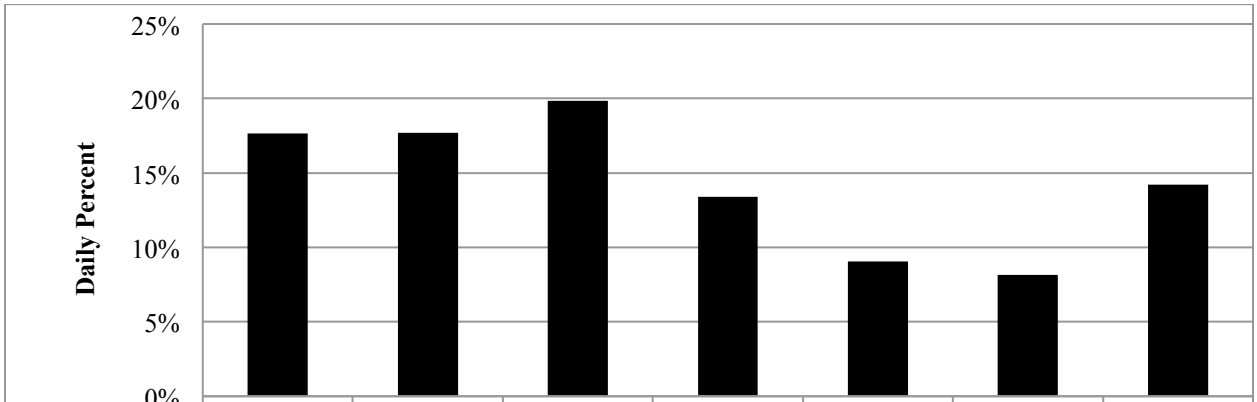


Figure 2. Feedback Questionnaire

From the survey shown to students at the end of watching a learning activity, PDMC video, points of data were retrieved from the Google Forum® and examined in a dashboard that was created in Excel® by the instructor. For example, Google Forum® data was summarized to provide a summary of what days students watched PDMC videos. This descriptive statistic was valuable because of the format and schedule of the course. The OMBA program targets working professionals with at least three years of professional working experience. Therefore, the students are not full-time students, and take a single class at a time. The semester is broken down into two terms (i.e., Term A and Term B); each term is seven weeks in duration. In addition, for the case-study class, there were two, synchronous online virtual sessions offered to students each week on Thursday and Saturday using Adobe Connect® a web-conferencing application. Based on this class section (*Figure 3*), the data indicates that the students actively participated in PDMC during times recommended by the instructors. In other words, students were asked to watch all forms of PDMC before coming to the first virtual session a week, which is indicated by the lowest participation rate average on Thursdays. This metric is valuable to the instructor as a measure of effective role-modeling (i.e., appropriate use of time and preparation for the course, students following the instructor's directions) which could indicate the effectiveness of PDMC as participation rates on Thursdays should gradually decline as students respond to and instructors engage in the tailoring of the PDMC to student needs. This presents an indicator to the instructor

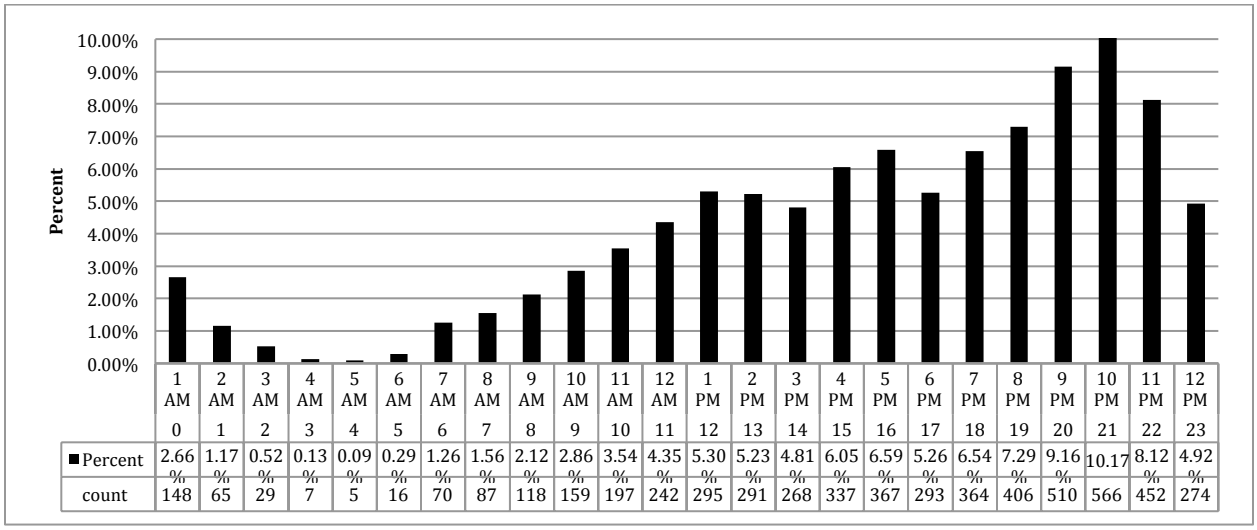
for lesson/discussion topics during Virtual Office sessions. Simply stated, as students realize the value of PDMC in the course, their engagement (viewing) would gradually increase throughout course weeks.



	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Percentage	17.66%	17.68%	19.83%	13.38%	9.07%	8.14%	14.23%
Count	983	984	1104	745	505	453	792

Figure 3. Days when Students would watch PDMC

Similar to *Figure 3*, the survey results can be summarized in terms of what time of day students watch learning activity videos. This particular information, which is shown in *Figure 4*, is useful for faculty as an indicator of when to dedicate certain periods of their day to respond to questions via e-mail and discussion boards. The instructors planned their interaction around student-peak times, increasing social presence; a major indictor for developing a CoI.



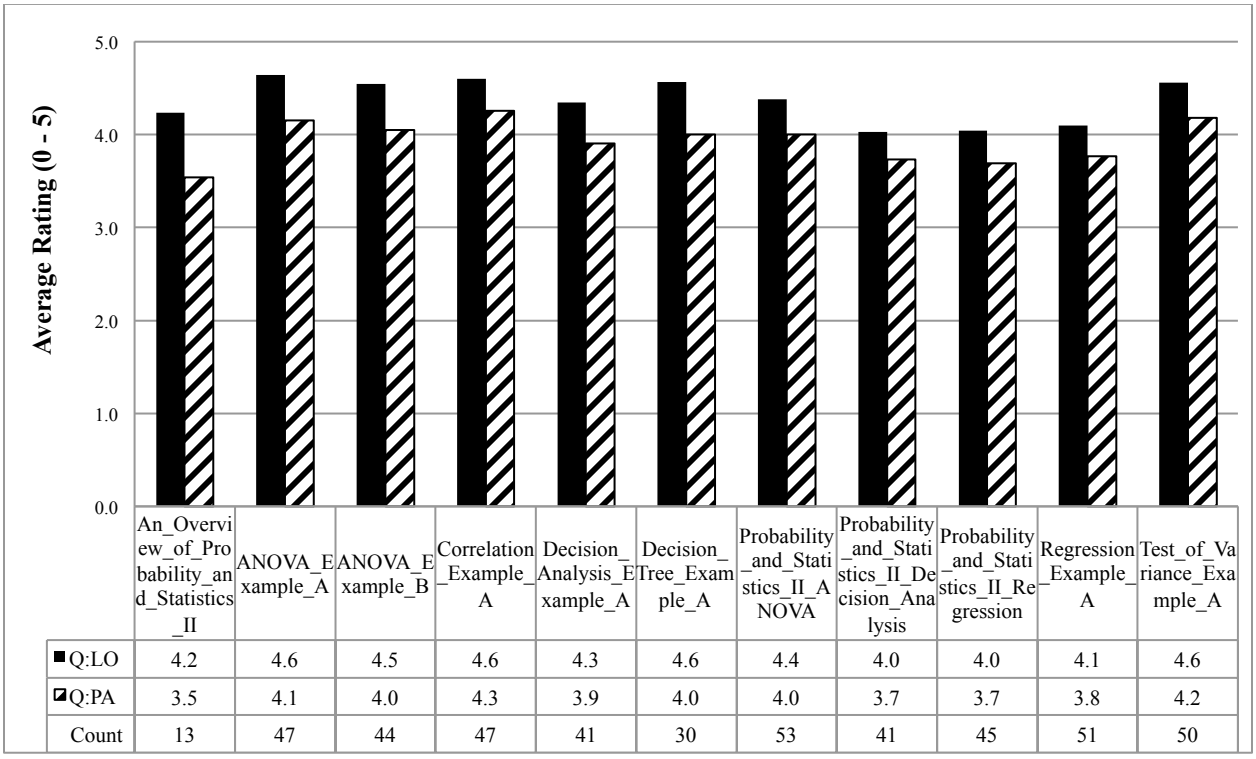
	1 AM 0	2 AM 1	3 AM 2	4 AM 3	5 AM 4	6 AM 5	7 AM 6	8 AM 7	9 AM 8	10 AM 9	11 AM 10	12 AM 11	1 PM 12	2 PM 13	3 PM 14	4 PM 15	5 PM 16	6 PM 17	7 PM 18	8 PM 19	9 PM 20	10 PM 21	11 PM 22	12 PM 23
Percent	2.66%	1.17%	0.52%	0.13%	0.09%	0.29%	1.26%	1.56%	2.12%	2.86%	3.54%	4.35%	5.30%	5.23%	4.81%	6.05%	6.59%	5.26%	6.54%	7.29%	9.16%	10.17	8.12%	4.92%
count	148	65	29	7	5	16	70	87	118	159	197	242	295	291	268	337	367	293	364	406	510	566	452	274

Figure 4. Time of Day when Students would watch PDMC

As noted by the instructor that developed the PDMC, there were two primary questions of interest, which were displayed to students after the PDMC video was viewed. It should be noted that the question "*This video taught the identified learning objectives well*," from this point forward will simply be abbreviated as Q:LO in all proceeding figures. In addition, the second

question, "*I will be able to apply what I learned from this video to my profession*," will be abbreviated to Q:PA from this point forward in all graphs. *Figure 5*, provides an example of a grouping of required PDMC videos, called modules, which students were expected to complete in a weeks' time. The particular module consisted of an overview titled *An Overview of Probability and Statistics II*, and specific PDMC videos were provided on (a) correlation; (b) regression; (c) an analysis of variances (ANOVA); and (d) decision theory and analysis. The figure summaries the average results of the 5-point Likert scale for each the two primary questions asked on the student survey. Though none of the PDMC videos rate below a 3.5 average ranking in either category, the results indicated that there is further refinement needed as to determine whether students do not perceive the PDMC content as useful or that additional survey tools are needed to create more specificity on the reasons for 'low-ranking' viewing of certain video content.

Therefore, an instructor viewing this data could choose to either do nothing or act on the information provided by the rankings. Acting on the feedback, the instructor could revise learning content placing additional emphasis on why the content is relevant to various business professions. In addition, the instructor could discuss reasons why the course topics are relevant through other course-methods such as in e-mail, discussion board, or during weekly, virtual sessions providing reinforcement of the PDMC through teaching presence and/or social presence.



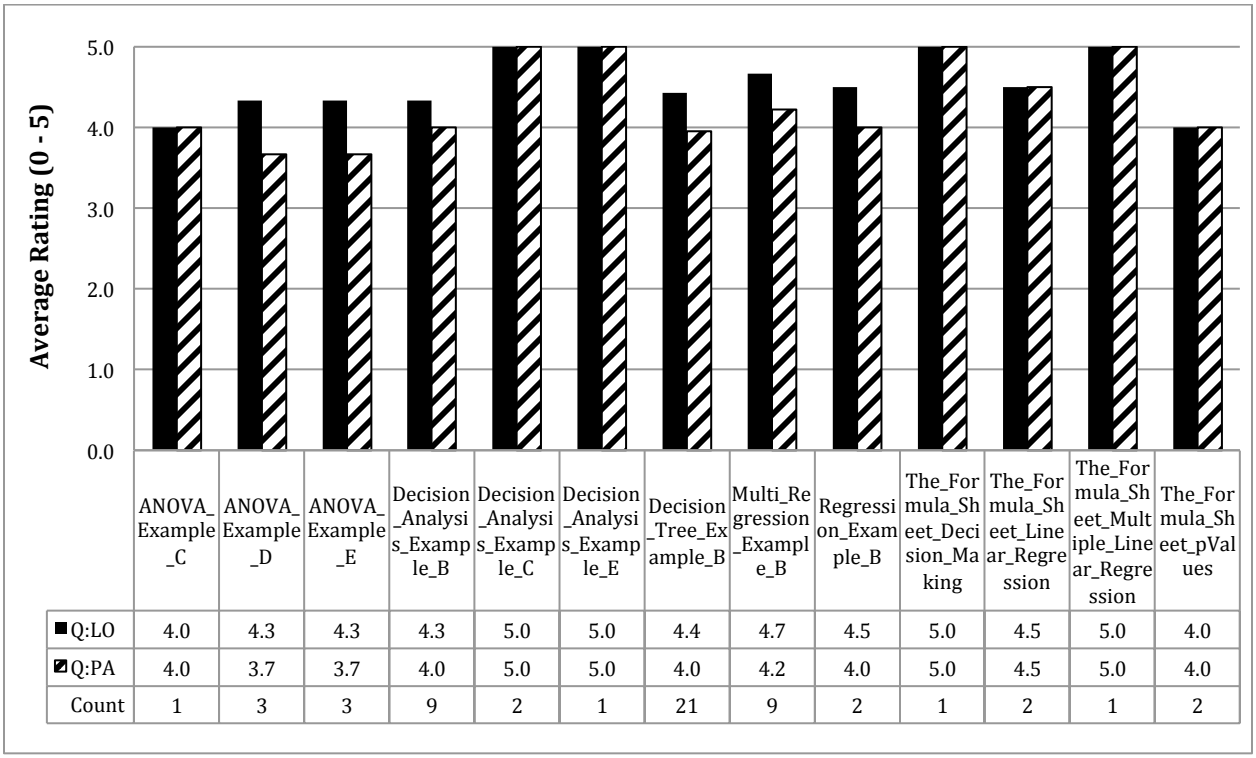
	An_Overview_of_Probability_and_Statistics_II	ANOVA_Example_A	ANOVA_Example_B	Correlation_Example_A	Decision_Analysis_Example_A	Decision_Tree_Example_A	Probability_and_Statistics_II_ANOVA	Probability_and_Statistics_II_Decision_Analysis	Probability_and_Statistics_II_Regression	Regression_Example_A	Test_of_Variance_Example_A
■Q:LO	4.2	4.6	4.5	4.6	4.3	4.6	4.4	4.0	4.0	4.1	4.6
◪Q:PA	3.5	4.1	4.0	4.3	3.9	4.0	4.0	3.7	3.7	3.8	4.2
Count	13	47	44	47	41	30	53	41	45	51	50

Figure 5. A Module's Required Learning Activities Example

Another unique point to be made of PDMC for this course is the use of required and optional learning content. The course developer designed required content that students were expected to watch and developed optional material to challenge students or provide additional information to students seeking to gain a deeper understanding of course learning objectives.

This supports adult-learning theory by offering students more *control* over their learning environment by choosing only course requirements or choosing a more robust experience supplemented by additional PDMC content.

Figure 6 shows the average results for optional content, which was built in to the same module as what summarized in *Figure 5*. Though the sample sizes are low for many of the videos, over time, instructors could monitor average rankings of PDMC videos, and decide if a video needs to be moved from an optional library to the required library. Likewise, an instructor could remove a video from the required library, and move it to optional material, if the PDMC content's ratings were less favorable compared to the optional material. In addition, instructors and even other students could recommend specific optional content to students seeking help with assignment problems. In terms of *Figure 6*, the reason why one video (i.e. Decision Tree Example B) was evaluated more than the other learning activities within the module were because the learning objectives covered where related to a particular homework assignment. While simplistic in description, the ability to shift content based on course-specific cohorts offers a tremendous opportunity to build a learning experience based on student needs, level of professional experience, engagement in activities, and comfort-level with multimedia content.



	ANOVA_Example_C	ANOVA_Example_D	ANOVA_Example_E	Decision_Analysis_Example_B	Decision_Analysis_Example_C	Decision_Analysis_Example_E	Decision_Tree_Example_B	Multi_Regression_Example_B	Regression_Example_B	The_Formula_Sheet_Decision_Making	The_Formula_Sheet_Linear_Regression	The_Formula_Sheet_Multiple_Linear_Regression	The_Formula_Sheet_pValues
Q:LO	4.0	4.3	4.3	4.3	5.0	5.0	4.4	4.7	4.5	5.0	4.5	5.0	4.0
Q:PA	4.0	3.7	3.7	4.0	5.0	5.0	4.0	4.2	4.0	5.0	4.5	5.0	4.0
Count	1	3	3	9	2	1	21	9	2	1	2	1	2

Figure 6. A Module's Optional Learning Activities Example

The final question of the student survey included an open-ended, free-text question. At times, the comments left by students were brief, and reflected feelings or emotions instead of content-related feedback. For example, the following is a sample of reactions left by students:

- *Loved it!*
- *Awesome!*
- *Eyes Crossed*
- *I actually stopped the video and then proceeded to the solution on my own. I was*

correct, YaY!
- *OH MY!!!*
- *Tricky!*
- *I like to see more like this.*
- *Yay the light bulb had gone off!*
- *Whew!*
- *Very Strong video!*
- *More great stuff, can't wait for more!*

Although brief, the sample expressions above provide an instructor the opportunity to gauge student's overall reaction and enthusiasm after viewing the PDMC and lay a foundation to communicate with the student body. If there are reactions that indicate the students had difficulty with the content, the instructor could communicate in more compassionately when answering questions via (a) e-mail, (b) discussion forums, or (c) presenting material during weekly, virtual-sessions. Likewise, if students react more positively to the PDMC content, perhaps an instructor can communicate additional applications or professional relevance of the content presented. Again, use of the PDMC supports a more robust experience for students by allowing tailoring of content to the student experience.

Besides reaction-based feedback, students often left feedback classified as either favorable, which might indicate to an instructor that he or she has created content that is thought of as highly useful by students or perhaps less favorable where an instructor needs to take immediate action. For example, the comments below were taken from survey results and classified as favorable outcomes, which also provides the instructor positive reinforcement that his or her PDMC is well received, thus encouraging more development and creativity.

- *Very impressive learning activity video! To date, the most useful tools to apply to my business. Shows how we can tie the other things learned together to create a powerful business application.*
- *Very clear demo of how to use a simple strategy with broad applications that can save loads of time and effort.*
- *Immediate knowledge for my profession and current position. Thank you!*
- *Very helpful for business applications. The use of examples and how this can be applied to business is very useful in the learning process.*
- *Straightforward, well-spoken, and easy to follow along.*
- *The yellow round highlighter very helpful.*
- *Awesome video and techniques! I can't wait to put them to work.*

As demonstrated above, the feedback was positive, and could give an instructor clear evidence that PDMC was well-received, which might suggest that additional content be developed in a similar manner. However, there were certainly less-favorable comments. These comments were reviewed and determined to be critical to the instruction and overall experience by the students in order to improve the learning content made available to students for this class. For example, students stated:

- *It would be helpful to have the slides available outside of the video for learning activities that ask students to attempt to solve a problem prior to finishing the video.*
- *Video cuts out after 7 minutes. Ending is not included.*

- *Please slow down, it is hard to keep up and understand what you are doing. I am following the steps but don't know what it all means.*
- *Not sure if it was just my computer or not, but there was a blue box on the middle of the screen the entire time.*
- *This video was better than in the required version*
- *It would be nice to be able to print off the sides, so we could take notes on them instead of writing down everything on the sides.*
- *Not sure video is complete. I think it's missing the full conclusion as well as the correct graph.*
- *This should be the first lecture video for the module! It's making so much more sense!*
- *The formulas are extremely complex and are not practical in my work environment.*
- *The length of the video was longer than needed for the content that was presented.*
- *I felt this was very poorly explained. I've taken stats before, and not too long ago, and I could not follow this.*

From an instructor point of view, there are many good points raised in these comments concerning the development of PDMC. Specific to individual learning of content these comments provide indictors for specific actions to take with specific videos. This is unlike end of the course evaluations where feedback can be more general and instructors do not have enough information to make informed changes to content such that content remains unchanged.

Students are providing direct feedback on the organization of the content as well as its value to obtaining learning objectives. In some cases, students pointed out technical issues unknown to the instructor. Depending on the technical error identified, instructors made necessary changes to create a more effective learning environment for students who may not begin learning activities because of technical errors. Finally, comments that were made related to the content not being satisfactory or related to additional materials needed, allowed the instructors to make these available to the students to improve their learning experience.

Findings

Students were surveyed after the completion of each course offering and were asked twenty-two, Likert scale questions about course content, and the instructor. The selection of responses ranged from Strongly Agree (5) to Strongly Disagree (1) with neutral represented by (3) and N/A or no-response represented by (0). In terms of the analysis, a two sample, one tailed z-test was chosen for the analysis. As noted, the two sample groups included a fall and a spring offering of a graduate-level course in an OMBA program, where the fall student body included 111 students and the spring offering consisted of 83 registered students. For this analysis, the hypothesis (H_1) was that using PDMC feedback produced improved survey scores on the questions asked specifically about course content. The null hypothesis (H_0) was that there would be no difference in survey scores on course content questions between a course offered with or without PDMC. A p-value of 0.05 was used to measure statistical value. Before the two-sample, one-tailed z test was performed; the descriptive statistics were computed and are shown in

Table 1.

Table 1

Descriptive Statistics Before and After PDMC Feedback

	Before PDMC Feedback				After PDMC Feedback			
Question	**N**	**Mean**	**Mode**	**Stdev.**	**N**	**Mean**	**Mode**	**Stdev.**
1	50	3.90	4	1.07	55	4.45	5	0.69
2	47	4.00	4	1.04	54	4.43	5	0.81
3	50	3.96	4	1.05	54	4.57	5	0.69
4	28	3.71	4	1.12	31	4.45	5	0.77

Of the four questions analyzed, each resulted in a p-value less than the pre-determined alpha value of 0.05. Thus in each case, there is sufficient evidence against the null hypothesis. In other words, PDMC feedback was used effectively by the instructor to improve the overall satisfaction of students within the four categories chosen for analysis. A summary of the statistical findings is shown in
Table 2.

Table 2

z-Test Results

Question	z Test Statistic	z Critical Statistic (one-tail)	P(Z<=z) one-tail
1	3.096	1.645	0.001
2	2.293	1.645	0.011
3	3.472	1.645	0.000
4	2.927	1.645	0.002

Discussion

This data shows a positive correlation among (a) student satisfaction, (b) knowledge attainment, and (c) overall success in an online learning environment using PDMC. Moreover, the data shows active student involvement as well was professor-engagement; further proving the effectiveness of social and cognitive presence (student-to-professor, and professor-to-student), cognitive (student-to-professor, and professor-to-student) as well as teaching presence (professor-to-student, and professor-to-media) in creating a CoI. Altering course content based on student feedback represents a new element of CoI in online learning as professors can promote content actively (through e-mails or course announcements) and/or passively (reviewing survey feedback). The addition of passive engagement helps promote students' sense of ownership over content and their learning experience; to a nearly 100% customizable learning content/environment. Furthermore, survey questions can be developed that ask students directly

if the PDMC helped promote a sense of connectedness to their learning experience (the hallmark of effective CoI creation).

The limitations of this study are the course content (an MBA course) where some of the PDMC has a direct influence on student success as they view learning activity videos while actively working on problems. In this particular course, a major emphasis was dedicated to developing dynamic spreadsheets to analyze and manage business data, as well as investigating statistical relationships that help managers augment their business decisions.

Another limitation is the strict exclusion criteria used due to the small repository of research on direct influences of multimedia content on student satisfaction. Additional research, controlling for outside variables on student satisfaction is needed to make a stronger, direct connect between PDMC and student satisfaction; however, a statistically significant connection suggests that PDMC has a strong, positive influence on knowledge attainment and student satisfaction.

Conclusions

PDMC and end-of-content feedback is useful towards promoting CoI in a distance-education/online learning environment by providing instructors with times of high-traffic, specific student feedback about PDMC relevance, and prompt notification of technical errors. When instructors can respond in high-traffic times, they capture students when they are *ready to learn*. Student responses suggest that by providing pointed feedback and direction during these times there can be increased knowledge attainment by creating a supportive atmosphere for teaching presence.

Furthermore, instructors know when a specific learning activity needs revision as well as knowing when learning content needs to be re-classified as required or optional based on the cohort's needs and composition. This increases the value of the student's learning experience as they recognize in near-real time content changes based on their feedback, providing students *control* and *customization* of their learning environment.

Overall, this strategy enables faculty to identify student needs in order to improve course-content for future offerings. In many cases, changes can be made in a short period. This explicit feedback overcomes the limitation of end of the term evaluations, where students often leave general or low-level feedback, which is difficult for instructions to react to in a timeframe that improves the learning experience of students leaving feedback.

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Inverting a non-major's biology class: Using video lectures, online resources, and a student response system to facilitate deeper learning

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Abstract: Instructors hypothesized that inverting/flipping a non-major's biology class by using pre-recorded video lectures, online resources, and a student response system (iClicker), would facilitate deeper learning. Following an inverted classroom format, students viewed lecture videos and completed online activities prior to face-to-face meetings with instructors. During face-to-face (traditional "lecture") time, instructors tested student knowledge and guided students in group learning activities. Using a quasi-experimental design, researchers compared student performance on a comprehensive final exam with student performance from a previous semester. An independent sample t test indicated that students engaged in the inverted instructional model (N = 73, M = 74.49, SD = 12.54) performed better than students engaged in a traditional model of instruction (N = 76, M = 70.32, SD = 12.19), t(147) = 2.06, p = 0.02 on the same comprehensive final exam. The effect size for this analysis (d = 0.33) represents a small effect according to Cohen (1988). Researchers also performed a chi-square test of goodness-of-fit to determine if final lecture grade distributions from the inverted model differed from the traditional model. Final lecture grade distributions from the inverted model were significantly different, X^2 (5, N=102) = 30.22, p < .05, showing a decrease of "F" and "Withdraw" grades for the inverted model.

Keywords: Pedagogy, Inverted, Flipped, Higher Education

The inverted or flipped classroom is a current trend in higher education and has been implemented in various forms from kindergarten to college (Thompson, 2011). Walvoord and Poole (1998) noted that the traditional lecture has historically provided students with their first exposure to material. Flipping this procedure, Walvoord and Poole (1998) argued that students should experience first exposure on their own time outside of the classroom. Lage and Platt (2000) proposed that technology would make this easier and thereby free up traditional lecture time to engage in rich learning experiences. Bowen (2011) confirmed Lage's and Platt's vision and argues that modern technology indeed provides many ways to invert pedagogy and thereby enrich students learning experiences in the classroom.

Proponents of the inverted/flipped classroom argue that educational institutions must develop richer learning experiences for students and that these experiences should inspire students to learn rather than simply provide students with knowledge (Short & Martin, 2011). These proponents cite research indicating that the traditional lecture experienced by most students during the first three semesters of college have little impact on their ability to write, think critically and engage in complex reasoning. In a study of 2,300 students at 24 institutions,

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Arum and Roksa (2011) demonstrated that 45% of the students studied exhibited no statistically significant improvement in the skills listed above. Because researchers have shown that student engagement and faculty-student interactions matter the most in student learning, inverted/flipped proponents feel their pedagogy can improve student learning by promoting these conditions and interactions (Astin, 1993).

Bishop and Verleger (2013) reviewed the current state of research concerning the inverted classroom. Despite a relatively large amount of published research concerning the inverted classroom, there is limited scholarly research on the effectiveness of the inverted strategy. The existing scholarly studies report that students' perceptions of the flipped classroom are generally positive. There is also anecdotal evidence suggesting that the inverted/flipped classroom improves students' learning when compared to the traditional classroom. However, there is very little objective research concerning student learning outcomes (Bishop & Verleger, 2013). The goal of this study was to help address the lack of objective measurements by comparing the performance of students taught traditionally and in an inverted classroom using the same objective metrics.

Instructors of the *Hunan Structure and Function* course at the College of Southern Idaho hypothesized that the inverted instructional model held promise in facilitating deeper learning while at the same time addressing difficulties identified in the current course. Instructors teaching this course have historically struggled with student apathy, poor attendance, lack of student preparation, a wide range of student abilities, and poor student success. Researchers have documented that problems such as these are commonly associated with traditional lecture strategies (Ramsden, 2003).

Method

Participants

Students enrolled in *Human Structure and Function* courses at the College of Southern Idaho (CSI) participated in this study. All students enrolled in the Spring 2013 Semester experienced an inverted pedagogical model while all students enrolled in the Fall of 2012 experienced traditional lecture pedagogy. Students take the *Human Structure and Function* course in order to prepare for various professional technical health care careers such as certified nursing assistant, dental assistant, and medical assistant. *Human Structure and Function* is a four credit course taught over 16 weeks. The course does not meet general education requirements and is not designed for transferability. Students enrolling in *Human Structure and Function* take a three credit lecture section and a one credit laboratory section concurrently.

Historically, *Human Structure and Function* has attracted a diverse population of students. These students often display poor study skills and struggle with demonstrating their knowledge and understanding. *Human Structure and Function* instructors report that student apathy, low student attendance, minimal student engagement, and dismal success rates are quite common in their courses. Failure rate, as indicated by final grades, show that *Human Structure and Function* students typically fail (loosely defined here as earning an "F") 26% of the time. Moreover, over 27% of the students withdraw from the class sometime during the semester.

Research Design

Researchers implemented a quasi-experimental design and compared the comprehensive final exam scores of students taught with the inverted pedagogy model in the Spring Semester of 2013 to those taught in a traditional lecture model during the Fall Semester of 2012. All students registered in *Human Structure and Function* at CSI for the Fall 2012 Semester experienced learning in a traditional lecture environment. Those students registered for the same class during the Spring 2013 Semester experienced the inverted classroom environment. The researchers used an identical comprehensive multiple choice exam to test all students at the end of both semesters.

Human Structure and Function students enroll in a lecture section as well as a laboratory section. Typically, the lecture sections hold up to 60 students while the laboratory sections hold up to 27 students. During the Fall 2012 Semester, two full-time faculty and two part-time faculty covered the three lecture sections and six laboratory sections offered at the college. During the Spring 2013 Semester, three full-time professors and two part-time instructors covered the three lecture sections and six laboratory sections offered at the college. Full-time faculty maintained responsibility for the lecture sections and a handful of laboratory sections, while the part-time faculty only taught laboratory sections during both semesters. All faculty teaching lecture sections during the Spring 2013 Semester employed the inverted model. The laboratory actives and teaching style in both the Fall 2012 and Spring 2013 Semesters remained unchanged. In order to minimize confounding variables and because the flipped design was implemented in the lecture sections, researchers chose to compare scores from the lecture comprehensive final exam given each semester. Researchers also compared final lecture grade distributions between the inverted and traditional models. Such a comparison allowed researchers to obtain a view of student performance in the lecture and avoid the direct influence of laboratory scores as a confounding variable.

Measures

Scores for a student's final exam performance were tallied using an Acu-Scan fill-in bubble form from the comprehensive, multiple choice final exam. A student's comprehensive final exam score represented the percentage of questions answered correctly on a 100 question, multiple choice, comprehensive test.

Students' final lecture grades were measured as A, B, C, D, F, or W grades. A student's lecture course grade represented the students' overall performance in only the lecture section of the class. The W grade was assigned to students who officially withdrew from the class. Students may officially withdraw from the course through the first 75% of the semester.

Researchers also captured data concerning the amount of time spent during the face-to-face class for various activities. An observer measured time spent on (a) testing, (b) business, (c) lecturing, and (d) group activities using a stopwatch during each class. Researchers defined testing time as the time spent on the homework accountability exams; business time included time the instructor spent making announcements and organizing the class; lecture time included any time the instructor delivered information about course content; group activities included the time students worked on responding to questions and evaluating each others' responses.

Procedure

Based loosely on Mazur's (1996) model of inverted instruction, faculty for *Human Structure and Function* implemented an inverted pedagogy by posting online videos and activities for students to complete prior to each face-to-face meeting. These actives were assigned as homework for students and were delivered to students via the campus course management system (Blackboard). Each homework assignment usually consisted of approximately 30 minutes of video, 5-20 pages of reading from an assigned textbook, and voluntary online activity such as self-grading quizzes. The video lectures were compiled from existing lectures created by various teachers found on *YouTube* and video clips created by the instructors of this study using Camtasia. Other online activities, such as self-grading quizzes, online flashcards, and labeling exercises were accessed through the textbook publisher's online resources and a variety of free websites such as http://highered.mheducation.com/sites/0072919280/student_view0/index.html.

The instructor encouraged students to complete the homework by testing the students on the content of the video lectures at the beginning of each face-to-face meeting (traditional lecture time). These homework accountability quizzes consisted of approximately 10 questions and polled students on their understanding of the basic concepts presented in the video lectures. The instructor implemented these homework accountability quizzes by using the iClicker Student Response System which allowed students to electronically answer questions with their personal iClicker remotes. iClicker software allowed the lecturer to capture instant results for each question and record individual student scores electronically. Because the iClicker system implemented at CSI only allowed for multiple choice voting, all homework accountability quizzes were structured as multiple choice questions.

After the homework accountability quizzes, the instructor would randomly establish groups composed of three to five students. Students were then provided with time to discuss questions they had generated from their experience with the homework and the homework accountability quiz. Students wrote questions they wished addressed on note cards which the instructor collected. Having collected the students' questions, the instructor organized the questions into categories to facilitate discussion. On-topic questions, questions that dealt with stated learning objectives, were addressed first. Off-topic questions, questions that strayed from the learning objectives were recognized by the instructor as being off-topic and students interested in those questions were encouraged to meet with the instructor outside of official class time.

In order to address student questions, the instructor presented the question to the class and asked for a group to volunteer to respond to the posed question. Volunteers were encouraged to participate by awarding participation points. These points were awarded and tracked by using the iClicker Response System. The group chosen to respond presented its response to the class during which time the instructor took notes on the board in front of the entire class, thereby documenting the response of the group.

Once the group had presented its response and felt that the instructor's notes accurately reflected the response, the instructor asked the class to evaluate the provided response. Each student was expected to analyze and then vote on the response using his or her student iClicker system. Because the iClicker system utilized at CSI only allows for multiple choice feedback, students had to choose whether the group's response was (a) correct, (b) partially correct but something important was missing, (c) partially correct but something presented was incorrect, (d)

partially correct but something important was missing and something was incorrect, or (e) incorrect.

After each student voted, the instructor provided the correct analysis. Students that correctly judged the presentation earned points. Those disagreeing with the instructor's analysis were provided with an opportunity to defend their judgment. If the instructor deemed a student's defense logical and valid, he awarded points to the students who voted accordingly.

If no group volunteered, the instructor would allow the class approximately five minutes to attempt to find a defensible response. During this time, the instructor encouraged students to search the internet as well as their text book or any other source of information that might prove useful. The first group ready to present its response after researching was allowed the opportunity to present and earn participation points.

This process continued until the end of the class period. If the class addressed all student

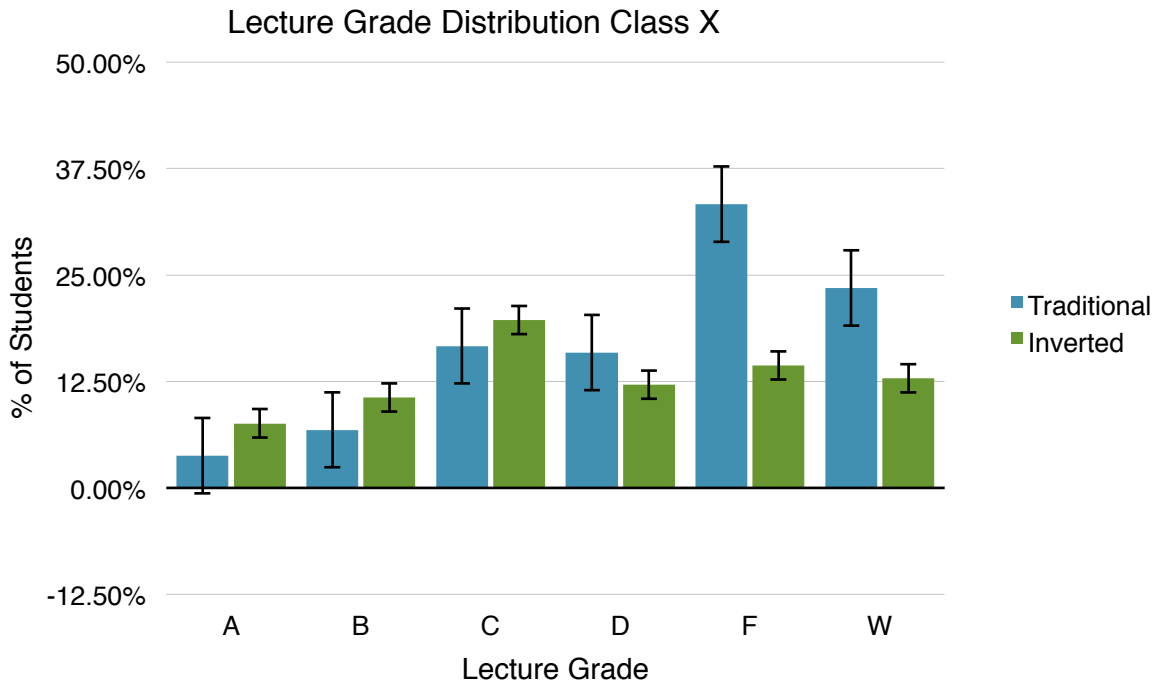

Figure 1: Student grade distributions (%) for inverted verses traditional biology classes (n=102). Note: Students who officially dropped the course receive a W grade on their transcripts.

generated questions, the instructor spent the remaining class time testing the students on the material using the student response system. This only happened once during the semester.

Results

An independent group t test indicated that there was significant difference in the comprehensive final exam test scores between the inverted pedagogy ($N = 73$, $M = 74.49$, $SD = 12.54$) and the traditional lecture pedagogy ($N = 76$, $M = 70.32$, $SD = 12.19$), $t(147) = -2.06$, $p = 0.02$. The effect size for this analysis ($d = 0.33$) represents a small effect according to Cohen (1988). A chi-squared test of goodness-of-fit determined that the student lecture grade

distribution from the inverted model differed significantly from the traditional model, X^2 (5, N=102) = 32.22, $p < .05$. As seen in Figure 1, fewer students earned F and W grades in the inverted model.

Researchers also found that instructors using the inverted pedagogy allocated time very differently than in a traditional lecture. Survey data from Watts and Becker (2008) indicate that instructors spend 83% of class time lecturing in undergraduate classes. Instructors using the inverted model in this study allocated only 15% of the face-to-face time for lecturing, while 52% of the time was used for interactive/group activities, 25% of the time for testing, and 8% of the time for administrative task (establishing groups, making announcements, organizing questions). Additionally, tracking data demonstrated that on average 71% of the students participated in the online learning activities prior to attending the face-to-face lecture.

Discussion

Overall, instructors were pleased with the results of the inverted pedagogy. After having implemented the inverted class design, all instructors observed significant improvements in student performance and learning outcomes. Because of this, the instructors have continued to implement inverted pedagogy in their classes. Despite a small measured effect size on the final exam scores, instructors noted that students attending inverted classrooms came away from their classes with greater gains in personal accountability, improved study skills, greater willingness to take personal responsibility for their learning, increased ability to work in groups, increased critical thinking skills, and improved ability to articulate their thoughts. Unfortunately, objectively documenting gains in these areas proves difficult. Yet more and more college instructors choose to adopt the inverted model because of such perceived gains (Arnaud, 2013).

Instructors also noted that students withdrew from the inverted classroom within the first three weeks, while those in the traditional classroom withdrew much later in the semester. Moreover, students experiencing the inverted classroom attended class consistently throughout the entire semester whereas student attendance in the traditional lecture classes was generally sporadic. Lack of attendance data from Fall 2012 prevented actual comparison. However, the difference in student grade distributions between the inverted and the traditional model indicates that the inverted model created an environment in which fewer students earned F and W grades. The significant difference in the number of students earning F and W grades in the inverted model, helps demonstrates the value of the inverted model in addressing poor student performance, poor attendance, student apathy and student persistence in the course. The researchers hypothesize that the inverted model is largely successful because it provides a cogent method to communicate and train students in the skills and habits necessary for individual learning. Others have noted that inverted models allow teachers more time to monitor student performance and provide immediate feedback to individuals and groups of students (Fulton, 2012; Herreid & Schiller, 2013). Future research should be conducted to document whether the inverted pedagogy influences students as the instructors of this study observed.

Conducting this experiment proved to be difficult for the instructors because of the new skills required to manage an inverted classroom. Stayer (2012) noted that instructors often struggle with balancing active learning and lecture activities in the inverted environment. Moreover, other researchers have documented that instructors are often not prepared to apply the inverted pedagogy because of the changing roles and responsible associated with student-centered learning (Brush & Saye, 2000; Hannafin et al., 1997). Instructors in this study described

the switch from lecturing to managing an inverted classroom as traumatic. Instructors were required to facilitate student discussion and interaction in real time instead of deliver predefined information to the class. Because of this, instructors often described their new role more as a mentor or a referee. The referee analogy is apt because instructors felt that an inverted classroom was similar to a sporting event. Students come to the inverted class to "play" while the instructor functions as a referee. As the players, the students perform, deliver the information, think critically, and articulate what is important and meaningful. As the referee, it is the instructor's responsibility to judge the students' performance, to keep the students "in bounds" and on topic, and to provide guidance and feedback concerning student performance. After working with the inverted model, one instructor noted that the best classes, just like the best sporting events, always focused on the players (students) not the referees.

When describing the traditional verses the inverted lecture experience, instructors built on the sports analogy. In the traditional lecture, if the sport was basketball, the instructor explains how to shoot free-throws and then shoots the free-throws while the students observe. In the inverted model, students have already been instructed and watched the lecturer's performance online; they come to class to actually shoot free-throws themselves.

Instructors found it difficult to avoid lecturing in the inverted model, especially considering that students often demanded and expected instructors to lecture. The lecturers felt that students advocated for the traditional model because they could avoid accountability and work. Students find it easy to simply observe, (or text, or check Facebook, or daydream) while the instructor lectures. Additionally, instructors felt comfortable lecturing, in so much that instructors actually described their desire to lecture as an addiction. Instructors found that lecturing made them feel accomplished and effective as compared to the frustration of listening to students answer questions incorrectly, argue over concepts, and sometimes sit in silence unwilling to address a question. Lecturing also helped free instructors from feeling culpable for student failure. Instructors in this study described that when students failed in the traditional model, they could excuse themselves from that failure by explaining how they had covered the material in lecture. It was therefore the student's fault that he or she had not mastered the concept(s). The inverted model created an atmosphere that removed much of that justification. Face-to-face time became a time where students demonstrated their understanding, which often times became a display of ignorance. Such displays created uncomfortable atmospheres for both student and instructor. However, instructors from this experiment felt that these uncomfortable experiences provided valuable insight and motivation to both student and instructor. They functioned as wake up calls to both parties and allowed instructors and students to adjust behaviors early to promote success.

Because of the challenge in managing an inverted classroom, the instructors found peer support very helpful. Often times, instructors found the presence of the observer, who was measuring time allocation, very helpful in maintaining the inverted structure. Being able to work as a team allowed the two instructors to minimize their "lecture addiction." Instructors also found that the inverted model worked better when allowed to meet for longer periods of time with the students. For instance, the class meeting two days per week for one hour and 20 minutes seemed to provide a better format for the inverted process than classes meeting three days per week for 50 minutes.

In conclusion, the modest increase in student performance on the comprehensive final exam along with the significant decrease in F and W grades demonstrated by students in the inverted model, provide objective support that corroborates the existing anecdotal evidence

concerning the efficacy of the inverted/flipped pedagogy. Additionally, the subjective observations of instructors noting improvement in student participation, groups skills, critical thinking, and personal responsibility for learning during this study support the current research that demonstrates the value of the inverted/flipped classroom. Although a challenge to implement because of the new skills required from instructors and the work necessary to restructure a class, the inverted model proves especially effective at decreasing the numbers of students that fail (earn F or W grades).

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The sound of feedback: Instructor uses and student perceptions of SoundCloud audio technology

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Abstract: This study reports on student perceptions of the use of SoundCloud, a web-based, audio-recording application, for instructor-student feedback and peer-to-peer feedback. Results from a self-report survey distributed to students indicate positive reactions to SoundCloud feedback at the instructor and peer levels. Implications of these results are presented, including qualitative data based on students' explanations for their feedback preferences. This study responds to the importance of improving current educational practices in ways that promote active, learner-centered educational environments as well as the need to test the potential of new technologies.

Keywords: audio, sound, feedback, evaluation, peer review, self-report survey quantitative data

Background

Since the late 1950s, scholars in composition studies have been exploring the efficacy of audio techniques for providing feedback to students usually in the form of instructor-recorded comments (see Killoran (2013) for a recent meta-analysis of the audio feedback literature since the 1950s). Recent scholarship on instructor-recorded audio feedback suggests many benefits, including students more comprehensively implementing audio feedback in comparison to written feedback as well as perceiving feedback as more personalized and supportive. Audio feedback by instructors has also been noted as bridging a gap between the learner and the instructor, benefitting the disabled, being a time-saver for instructors, and resulting in more elaboration by instructors because responses are longer (Gould & Day, 2013; Ice et al., 2010; Lunt & Curran, 2010; Merry & Orsmond, 2008; Middleton & Nortcliffe, 2010; Munro & Hollingworth, 2014; Sommers, 2012; Sommers & Mellen, 2003).

Current scholarship also indicates that students and instructors have an overall positive attitude toward audio feedback. More specifically, a study by Merry and Orsmond (2008) designed to measure the effectiveness of instructor audio feedback found that students more easily implemented audio feedback than written feedback and that students were able to interact with the audio feedback in different ways (each time they listened to the audio and when the audio was compared to written). Merry and Orsmond (2008) conclude that "students perceive and implement audio file feedback in different and more meaningful ways than written feedback." Similar to Merry and Orsmond, Middleton and Nortcliff (2010) found that when students listened to their feedback more than once, they engaged the feedback multiple times by,

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for example, taking notes each time and deciphering and interpreting the feedback in potentially new ways. However, despite the scholarship praising instructor use of audio feedback, "even today, audio-recorded commentary continues to fly beneath the radar of most writing teachers" (Sommers, 2013, p. 22). Among feedback methods, audio recording is often overlooked by instructors.

In addition to audio feedback from instructors, current technology allows for audio feedback from peers. Reynolds and Russell (2008) assessed the effectiveness of students' audio comments for peer review and found that "on average, audio reviews had 4 more HOCs [higher order concerns] and about 2 more LOCs [lower order concerns]" as well as "almost 6 more specific comments per review, on average, than written peer reviews" (p. 34). Although the audio reviews resulted in higher quality feedback, the attitudinal survey results indicate that students prefer to give and also receive written reviews (Reynolds & Russell, 2008). However, Reynolds and Russell (2008) argue that regardless of student preferences for written feedback, "audio feedback is more beneficial" because students "addressed more higher-order writing issues...providing their classmates with more and better feedback" and that students "spend more time thinking about audio feedback" and having "to interpret the reviewers' comments and then decide how to respond" (p. 36).

Although audio feedback is not new to the classroom, the technologies and devices used to compose and share audio recordings have evolved tremendously and range widely, including programs like Adobe Acrobat Pro, Microsoft Word, and Audacity as well as devices such as the iPhone and iPod. This spectrum of newer technologies also includes faster, web-based applications with more flexibility. Feedback technologies have also moved beyond just audio recording to screencasting, which enables an instructor to provide a visual with the audio commentary. However, these technologies bring up issues of access and can sometimes be cumbersome or expensive; additionally, they also often require more bandwidth, which can further limit student access. In response to these potential barriers to access and usability, we were interested in adapting an accessible (in this case web-based), easy-to-use, and free digital media application for distributing audio feedback in the classroom. One such application is SoundCloud, a web-based, social platform that allows users to record and share their sounds and to store their data in the cloud while also providing the option to make files downloadable. SoundCloud also allows users to follow each other, comment on sound files at specific moments, and create groups. Aware of the affordances of SoundCloud, our study contributes to scholarship documenting the benefits of audio feedback by exploring instructor- and peer-level feedback processes in the composition classroom through the use of audio feedback recorded and exchanged on the SoundCloud platform. Whereas past research has addressed the efficacy of audio-recorded feedback for instructor feedback and peer review across a variety of technologies, our research addresses the opportunities afforded by one of the more recent audio-focused social media technologies available, SoundCloud. Overall, our study is motivated by a recognition of the critical nature of feedback methods, such as peer review and instructor comments, in the writing classroom; a desire to identify ways we might improve our current practices to promote an active, learner-centered educational environment; and a need to test the potential of a new technology for audio feedback.

Methodology

Description of Study

The goals of this research project were to examine the efficacy of instructor-student and peer-to-peer audio feedback in a variety of English course contexts. Students' perceptions of the usefulness of audio feedback have been measured. Our choice of SoundCloud was partially driven by the need to address technology-related issues in giving and receiving audio feedback. SoundCloud offers a free version of its service, and it is available across multiple platforms. All functions can be performed on its website with robust site-based support, but it is also available for smartphones and tablets and compatible with both iOS and Android devices. Because audio files are saved to the cloud and shared via a URL link, users need not worry about the challenges of submitting large files over digital dropboxes or email. In addition to addressing some of the issues mentioned, SoundCloud is a social media, affording opportunities to follow users and insert written comments within an audio clip.

Timeline and Course Descriptions

This project spanned two semesters (Fall Semester 2012 and Spring Semester 2013), several course contexts, two institutions, and both face-to-face and distance learning environments. The institutional settings include a southeastern, midsize research institution and a community college in the same area. One hybrid course, three distance courses, and 10 face-to-face courses form the context in which the research was conducted. Course descriptions are provided below along with a brief overview of each course's composition projects and how audio feedback was incorporated.

First-Year English Composition. Students at a four-year research institution drafted a series of written and visual compositions for a variety of audiences and discourse communities. Peer reviews required students to comment on one another's written and visual arguments; however, students could choose to either write their peer reviews or record and share them using SoundCloud. A student-generated peer review worksheet was used to facilitate their written or audio feedback.

College Composition II. This entirely asynchronous course, based at a community college, focused on argumentation. Students were required to respond to two classmates for peer review on two major projects, using SoundCloud for one of those responses and providing written feedback for the other. They were also required to respond back to a classmate that had left a SoundCloud review using the written comment feature in SoundCloud. Additionally, the instructor provided formative written comments throughout drafts of these two assignments followed by a SoundCloud clip that summarized the issues and possible solutions.

Second-year English Composition. Students at a four-year research institution composed fully documented, researched arguments and persuasive pieces. One instructor included a peer review component with each of the four essays assigned, and students had the option of recording their peer review in SoundCloud or writing their peer review. The other instructor required students to use SoundCloud to compose an audio comment in conjunction with the written portion of the peer review.

Introduction to Technical and Scientific Writing. As a second-year science and technical writing course at a four-year research institution, students composed informative and

persuasive reports for both professional and academic audiences. Each assignment required a peer review, and students were given the option of providing written feedback or audio feedback using SoundCloud.

Introduction to Literature. This course at a four-year research institution introduces the analysis of literary devices in short fiction, poetry, and drama. Major projects included a conventional literary analysis and a multimodal wiki page. Students used SoundCloud to record audio comments as a concluding component to a written peer review for the literary analysis. The instructor also used SoundCloud for formative and summative feedback as well as engaging in online, small group discussions.

Data Collection

A self-report survey on students' perceptions was distributed at the end of each semester. The 11-item survey included questions formatted according to a Likert-type scale as well as open-ended questions designed to measure students' perceptions of the usefulness of SoundCloud as a pedagogical tool. A total of 150 students (n=89 fall students; n=61 spring students) participated in the survey. This article reports the findings of the quantitative results of the survey as well as a sampling of the responses from the open-ended questions. We intend to analyze audio clips in future iterations of this study.

Instructor-to-Student Audio Feedback Findings

To help determine the pedagogical implications of SoundCloud, students' perceptions of their instructors' audio feedback were examined. Instructor techniques varied within the study, including summative and formative feedback as well as the integration of sentence-level written feedback. While higher-order concerns were summarized verbally and shared with students through a URL link to a SoundCloud recording, lower-order concerns were identified with written comments throughout their essays.

Results

Survey results from both the fall (n=89) and spring (n=61) semesters indicate little change in opinion regarding the helpfulness of receiving audio feedback through SoundCloud (see Figure 1). Roughly 36%-39% found instructor feedback through SoundCloud very helpful in both semesters, with a range of 31-39% finding it helpful and 6-18% finding it somewhat helpful. Overall, the numbers show a positive reaction to SoundCloud feedback from their instructors. None of the students indicated that their instructor's audio feedback was not helpful. The most significant change between semesters exists in the number of students who did not use SoundCloud to listen to their instructor's feedback. In the fall semester, 21.4% of respondents indicated they did not listen to their instructor's recordings; only 6.6% of respondents did not listen in the spring semester. While speculative, we believe this decrease may be due to the instructors' growing familiarity with SoundCloud and its pedagogical applications as the semesters progressed. As the instructors grew more comfortable using the program in the second semester, they provided more reminders regarding the feedback, discussed it more often in class, and underscored the importance of hearing feedback in addition to reading it.

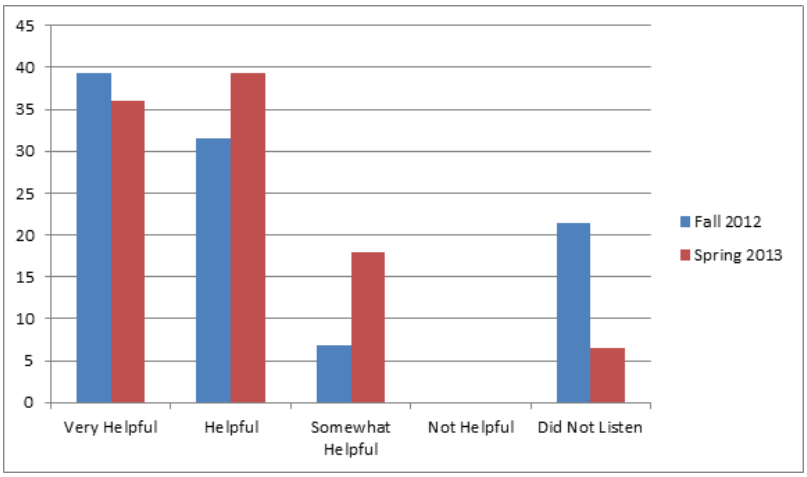


Figure 1. How helpful have you found the instructor's SoundCloud feedback?

To compare audio instructor feedback with written feedback, students were asked to state their preferences. Similar results were found across semesters (see Figure 2). Among the 89 who responded to this question in Fall Semester 2012 and the 57 who responded in Spring Semester 2013, more than 50% of students indicated a desire for a combination of written and audio feedback. This may be because those surveyed had grown accustomed to a combination: They consistently received both written and audio feedback on their final drafts from their instructors. From Fall Semester 2012 to Spring Semester 2013, a slight decrease in the number of students who preferred written feedback only (31%-21%) was observed as well as a slight increase in the number of students who preferred a combination (53%-56%). Because our study uses a Likert-type scale with a focus on student perceptions, it does not offer data explaining why students hold these opinions. Discovering why changes in preferences occurred and why students have these perceptions would require further study.

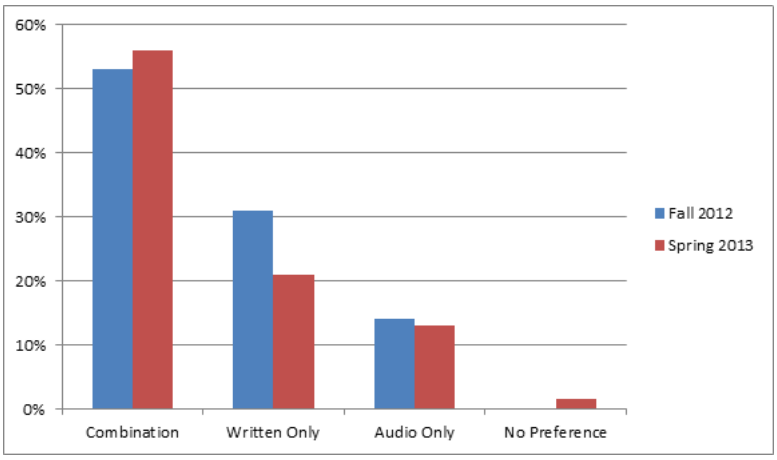


Figure 2. If given the option, which type of instructor feedback would you choose? For example, would you choose written, audio (recorded via an application like SoundCloud), or some combination of the two? Please explain your answer.

Table 1

Sample of Students' Explanations for Their Preferred Instructor-Level Feedback

Preferred method	Sample student responses
Written	"Written just beacuse [*sic*] it is what I am use [*sic*] to...But the soundcloud also worked well."
	"Written because I would rather see my feedback next to where the problem is on my paper than to have to listen to an audio file where I could potentially miss something."
	"Written because it is faster for me to read it than it is to listen. Also I may toon [*sic*] out because it isn't interesting and I would always have to go back and listen to it over and over."
Audio	"Audio helped me the most because I could hear what my professor was talking about when it came to my paper, I understood her clearly, and it made my life easier when it came time to correcting work which was revised using soundcloud."
	"audio, because it is on a more personal level."
	"SoundCloud. It's nice to actually hear them explain."
Combination	"I would prefer written as well as audio feedback. Audio feedback allows me to here [*sic*] the sincerity in my instructor's voice."
	"Both. I like being able to hear what my instructor has to say about my work instead of reading it. This way, I can hear the tone of her voice!"
	"Combination of both, audio adds an aspect of being personal with the students while the written feedback is clear cut."

Discussion and Implications

The results regarding student perceptions of their instructors' use of SoundCloud were favorable. The majority found the application helpful when reviewing and understanding their teachers' comments. Open-ended responses indicate that audio feedback clarified their instructors' responses (see Table 1). Presumably, students may experience this clarity because it can take less time to talk through feedback than it can to write it out; as a result, instructors may be more verbose in their comments, leading to more explanation and clarification. Open-ended responses also indicate an increased feeling of personal connection with their instructors through audio feedback. As shown in Table 1, students viewed audio feedback as more "personal" and "[sincere]," and they value the information gained from the tone of voice.

However, it is important to note the preference toward a combination of written and audio feedback (see Figure 2). The instructors in this study provided a combination, relying on written comments to point out specific problem areas and highlight lower-order concerns. Open-

ended responses from students indicate a preference for written comments when it comes to locating these minor changes (see Table 1). While written comments may be more familiar to students and, therefore, more comfortable, the data suggest that audio feedback greatly enhances written feedback, providing clarity and a personal connection that can be lost in the written word.

Peer-to-Peer Audio Feedback Findings

While investigating the efficacy of audio feedback, one goal of the study was to explore the context of peer-to-peer feedback through peer review. In several courses, students were required to provide audio feedback in conjunction with the more traditional written peer review; however, some courses did not require students to use SoundCloud for peer review but, instead, made this component optional. The prompts instructors designed for students' audio feedback in peer review also depended on individual course contexts and their corresponding learning objectives and assignments. See the following link to hear an example of a student's audio feedback: http://bit.ly/YA67eo.

Results

To measure students' perceptions of audio feedback for peer review, students were asked about 1) the usefulness of this type of feedback; 2) which form of peer-level feedback they prefer; and 3) why they prefer audio, written, or a combination of the two types of feedback. In the previous section on instructor-student feedback, combined data from all the courses have been provided because all three instructors incorporated instructor-level audio feedback at either or both the formative and summative levels. However, while all three instructors implemented peer-to-peer audio feedback on peer review assignments, in some courses, students were given the *option* to provide audio peer feedback, whereas in other courses this feedback method was a required component of peer editing. As such, combining data would skew the results; therefore, the data have been parsed based on participants in courses required to use audio feedback for peer review and those who were not required to do so.

Results for courses requiring audio feedback for peer review. During Fall Semester 2012 and Spring Semester 2013, roughly one third of the students (n=49) who participated in our study were enrolled in courses that required them to provide audio feedback for peer review. All but one of these students responded to the question measuring the "usefulness" of audio feedback for peer review. Fifty-nine percent (n=29) of the participants reported that this method of feedback was either very useful or useful for peer review. Twenty-five percent (n=12) reported that audio feedback for peer review was "somewhat helpful" while 14% (n=7) said it was not useful. Only one student reported not using it at all for peer review (see Figure 3). Forty-four out of 49 students responded to the question regarding their preference for which type of feedback they would prefer to give and receive. Twenty-two students reported a preference for written feedback while 14 students preferred a combination of written and audio feedback for peer review. Seven students said they would prefer just audio peer-level feedback, and one student stated a preference for giving written feedback but receiving audio feedback.

Results for courses not requiring audio feedback for peer review. In our study, twice as many students (n=101) who participated in our survey were enrolled in courses that did not require them to provide audio feedback for peer review but, instead, made it an optional component of the assignment. All of the students (n=101) responded to the question regarding

how useful audio feedback is for peer review. Almost all students who participated in using audio peer-level feedback (46% or 46 total), by recording comments themselves and/or listening to comments recorded by their peers, reported that this method of feedback was very useful or useful while six students found audio feedback only somewhat useful. Notably, however, 48% (*n*=49) reported that they *did not* elect to engage audio feedback at all during the semester (see Figure 3). Eighty-eight students responded to the question regarding preference for peer-level feedback method. Although 43% (*n*=36) preferred to give and receive written peer-level feedback, a significant percentage of students indicated some preference for audio peer-level feedback, with 28% (*n*=23) preferring to give and receive *only* audio feedback for peer review and 29% (*n*=24) preferring a combination of audio and written peer-level feedback. One student from this data set also reported a preference for giving written feedback but receiving audio feedback at the peer level. Table 2 provides a sample of students' explanations regarding why they prefer a certain type of feedback for peer review.

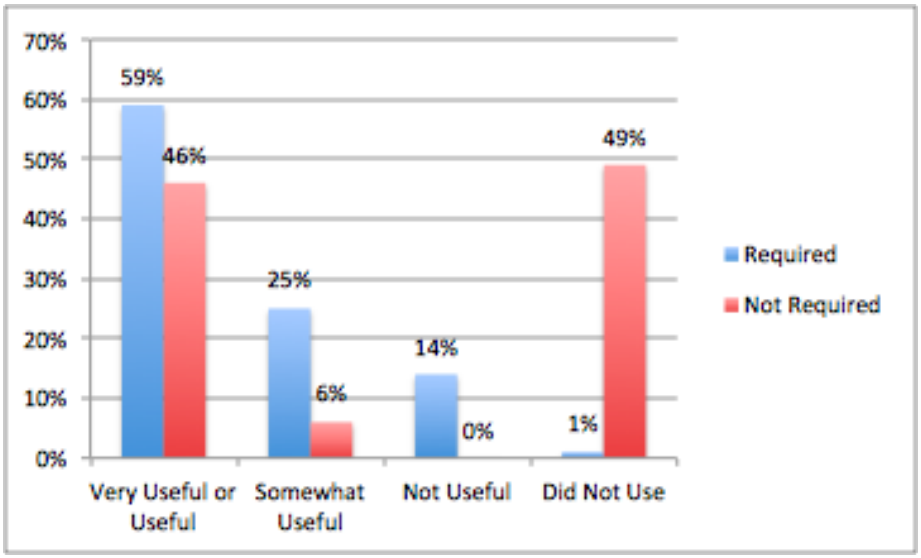


Figure 3. Comparison of students' perceptions of usefulness of audio feedback for peer review based on courses requiring and not requiring this method.

Discussion and Implications

The results of the quantitative data indicate that students perceive audio feedback at the peer level to be useful. The combined semesterly results of students required to provide audio commentary for peer review reported more positive responses regarding the usefulness of this method of feedback. Similarly, in courses not requiring audio feedback for peer review, nearly all of the students who willingly participated in this method found it useful. What is noteworthy, then, is that students who provided and/or listened to audio feedback for peer review, whether required to do so or not, overwhelmingly responded favorably to the added component of audio feedback for peer review. Also, that a little more than half the participants (*n*=70) reported a preference for only audio feedback or a combination of audio and written feedback suggests pedagogical promise for implementing audio feedback at the peer level. These results imply that students are receptive to this method of feedback and that they recognize and appreciate the value and usefulness of providing and/or listening to audio feedback at the peer level.

Table 2

Sample of Students' Explanations for Their Preferred Peer-Level Feedback

Preferred method	Sample student responses
Written	"I personally like written because it takes less time and I can go into greater depth."
	"I prefer written communication. If I were to have used SoundCloud I would have had to jot down notes as a script anyway so it was just easier to write the whole assignment."
	"I'd prefer to use only written communication, makes the criticizing more impersonal which is helpful with reviewing peers."
Audio	"Audio is preferred because some people's written feedback seemed overly critical until audio was added."
	"I really enjoyed giving and receiving audio feedback. It felt much more personal and more in depth. However, the audio feedback is harder to refer back to than written feedback."
	"I prefer to give and receive audio feedback. I'll typically find my little, smaller writing concerns with proofreading, I need to hear my 'big picture' problems for the most part; that was the best part of soundcloud."
Combination	"I would use either one, mainly a combo of the two so that if something was missed on sound-cloud [*sic*], then it can be recognized in the writing."
	"Both because people say more over soundlcoud [*sic*], but I would like to be able to look at their comments as well."
	"Both, SoundCloud is great, but can be difficult to go back and find what she was saying when you want it. It is easy to look through written feedback for something specific."

Students who prefer written feedback typically cited reasons related to efficiency and thoroughness; more specifically, students felt that written feedback is a more time efficient process, which correlates with the findings in Reynolds and Russell's (2008) research wherein students, despite the higher quality of their audio feedback for peer review, overwhelmingly preferred to exchange written feedback because they found the process of audio feedback too time consuming. Also, students who preferred audio feedback from their peers commonly described this feedback type as more "personal" and less harsh than written comments, which

aligns with Middleton and Nortcliffe's (2010) findings that indicate participants felt audio comments were more personal in nature. Interestingly, those who preferred a combination of audio and written peer-level feedback emphasize how they like to hear feedback from their peers but do not necessarily comment on their preference for giving this type of feedback; additionally, participants who preferred a combination of both types of feedback suggest that one type of feedback is enriched and supplemented by the other, thus resulting in a more effective peer review experience.

Perhaps, students who actually participated in the process of peer-level audio feedback, whether required to or not, became more comfortable with the technology and the method and were, therefore, more inclined to view audio feedback as more useful than those who did not use this method of feedback regularly. Based on their attitudinal survey results, Reynolds and Russell (2008) suggest that students' preference for written feedback versus audio feedback may reflect a reluctance to spend the time required for "processing audio comments" (p. 36). Their observation may help explain why the students in our study, when given the option, chose not to use audio feedback at the peer level. In other words, if students are not required to provide audio feedback for peer editing, they may not take the initiative to participate in this process on their own given the time required to explore the usefulness of such feedback, time that requires learning a new technology as well as time required for recording, listening, and processing. Additionally, it is possible that students who chose not to use audio feedback for peer review may have done so based either on their perceptions of instructor-recorded audio feedback or on previous experiences with audio feedback in other courses; furthermore, technological obstacles may have deterred students from opting to use SoundCloud to record and share audio feedback with their peers.

Limitations

To further support the efficacy of using SoundCloud for instructor- and peer-level feedback, we intend to conduct future research emphasizing qualitative analysis of transcribed recordings to assess the nature of the feedback instructors and students tend to give, for example, the degree to which feedback highlights higher order versus lower order concerns. Actual sound files should also be analyzed to determine what sound components lend to the more "personal" aspects of voice and tone in audio feedback. Additionally, cross-examining audio feedback at the instructor and peer level with students' drafts and final papers would facilitate a better understanding of the extent to which students actually implement audio feedback, thus assisting in determining the effectiveness of instructor and peer-to-peer audio feedback. Also, this study does not explore the depth of the social affordances of web-based, audio-recording technologies like SoundCloud; therefore, future studies should emphasize ways of utilizing the social features of such technologies designed specifically to prompt dialogue and collaboration. Finally, we acknowledge there are limitations to self-reported student data, primarily in regard to making pedagogical changes based on student perceptions; as such, we view our study as a step toward studying the effects of audio-feedback on student learning and engagement in writing classrooms.

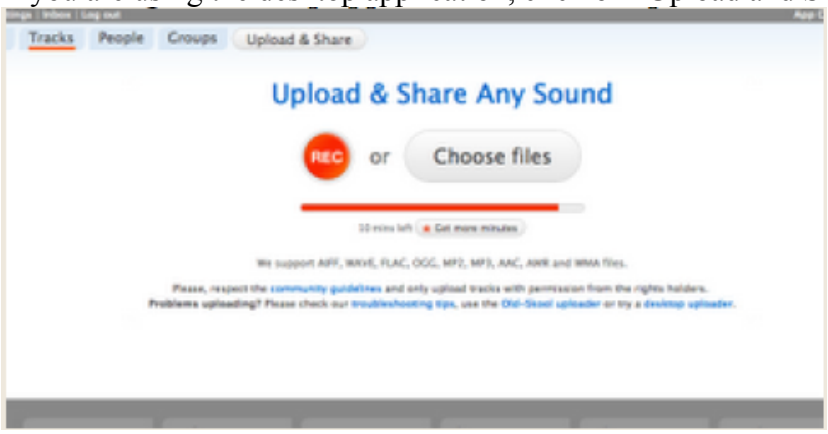
Conclusion

In general, the results of this study support the literature on instructor-to-student feedback. Students' responses were positive, as they felt audio feedback provided clarity, was more personal, and helped them feel more connected to their instructors. The students who participated in this study reported a more positive experience using audio feedback for peer review than did the students who reported a preference for written peer-level feedback in the study that Reynolds and Russell (2008) conducted. The majority of our students that were required to use audio feedback for peer review found it to be very useful, especially in conjunction with written feedback. This suggests that feedback may be too complex for a single approach, and there are a number of technologies available for exploring this complexity. SoundCloud is one technology that can easily be used as a means of supplementing written feedback in positive ways that allow students to engage and process feedback through multiple modalities. Importantly, students found the technology very easy to use. Overall, use of SoundCloud supported course communication outcomes by providing an efficient and effective way of giving feedback.

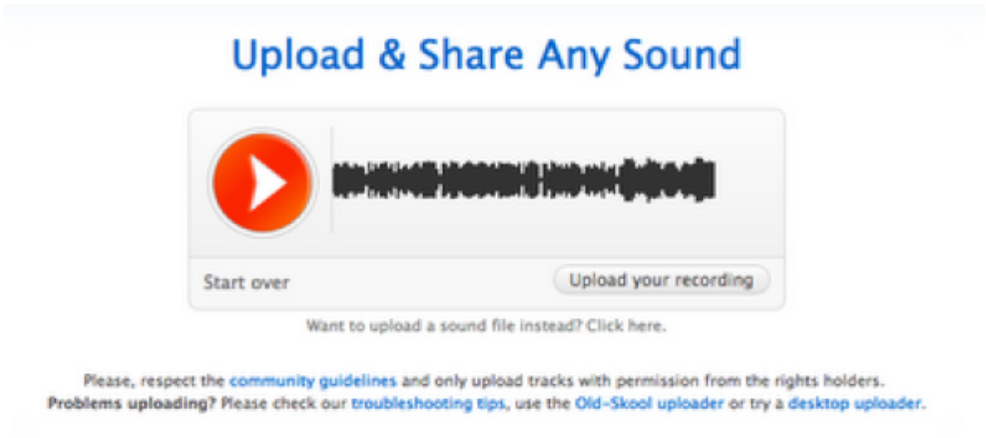
Appendix

SoundCloud Instructions:

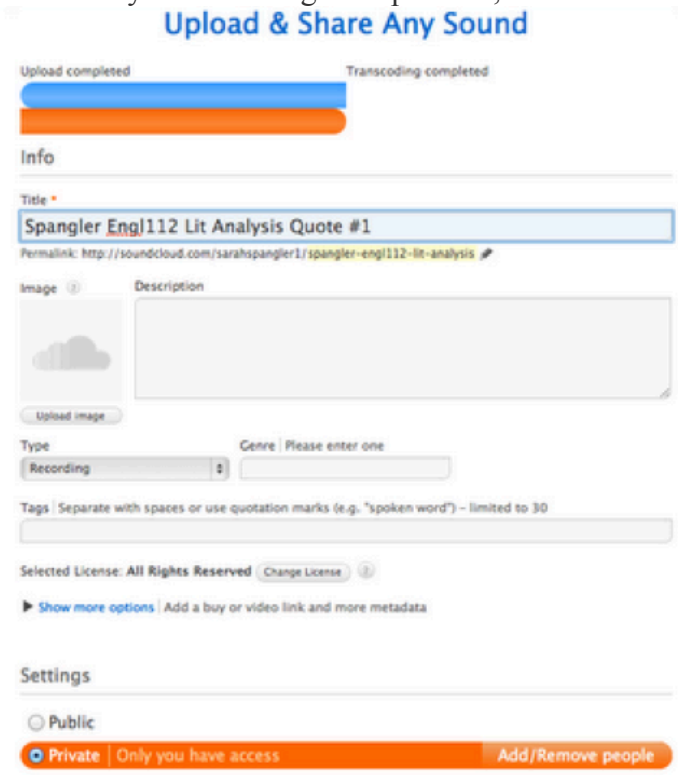
- Go to SoundCloud.com, click on "sign up" in the upper-left corner, and create a **free** account.
- Take the SoundCloud tour.
- If you have a smartphone, you may want to download the SoundCloud app to your phone.
- If you are using the desktop application, click on "Upload and Share":



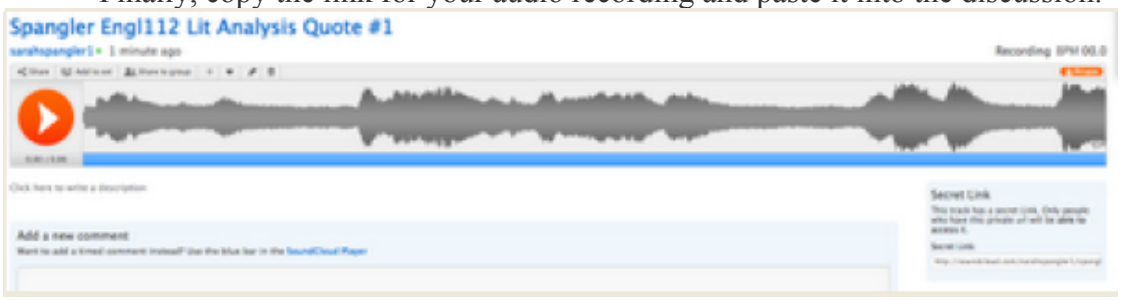
- Next, click on the orange record button and record your comment.
- When you are done recording, select "Upload your recording":



- After your recording has uploaded, title it and select the private option, and then save.



- Finally, copy the link for your audio recording and paste it into the discussion.



Mobile App

- Label your track accordingly.
- Select "private" before uploading your file.
- Access your desktop account.
- Click "You" to view your recent uploads.
- Select the track you wish to share.
- Copy and paste the link into your Google doc.

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Usability of iStudyGuides: A confirmatory factor analysis model

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Abstract: With the advances of technology, technological learning tools are becoming more important in enabling learners to study more effectively. The pre-requisite for the success of any technological learning tool hinges on its usability or technical ease of use. A tool that is not usable has the undesired effect of disrupting the user's learning as more time is expended on learning the tool than the contents (Wong, Nguyen, Chang & Jayaratna, 2003). Therefore, the aim of this research is to explore and uncover the dimensions of the usability of the interactive e-study guide known as the iStudyGuide used as one of the main learning resources in the context of SIM University (UniSIM). Therefore, the research question in this study is "What are the dimensions that determine the usability of iStudyGuides?". It employs a survey research methodology, utilising the statistical methods of exploratory and confirmation factor analysis. Data are collected from 278 students who used iStudyGuides in their learning at UniSIM. In the confirmatory factor analysis process, Bollen-Stine bootstrap p = 0.688. CFI = 0.996, RMSEA = 0.026 and PCLOSE= 0.918. The confirmatory factor analysis shows that the final model of usability of the iStudyGuides that comprises of the dimension of reliability, utility, learnability, accessibility and control has a good fit on the data. The emergence of the model of usability of iStudyGuides sets as the basis that iStudyGuides can be evaluated to ensure quality assurance in terms of usability.
Keywords: iStudyGuides, technological learning tool, factor analysis

Introduction

The study guide is integral to the students' learning experience at SIM University (UniSIM). In particular, it serves as the students' first point-of-contact with a course, and a tool for managing their learning, along in a progressive journey towards acquiring and discovering knowledge associated with a subject matter. At UniSIM, courses' study guides, known as iStudyGuides, come in the form of the EPUB 3 format[3]. UniSIM adopted the EPUB 3 format as the delivery platform for its study guides because of its flexibility and learning enhancing potential. In terms of flexibility, the reflow-able nature of EPUB 3 format allows learners to access their study guides on all electronic platforms, namely hand phones, tablets and personal computers, thus allowing them to learn anytime anywhere. E-PUB 3 also allows rich media and interactive features to be incorporated into the course content. The use of such features in supporting or presenting the content has potential in enhancing the student learning experience. In short, the iStudyGuide is an interactive e-study guide that can be accessed from multiple delivery platforms. Since the iStudyGuide is a technological learning tool, how users perceive its

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[3] **EPUB** (short for *electronic publication*) is a free and open e-book standard by the International Digital Publishing Forum (IDPF). Source: http://www.idpf.org/epub/30/spec/epub30-overview.html

usability or technical ease of use can affect its learning effectiveness. A tool that is not usable has the undesired effect of disrupting the user's learning as more time is expended on learning the tool than the contents (Wong, Nguyen, Chang & Jayaratna, 2003). Therefore, the aim of this research is to explore and uncover the dimensions of the usability of the iStudyGuide in the context of UniSIM. Therefore, the research question in this study is "What are the dimensions that determine the usability of iStudyGuides?".

In this research, the usability of iStudyGuide would be analysed from the standpoint of usability in the domain of Human-Computer Interaction (HCI). Widely used for evaluation purposes, the usability of a system or tool can be measured in terms of (1) effectiveness, (2) efficiency and (3) satisfaction (ISO, 1998). Most of the earlier researchers studying usability generally included these three main measurements of usability, though they may have used different but equivalent descriptors. At the same time, some of these researchers have increased the dimensionality of "usability" by including one or more elements of evaluation in its conceptualisation. These included "learnability" and "likeability" (Blandford & Buchanan, 2002; Booth, 1989; Constantine & Lockwood, 1999; Hix & Hartson, 1993; Nielsen, 1993; Schneiderman, 1992; Swett, 2002), "utility" (Bernérus & Zhang, 2010; Brooke, 1991; Zaharias, 2009), "memorability" and "error" (Marta, 2011; Nielsen, 1993; Swett, 2002; Yordanova, 2007), "quality of use" (Bevan, 1995), "content usability" (Lamb, 1995), "outcomes", "process" and "task" (Thomas, 1998), "control" and adaptability" (Oulanov & Pajarillo, 2002), "accessibility", "trustfulness" and "universality" (Bernérus & Zhang, 2010; Caldwell et al., 2004; Dee & Allen, 2006; Yordanova, 2007), "reliability" (Constantine & Lockwood, 1999; Nielsen, 1995; Siritongthaworn, Krairit, Dimmitt & Paul, 2006) and "web usability" (Brophy & Craven, 2007). These studies are fundamentally grounded on the technical aspects of usability, i.e. how the tool's or system's interface, functionality and content are user-friendly and free from errors.

While there is an abundance of literature in the domain of usability, these concepts or criteria in the domain of usability were not consistently defined or operationalised across models. Besides, they were usually designed to evaluate websites, software or learning management systems instead of interactive e-study guides. Most of the time, it was also unclear how these concepts or criteria could be translated into a metric to evaluate usability. Thus, these issues made it difficult for researchers or practitioners to choose the most suitable concepts or criteria in the evaluation of usability relevant to their own contexts. Therefore, in this study, the researchers decided to include the five most common concepts or criteria that were mentioned in the literature as the hypothesised model of usability in the context of iStudyGuides. Therefore, it is hypothesised that the usability of iStudyGuides is made up of the dimension of learnability, utility, reliability, accessibility and control. These five dimensions, in other equivalent forms, generally encompassed most of the variables investigated by previous studies in the domain of usability.

Learnability is consistently cited in literature as an important and fundamental attribute of usability (Blandford & Buchanan, 2002; Booth, 1989; Hix & Hartson, 1993; Nielsen, 1993; Schneiderman, 1992; Swett, 2002;). It is one of the five attributes of usability pointed out by Nielsen (1993), in addition to efficiency, memorability, error recovery and satisfaction. Likewise, Booth (1989) proposed usability to consist of four factors: usefulness, effectiveness (ease of use), learnability and attitude (likeability). While many definitions of learnability have been postulated, this concept was defined based on the initial user experience in most studies. A system or a tool that is easy to learn allows initial users to attain a reasonable level of usage proficiency within a short time (Nielsen, 1994). The perceived ease of learning a technological learning tool will

allow them to devote more time and attention to learning the course materials instead of spending additional time to learn how to use the tool (Davis, Bagozzi & Warshaw, 1992).

Utility refers to the usefulness and relevance of functions in helping students to learn (Bernérus & Zhang, 2010; Brooke, 1991; Zaharias, 2009). The functions in some e-resources may encompass highlighting, memo, copy text, share, define, online search and within guide search. A literature review conducted by Bernérus and Zhang (2010) revealed the presence of learning and authoring support tools to be an essential factor in usability assessment of technological learning tools. Additionally, Zaharias (2009) found empirical support for learning and support tools as criteria for usability evaluation. Utility is measured by the presence or absence of tools such as notes taking, job aids, glossaries that support both individual and group-based activities (Bernérus & Zhang, 2010; Brooke, 1991).

Reliability refers to the dependability of the technical functions of the e-resources (Constantine & Lockwood, 1999; Nielsen, 1995; Siritongthaworn, Krairit, Dimmitt & Paul, 2006). Reliability comes about when iStudyGuides follow consistency standards. A system that has consistency standards should allow the learner to experience the user interface, encompassing control, colour, typography and dialogue design, in a uniform manner. A reliable system is also one that takes into consideration error management issues, including error prevention, diagnosis and recovery from errors (Constantine & Lockwood, 1999; Nielsen, 1995). Poor availability of access points, slow network communications and a lack of software application were cited as challenges to using an e-learning tool, undermining the reliability of the system (Siritongthaworn, Krairit, Dimmitt & Paul, 2006).

Accessibility refers to the convenience of using iStudyGuides (Yordanova, 2007; Dee & Allen, 2006; Caldwell et al., 2004). Accessibility is measured by the extent of access on a variety of equipment and platforms such as laptops and handheld devices during working, learning and commuting hours. Bernérus and Zhang (2010) reported the inclusion of accessibility as a criterion of usability in 9 out of 27 empirical studies reviewed. Furthermore, accessibility was shown to be an empirically validated criteria in Zaharias (2009)'s study.

Control refers to the amount of control that learners have in personalising their learning experience through the use of iStudyGuides (Oulanov & Pajarillo, 2002). Learner-controlled instruction refers to instructional designs where learners have the ability to make decision regarding some aspects of the path, flow or events of instruction. The emphasis of a learner-controlled instruction is to give learners the freedom to choose learning activities that suit their own individual preferences and needs (Williams, 1996). Elissavet and Economides (2000) argued that learner control is an important factor in hypermedia learning systems, with a primary role in the design of interactive learning as it gives students the freedom to tailor their learning experience to meet their own individual needs. Learner control is measured by the extent of freedom students have in regulating their own learning by exercising choice and discretion over the sequence, pace and amount of information they can process (Chung & Reigeluth, 1992; Milheim & Martin, 1991). This gives learners the ability to make decisions about what sections to study and the sequence in accessing the interactive material.

Although these studies supported the importance of the dimension of learnability, utility, reliability, accessibility and control in the design of interactive study guides or learning systems to learning, the studies did not conduct any further analysis to confirm that each of these dimensions are inter-related and are part of an empirical model that define the usability. As a result, this study aims to close this gap by proposing a model of usability and confirming it

through the use of factor analytic methods to answer the research question "What are the dimensions that determine the usability of iStudyGuides?"

Method

iStudyGuides are mobile interactive study guides. Thus they are considered a form of technological learning tool. Predictive evaluation, heuristic evaluation, naturalistic observation, questionnaires, interviews are some of the more popular methods to evaluate usability of technological learning tools (Sharp, Rogers, & Preece, 2007). In this study, heuristic evaluation was first used to ensure rigour in the content validity of the questionnaire items conceptualised to measure the five dimensions of the hypothesised model of usability. After that, the end-users, the students, were invited to participate in the questionnaire survey. This allowed the users' perspectives about the tool to be captured (Baber, 2002). The data was then analysed through the exploratory factor analysis to validate the questionnaire. It is then followed by another round of questionnaire implementation to evaluate the fit of the hypothesised model of usability in the context of iStudyGuides.

Although there were questionnaires (such as Chiu & Hung, 2009; Demers, Weiss-Lambrou & Ska, 1996; Drummond & Themessl-Huber, 2007; Hashim, Wan Ahmad & Ahmad, 2011; Jordan, 2000; Kirakowski & Corbett, 1993; Lewis, 1995; Lindholm, Keinonen & Kiljander, 2003) that were formulated to measure the usability of technological learning tools, they were usually designed to evaluate websites, software or learning management systems. However, iStudyGuides are interactive e-books. Besides, such questionnaires were mostly not statistically validated. Consequently, it was decided that the questionnaire items used to evaluate the features of iStudyGuides are to be conceptualised with due consideration to the literature review, in the context of an interactive e-book. In this study, it is hypothesised that the usability of iStudyGuides is made up of the dimension of learnability, utility, reliability, accessibility and control. Based on the literature, a set of 3-5 questionnaire items was conceptualised to measure each dimension. This list of 26 items were further refined and confirmed for content validity through a team of three experts in the domain of usability. The questionnaire was cleared by the Institutional Review Board at the university. The final list of 15 items (in Table 1) used in the exploratory factor analysis is shown below.

For the first survey, an invitation to participate in the first survey was sent to 1231 students. A total of 48 students participated in the survey and completed it. They evaluated each item on a Likert scale of 1-"Strongly Disagree", 2-"Disagree", 3-"Slightly disagree", 4-"Neither agree nor disagree", 5-"Slightly Agree", 6-"Agree" and 7-"Strongly Agree". They were also asked to comment about the use of iStudyGuides in terms of their usability in an open-ended response item in the questionnaire. An invitation was sent to a total of 5032 students were using iStudyGuides for the first time, to participate in a second survey near the end of the semester. 329 students responded to the survey and completed it. The respondent samples for both surveys were fairly representative of the active UniSIM student population in terms of certain demographic and institutional factors[4]. Although MacCallum, Widaman, Zhang and Hong (1999) reported that there have not been much agreement in the research community about the minimum

[4] Demographic factors include gender, age group and highest educational level attained while institutional factors include school enrolled in, Cumulative Grade Point Average and number of years studied at university. UniSIM's students are primarily non-traditional learners and enroll themselves across four schools - School of Business, School of Human Development and Services, School of Science and Technology and School of Arts and Social Sciences.

number of subjects needed for factor analysis, a minimum ratio of number of participants to manifest factors of at least 3.0 should be able to yield a recognisable factor pattern. In this research, the ratio of number of participants to manifest factors in the exploratory and confirmatory factor analysis were about 3.2 and 19.2 respectively.

Table 1

List of items under technical domain

No.	Original list of items analysed through factor analysis for Technical Domain
1	The functions of the iStudyGuide are not reliable.
2	Accessing the iStudyGuide can be slow at times.
3	Every time I study, I activate iStudyGuide without fail.
4	I use the highlighting functions to highlight certain important concepts or information for easy learning
5	I use the copy text function to easily transfer certain sections of my iStudyGuide to other writing platforms for note taking
6	I use the Search Online or Within Guide function to look up for information and keywords.
7	I remember how to use the functions of the iStudyGuide Reader easily whenever I need to use it.
8	I can use the functions of iStudyGuides easily with little effort.
9	I am able to use the functions of the iStudyGuide easily without wasting a lot of time.
10	The iStudyGuide is easier to access than the hardcopy equivalent.
11	I can use my iStudyGuide whenever I need it.
12	I can access my iStudyGuide on different electronic devices
13	I can customise my learning using the iStudyGuide.
14	I have more control over how I want to learn when I use the iStudyGuide.
15	I like the control I have when I use the iStudyGuide.

Analysis

The analysis section reported on the validation of the questionnaire items used to evaluate usability in the context of iStudyGuides and the fit evaluation of the hypothesised model of usability.

Validation of the Questionnaire items

A total of 48 respondents' data was used in the first round analysis. The aim of analysis in this round was to validate the questionnaire items that would be used to evaluate the five dimensions of usability in the use of iStudyGuides. The respondents' data from the open-ended response item that was used to solicit comments about the usability of iStudyGuides were first analysed. There were 41 comments and they were mostly related to the hypothesised dimensions of learnability, utility, reliability, accessibility and control. No significant new dimension related to usability was mentioned in the comments.

Factor analytic function in SPSS Base was used in the statistical analysis. The ratio of subjects to variables in this factor analysis process was 3.20. The extraction method, Principal Axis Factoring and the rotation method of promax were used in the analysis. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy was 0.755 and the Bartlett's Test of Sphericity was significant (χ^2 (66) = 466.121, $p < .05$). The determination of the correlation matrix was

approximately 0.00001582. There was 0 (0%) non-redundant residuals between observed and reproduced correlations with absolute values greater than 0.05. These measures assured that the data set here is adequate for factor analysis. A five-factor solution (in Table 2) that accounted for 79.2% of the total variance (in Table 3) was produced with 3 items removed from the original list of 15 items. Each pattern coefficient of the solution was at least 0.506 and a mean pattern coefficient of at least 0.690 was obtained for each factor. The Cronbach's Alpha Coefficient of the items in each factor was at least 0.774 (in Table 2). The correlation between the factors was not more than 0.695 (in Table 4). Thus, the reliability, convergent validity and discriminant validity of the data were generally assured.

Table 2

Five factor solution

Pattern Matrix[a]					
	Factor				
	1	2	3	4	5
Cronbach's Coefficient	.953	.889	.774	.929	.880
I use the Copy Text function to easily transfer certain sections of the iStudyGuide to other writing platforms for note taking or assignment preparation.	.978				
I use the Highlighting function in the iStudyGuide to highlight certain important concepts or information for easy learning.	.909				
I use Search Online or Within Guide function in the iStudyGuide to look up information and keywords.	.846				
I can use my iStudyGuide whenever I need it.		.933			
The iStudyGuide is easier to access than the hardcopy equivalent.		.855			
Accessing the iStudyGuide can be slow at times.			.967	-.214	
The functions of the iStudyGuide are not reliable.			.665	.355	
I have more control over how I want to learn when I use the iStudyGuide.				.867	
I can customise my learning using the iStudyGuide.		.270		.734	
I like the control I have when I use the iStudyGuide.	.223	.212		.506	
I remember how to use the functions of the iStudyGuide Reader easily whenever I need to use it..					.695
I am able to use the functions of the iStudyGuide easily without wasting a lot of time.	-.213				.678

Extraction Method: Principal Axis Factoring. Loadings of 0.2 and below are not shown.
Rotation Method: Promax with Kaiser Normalization.
a. Rotation converged in 6 iterations.

Table 3

Total variance explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	5.903	49.190	49.190	5.769	48.074	48.074	4.756
2	1.789	14.908	64.098	1.544	12.863	60.937	4.097
3	1.348	11.233	75.330	1.014	8.451	69.388	1.520
4	1.020	8.497	83.828	.762	6.353	75.741	4.757
5	.575	4.790	88.618	.416	3.465	79.206	1.510
6	.446	3.721	92.339				
7	.344	2.863	95.202				
8	.185	1.540	96.741				
9	.142	1.185	97.926				
10	.107	.894	98.820				
11	.096	.798	99.618				
12	.046	.382	100.000				

Extraction Method: Principal Axis Factoring.
a. When factors are correlated, sums of squared loadings cannot be added to obtain a total variance.

Table 4

Factor Correlation Matrix

Factor Correlation Matrix					
Factor	1	2	3	4	5
1	1.000	.556	.032	.695	.125
2	.556	1.000	.022	.670	.226
3	.032	.022	1.000	.104	.264
4	.695	.670	.104	1.000	.301
5	.125	.226	.264	.301	1.000

Extraction Method: Principal Axis Factoring.
Rotation Method: Promax with Kaiser Normalization.

Table 5 below shows the final list of the items used that was conceptualised the items used to measure the hypothesised model of usability of iStudyGuides.

Table 5

Description of factors in usability

Latent Factor	Description	Manifest Factor
Reliability	Reliability refers to the dependability of the technical aspects of the iStudyGuides.	q0045_0001: The functions of the iStudyGuide are not reliable. q0046_0001: Accessing the iStudyGuide can be slow at times.
Utility	Utility refers to the usefulness of the technical functions in iStudyGuides in helping the students to learn.	q0058_0001: I use the highlighting functions to highlight certain important concepts or information for easy learning q0061_0001: I use the copy text function to easily transfer certain sections of my iStudyGuide to other writing platforms for note taking q0066_0001: I use the Search Online or Within Guide function to look up for information and keywords.
Learnability	Learnability refers to the ease of use of the iStudyGuides.	q0042_0001: I remember how to use the functions of the iStudyGuide Reader easily whenever I need to use it. q0044_0001: I am able to use the functions of the iStudyGuide easily without wasting a lot of time.
Accessibility	Accessibility refers to the convenience of using iStudyGuides in terms of reliability and space and as compared to the hardcopy study guides.	q0049_0001: The iStudyGuide is easier to access than the hardcopy equivalent. q0051_0001: I can use my iStudyGuide whenever I need it.
Control	Control refers to the control one has in using iStudyGuides to learn.	q0054_0001: I can customise my learning using the iStudyGuide. q0055_0001: I have more control over how I want to learn when I use the iStudyGuide. q0056_0001: I like the control I have when I use the iStudyGuide.

Fit Evaluation of the Hypothesised Model of Usability

The second round of questionnaire implementation was conducted with the questionnaire validated from the first round. A total of 329 students responded to the second survey. However, a total of 230 responses were used in the confirmatory factor analysis process due to their items' completeness and validity. The aim of this round of analysis was to evaluate the fit of the hypothesised model of usability of the iStudyGuides.

SPSS AMOS was used in the analysis. Maximum likelihood model test was employed. As multivariate normality was violated in the data, bootstrapping was performed to overcome this limitation. The data collected in this stage were used to confirm the model of usability produced through exploratory factor analysis in the first round of analysis. Testing the null hypothesis that the model is correct, Bollen-Stine bootstrap $p = 0.688$. CFI = 0.996, RMSEA = 0.026 and PCLOSE=0.918. The standardized regression weight estimates of all manifest

variables are statistically significant and thus are representative of their latent variable. The estimates of correlations between the latent variables are also statistically significant. In short, the 5 factor model exhibited a reasonably good fit of the data. Below is the diagrammatic representation of the factors.

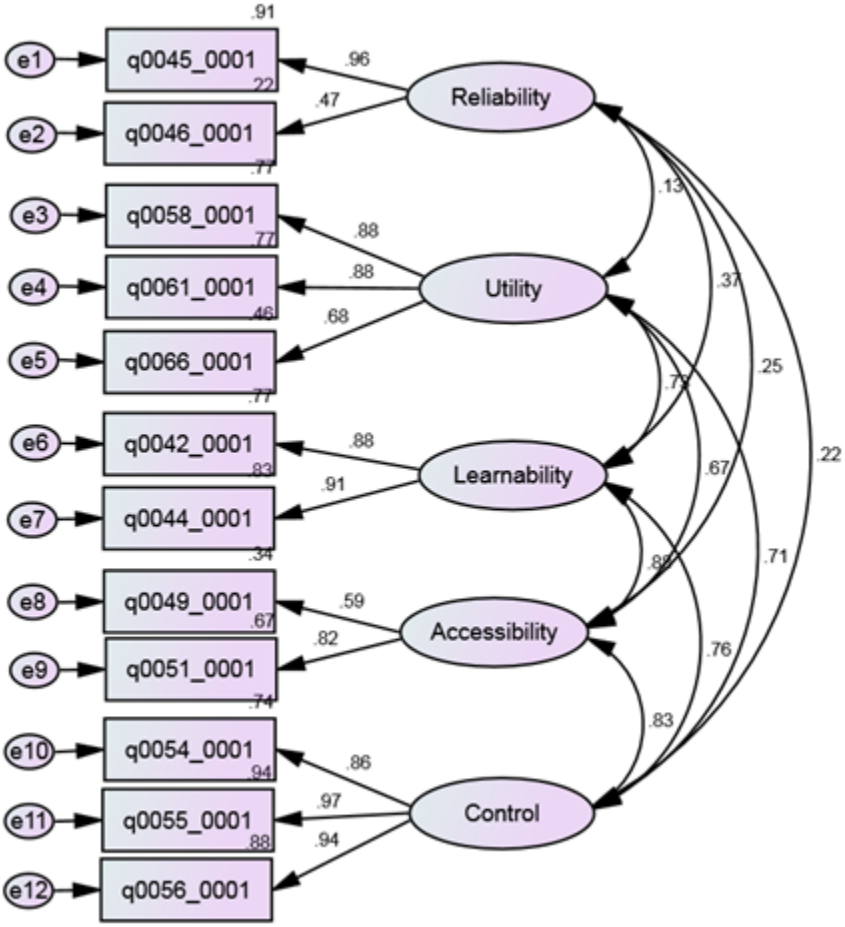

Figure 1. Proposed empirical model of usability.

In summary, the hypothesised model of usability of the iStudyGuides that consisted of the dimension of reliability, utility, learnability, accessibility and control, fit the data.

Limitations

Although this study managed to confirm the various dimensions of usability that influence that the use of iStudyGuides, there are several limitations worth noting. First, the study relied solely on self-reported questionnaire survey in the collection of data. This might cause some reliability issues as the respondents might interpret some of the items differently. Thus, further reliability tests can be conducted with the possible complement of other data such as observation of the participants' usage of the iStudyGuides or more structured interviews if resources are not a concern in future. Second, the current results are most probably applicable in the context of iStudyGuides. There is a need to cross validate the findings to that of other

interactive e-books. Third, as the five dimensions of usability were suggested by the researchers in this study based on the literature review, there might be a possibility that one or more element that impact on the usability of iStudyGuides was not captured. Therefore, it is important that new dimensions of usability are investigated if they are brought up by stakeholders in future. Fourth, the sample used in this research was made up of non-traditional undergraduates who studied part-time and had an average age of 28 years. Thus, the results might not be representative of traditional undergraduates though it could have some implications on non-traditional undergraduates in other universities.

Discussion

The confirmatory factor analysis has shown that the final model of usability of the iStudyGuides had a good fit on the data. This means that that the latent constructs are good representative of the usability of iStudyGuides. Through the rigorous process of factor analysis, the 12-item questionnaire is considered a valid instrument to determine the level of usability that iStudyGuide offers to the end users. Thus, in the case of this research, the validated model and its questionnaire serve as a robust basis for the quality assurance of iStudyGuides in terms of usability. This is an important process as a tool that is not usable has the undesired effect of disrupting the user's learning as more time is expended on learning the tool than the contents (Wong, Nguyen, Chang & Jayaratna, 2003). At the same time, the validated model of usability of iStudyGuides will enable all the stakeholders, namely the developers, students and instructors in obtaining a common understanding of what constitutes a usable iStudyGuide.

While questionnaires were designed to measure the usability of technological learning tools, they were mostly not specifically designed for interactive e-books or were not statistically validated. Therefore, the model of usability of iStudyGuides serves as the first or one of the few statistically validated models to evaluate the usability of interactive e-books. This validated model of usability can serve as the basis for development of other e-book evaluation platforms or for comparison with other usability model in the domain of e-books.

In conclusion, the study elucidated the dimensions that determine the usability of iStudyGuides. It is hoped that the findings can help to improve the iStudyGuides to enhance the learning experience of the students at UniSIM.

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English language teaching and assessment in blended learning

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Abstract: The aim of this study was to evaluate the effectiveness of blended learning vis-à-vis face-to-face instruction. In order to achieve this aim, three research questions were raised: 1. Does the use of blended learning in English language teaching support the adoption and use of better teaching methods than those used in face-to-face instruction?, 2. Are the blended systems of assessment used during English language teaching better than those used in traditional face-to-face English classrooms?, 3. Does the use of blended systems of instruction and assessment result to better student outcomes when compared to face-to-face instruction?. The study was conducted using the case study approach which was supported by the collection of qualitative and quantitative data. The study involved two teachers, one who taught the experimental group using blended learning, and another one who taught the control group using face-to-face instruction. The results showed that the blended learning techniques were accepted by students of the experimental group much more positively than the conventional face-to-face instructional methods were. The comparative advantage of blended learning in contrast to face-to-face instruction is also supported by differences in students' performances which show that the experimental group performed better by scoring higher means and recording lower variances.

Keywords: Teaching, learning, assessment, blended, technology, approach

Introduction

Teaching and assessment are educational areas that have constantly evolved following the need to improve development and learning among students. According to Thorne (2003), blended learning has almost limitless potential because it "represents a naturally evolving process from traditional forms of teaching to a personalized and focused development path" (p.5). Blended learning is used to teach different subjects one of them being English. The process of learning English presents varied challenges for learners in varied contexts (Marsh, 2012). There are varied methods that instructors can use to teach grammar, vocabulary, speaking, reading, listening, writing, and other language skills, and according to Marsh (2012), there is no particular one way that can be used to teach students these skills.

However, there are optimal conditions for teaching the language and these include: authentic learner interactions (original, not copied, stemming from primary observation and not secondary sources), authentic learner tasks, exposure to varied language in creative ways, high levels of social interaction, adequate learning time and feedback, optimal learner guidance, relaxed atmospheres, and learner autonomy (Marsh, 2012). Marsh (2012) went on to cite that the process of attaining these optimal conditions in language teaching is a challenge. This makes blended learning important because it increases the chances of meeting these optimal conditions.

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The ability of blended learning to support these conditions is vested in its core philosophy because according to Marsh (2012):

> *"Blended learning refers to a mixing of different learning environments. The phrase has many specific meanings based upon the context in which it is used. Blended learning gives learners and teachers a potential environment to learn and teach more effectively". (p.3)*

Similar definitions have also been given by other scholars including Hofmann (2011) who stated that:

> *"A blend is using the best delivery methodologies available for a specific objective, including online, classroom-based instruction, performance support, paper-based (self-study), and formal and informal on-the-job solutions." (p.2)*

Hofmann (2011) went on to note that in most instances, blended learning is understood to mean the available technologies and how they can be used during the instructional process. However, instructors are expected to review the content to be taught, and then determine the best ways to teach the content. In other words, blended learning not only deals with the selection and use of technology, but also the incorporation of other teaching methods that support learning in the best ways. Similarly, Bersin (2004) defined blended learning as:

> *"The combination of different "media" (technologies, activities, and types of events) to create an optimum training program for a specific audience. The term "blended" means that traditional instructor-led training is being supplemented with other electronic formats." (p.15)*

These given definitions have their basis on two of the core processes of blended leaning including the process of teaching, and the process of assessing students. These processes are crucial in English teaching because the teaching processes support the accomplishment of specific learning objectives, while the assessment processes support evaluation to establish whether the set objectives were indeed accomplished. There are several studies that have been conducted to validate the effectiveness of blended learning in teaching and assessment, and some of their findings are presented in the next session.

Literature Review

Teaching

One study on English teaching using blended learning was carried out by Chatel (2002). The author conducted interviews and made observations that sought to enunciate whether blended learning which combined face-to-face instruction and technology based instruction facilitated instruction that was culturally, socially, and linguistically aligned to the needs of the students. To achieve this aim, the researcher involved eight classroom teachers and four English as an additional language (EAL) teachers. The findings of the study showed that the process of instruction was improved considerably.

Through the use of blended learning, teachers were able to ensure that the process of language instruction was aligned to the cultural, social, and linguistic needs of the students. To add to this, the study established that the students were able to collaborate through the use of technology. Moreover, the instructional process was characterized by flexibility and it supported

the development of technology skills. Students were for example able to locate English-French, and English-Spanish dictionaries using computers, which is reflective of the stated benefits. Through technology, students got opportunities to interact with the English language in its written and oral forms. They developed both vocabulary and grammar skills. Chatel (2002) concluded the blended instruction was better than face-to-face instruction because the instructional processes were improved and so were student outcomes.

A similar study to this was conducted by Gimeno-Sanz (2010). This study was conducted at the Technical University of Catalonia in Valencia, Spain and one of its targets was to establish the impact of blended learning on English teaching. The program allowed language instructors to design materials that are aligned to the students' needs by integrating audio, video, graphics, and text. The study by Gimeno-Sanz (2010) established that indeed there is a correlation between effective English teaching and the use of blended learning.

The combination of web tools, computer assisted language learning tools, and the face-to-face teaching practices resulted to higher levels of learner autonomy in the course of learning. The students were satisfied to a great extent because they were able to locate resources on their own and use them to learn English. The blended learning program implemented at the Technical University of Catalonia, Spain was also useful in improving needs-specific instruction and this in turn led to increased levels of proficiency and motivation.

The improvement in instructional processes in turn led to positive outcomes that were measured though the scores recorded by students. This is because in the years 2007/2008 and 2008/2009, 60% of the students passed the whole course and this was better than results recorded in earlier years when exclusive face-to-face instruction was in use. A similar study to those reviewed above was conducted by Zygadlo (2007) and its main aim was to establish the influence of blended learning on the acquisition of new vocabulary and in turn the development of language. In order to conduct the study, the researcher selected 46 students from a school in Izabelin, Warsaw Poland. The researcher used pretests and posttests. Before these tests were administered, the students in the experimental group were taught using blended learning with strategies such as self-study, use of computer tools, and face-to-face instruction. This researcher wanted to establish whether using blended learning promoted higher levels of student autonomy in the course of teaching than traditional face-to-face instruction.

The study by Zygadlo (2007) established that students learned better when blended learning was used, than when it was not used following the dynamism of strategies used to learn. In the study by Zygadlo (2007), the experimental group which learned new vocabulary using blended learning, performed better than the control group which was taught using face-to-face instruction only and had minimal autonomy. The results outlined by Zygadlo (2007) also showed that student autonomy was promoted and motivation was improved. Generally, these results showed that the use of blended learning improved instructional processes and made them better than those used in face-to-face instruction.

Assessment

According to Gimeno-Sanz (2010), assessment is also improved when blended learning is used. In this case study, the use of *InGenio*, which was the developed blended learning computer

application, and other blended learning strategies supported better student assessment. According to SmartPlay (2014) experts, *Ingenio* is the first American bilingual educational application containing educational games and toys for children from 3 to 8 years old. Its major benefits include innovative content and involving organization of educational activities in the form of fun games; it is durable and safe, and can be applied for both preschool and early schools studies. Assessment was in this sense improved in two ways because students got the chance to evaluate themselves and their progress, and similarly teachers found it easy to evaluate students.

Gimeno-Sanz (2010) noted that when students were learning, they continually checked their answers and corrected them in case they were wrong. Students could also request instructors to evaluate their work in the course of learning. Moreover, students got the chance to refresh exercises so that they could redo them before evaluation. This supported self-assessment and the attainment of better scores by students.

Blended learning also supported efficient language assessment because the students' progress could be established easily through progress reports that were available through assessment links (Gimeno-Sanz, 2010). Therefore both students and teachers could assess progress by accessing the reports. These are benefits that were not experienced when traditional modes of assessment that are supported in face-to-face instruction classrooms only were used.

Feedback was also an important aspect in assessment. The use of technology as part of blended learning to support feedback had positive effects on students because it complemented the feedback given to students during face-to-face instruction (Gimeno-Sanz, 2010). Students received personalized feedback because they were scored individually and they got individualized comments on areas that needed improvement (Gimeno-Sanz, 2010).

The feedback given to students was either delayed or immediate, but whichever way it was given, it ensured that students felt supported throughout the learning process. This is unlike traditional assessments which are not highly supportive of immediate feedback though they support delayed feedback in most cases.

Another case study that highlights the usefulness of blended learning in supporting language assessment was conducted by the University of Manchester (2010). The study covered diagnostic assessment in English. Non-native speakers of English were targeted for the assessment. The test given to students involved filling gaps with the correct words and completing sentences.

The results of the case study showed that the online and computerized assessment tools made it easier for instructors to establish the students' linguistic weaknesses (University of Manchester, 2010). The case study also established the importance of aligning the computerized assessment tools to the curriculum and learning objectives. The established assessment system complemented traditional assessment methods because the system "enabled people and computers to work in tandem" (University of Manchester, 2010, p. 3). The blended system of assessment was better than the non-blended system.

The combination of human input and technology as part of the blended system made language assessment and marking easier because the process was faster than those that involving exclusive human resources only. These tests also reduced the amount of time used to administer and mark tests thus making the assessment process efficient. On-screen marking was found to improve the analysis of results because similar answers could be grouped easily. It also supported faster marking and it made the processes of totaling faster.

Another benefit that the program used at the University of Manchester came with was increased levels of assessment. The tutors were able to develop more formative assessments for

their students even when they were in large groups. Moreover, the assessments were also found to be useful because they supported prospects of future curriculum improvements.

The conclusions of the case study were that the combination of computer assessment systems and human input "improves the appropriateness, effectiveness, and consistency of assessments", and that "efficient assessment processes produce pedagogic as well as institutional benefits" (University of Manchester, 2010, p. 4). A similar case study to those outlined above was conducted by Ware & O'Dowd (2008) and its aim was to evaluate the usefulness of an online assessment system in supporting peer assessment to complement assessments that are administered in face-to-face lessons. The scholars noted that peer assessment is important in settings where there are many students to a single tutor. This is because one-on-one feedback from the tutor may not always be feasible thus making the blend necessary. In such cases, instructors may use computer assisted language learning systems (CALL) to support learner assessment and feedback from peers.

In this case study, CALL assessment systems were used in two different ways to support assessment and feedback as part of complementing traditional forms of assessment. One group of students was exposed to e-tutoring, while another group of students was exposed to e-partnering. The students in the e-tutoring group were required to give feedback on any incorrect use of language while those in e-partnering were to do so only if they wished to. The study involved learners of Spanish and English at the post-secondary level. The results showed that students preferred to receive feedback through e-tutoring as opposed to e-partnering.

The authors concluded that the instructors should ensure they train students on how to give feedback during face-to-face teaching to support the effective use of blended systems of assessment. This is because peer feedback is useful in the process of assessment and in turn learning. They recommended that students should be taught how to give feedback, which would support constructive feedback when students are engaged in online activities and during face-to-face learning in the course of learning instruction.

Current Study

Methodology

Background Information. This case study investigated the use of blended learning versus the use of face-to-face instruction in teaching English. The main aim of the study was to establish whether outcomes of blended learning are better than outcomes of only face-to-face instruction. It also sought to establish whether traditional assessment is better when teaching speaking and writing or assessment systems that combine traditional assessments and blended forms of assessments are more efficient.

Research Questions. In order to verify specific elements of this research, the following research questions were made at the onset of the study:

1. Does the use of blended learning in English language teaching support the adoption and use of better teaching methods than those used in face-to-face instruction?
2. Are the blended systems of assessment used during English language teaching better than those used in traditional face-to-face English classrooms?
3. Does the use of blended systems of instruction and assessment result to better student outcomes when compared to face-to-face instruction?

Approach. The case study approach was adopted for the research. The study, which was conducted at a secondary level institution, was completed through the collection of both qualitative and quantitative data which means the mixed methods approach was applied. Woodside (2010) defines case study as "an empirical enquiry that investigates a contemporary phenomenon within its real life context, especially when the boundaries between phenomenon and context are not clearly evident" (p.1)

The case study research was selected because it is appropriate for studying human phenomena as cited by Gillham (2000). These studies support the collection of evidence because researchers collect "scientific" data (Gillham, 2000). Case studies therefore make it possible for researchers to manufacture new evidence in order to prove phenomena. The case study approach was also selected because it supports the collection of in-depth data as stated by Swanborn (2010).

Measurements and Analysis. The first set of measurements were questionnaires. Two questionnaires were developed for two groups of participants including the teachers and the students. The first questionnaire had closed ended questions and it sought to establish the teaching strategies and the assessment strategies used by the teachers.

The questionnaire had an 11-factor scale through which they used to rate their own utilization of specific teaching methods and assessment processes in relation to blended and face-to-face instruction. The second questionnaire was administered to the students and its target was to collect data on the students' levels of motivation in relation to the teaching and assessment processes used in blended and face-to-face learning. The questionnaire had 10 closed ended questions with a scale which they used to rate specific concepts. The questionnaires for the participants were developed and customized by the researcher.

The second measurement was pretest-posttest measurement on speaking and writing. The pretests and posttests supported the collection of numerical data on the performances of the students in the experimental group and those in the control group. The test had two sections, section one of the test was on speaking while section two was on writing. This allowed the researcher to compare results at more specific levels and establish whether the groups' performances were influenced by the processes of instruction and assessment that had been used. The data was analyzed using several methods.

One method was coding which was used to analyze qualitative data. Simple computations were also used to analyze quantitative data from the questionnaires. Another method was ANOVA which was used to analyze and present the results recorded by students. The analysis made it possible to establish differences in performances recorded by students in the two areas of learning that formed the focus of the developed program.

Participants and participant sampling. The study involved two groups of participants. Forty students studying in different classes but on one course made up the first participant cohort and all of them were in one high school. The participants were aged 13 to 14 and they were all English second language speakers. All the selected students had been exposed to the language within the same high schools setting. The second sample comprised 2 teachers who were responsible for teaching English to the two classrooms. Both teachers had over ten years of experience in teaching English to second language speakers of the language and both were females.

Purposeful sampling was used to ensure that selected participants had the desired characteristics. The researcher requested the school administration for collaboration in identifying potential participants. The students were then given forms to fill in order to establish

the number of years they have been learning English as a second language in classroom. This made it possible for the researcher to select students who had the desired characteristics. Ethical IRB approval was also granted from the university board of the researcher.

Procedure. The first step involved seeking consent from the children's parents, their teachers, and assent from the students. The parents and the teachers were required to fill up consent forms. Informal discussions were held with the children to establish whether they were comfortable with the idea of taking part in the study. The process of data collection was completed in several steps.

The students were randomly assigned to two groups. One of the groups was the experimental group while the other one was the control group. Two teachers were involved in the study and used the school curriculum to come up with the learning program for the study. The topics covered were speaking and reading. The learning program was developed by the two teachers collaboratively through reference to the high school curriculum for EAL learners which the students were being taught at the time of the study. The students were therefore taught the same content in different ways.

After the identification and development of learning content, the students in both groups (each group's number was 20) were given the same pretest on the topics. The pretest was followed by for a week's instruction. The experimental group was taught using blended learning strategies including online learning, computer assisted language learning tools, face-to-face instruction, performance support, self-study, and formal and informal on-scene solutions, while the control group was taught using face-to-face instruction only. After the four weeks period of instruction, the students were given the posttest. The posttest made it possible for the instructors to collect quantitative data on the students' performances and compare them with the pretest scores.

The collected data was then analyzed. The posttests were followed by questionnaire administration. The teachers were given their questionnaires first following the completion of students' post tests. This was followed by administration of the students' questionnaire. Both teachers and students filled up the questionnaires in the school's computer room through computer software to support easier and faster completion of the data collection process.

Results

Below are tables presenting the results collected from questionnaires that were completed by teachers and students.

The results presented in the tables show that the teachers assigned to the control and experimental groups gave students different materials, and used different teaching methods depending on the type of learning selected. Blended learning strategies included both distance learning elements and face-to-face educational elements, while face-to-face control group performed only face-to-face instructional activities. The teaching strategies/methods and assessment strategies included: individual work, pair work, group work, use of culturally responsive materials, social context alignment, self-assessment, immediate feedback, delayed feedback, and personal feedback. Most of the ratings by the control group fell under the "moderately supported/used" category, which means that students were moderately motivated and involved within the control period.

Table 1

Teaching and Assessment: Results from Scale: Control Group Teacher Responses

	Not supported/used	**Moderately supported/Used**	**Not sure**	**Highly supported/used**	**Extensively supported/used**
Teaching					
Individual work	-	-	-	✓	--
Pair Work	✓		-		-
Group Work	-	✓	-	-	-
Culturally responsive materials	-	✓	-	-	-
Alignment to the social context	-	✓	-	-	-
Alignment to linguistic needs	-	-	-	-	✓
Assessment					
Student self-assessment	-	✓	-	-	-
Frequent student assessment	-	✓	-	-	-
Immediate feedback		✓	-		-
Delayed Feedback	-		-	✓	-
Personal feedback	-	✓	-	-	-
Total Rating	**1**	**7**	**0**	**2**	**1**

The discussed category has been marked 7 out of 11 times which is equivalent to 64%. On the other hand, the experimental group rated the use of the blended learning teaching and assessment strategies highly; 8 out of 11 ratings which represent 73% of the total ratings were "highly supported/ used". The students' responses also indicated that the experimental group had higher levels of motivation than the control group. 109 responses out of the 200 collected for different prompts presented to students in relation to teaching and assessment indicated that the control group generally had "slight motivation". This is equivalent to around 55% of the student population. On the other hand, the results for the experimental group show that 103 responses out of the 200 collected fell under the category of "high motivation". This is equivalent to 52% of the experimental group cohort.

Table 2

Teaching and Assessment: Results from Scales: Experimental Group Teacher Responses

	Not supported/used	**Moderately supported/Used**	**Not sure**	**Highly supported/used**	**Extensively supported/used**
Teaching					
Individual work	-	-	-	✓	-
Pair Work	-	-	-	✓	-
Group Work		✓	-		-
Culturally responsive materials	-	-	-	✓	-
Alignment to the social context	-	-	-	✓	-
Alignment to linguistic needs	-	-	-	✓	-
Assessment					
Student self-assessment	-	-	-	-	✓
Frequent student assessment	-	-	-	✓	-
Immediate feedback	-	-	-	✓	-
Delayed Feedback	-	✓	-		-
Personal feedback	-	-	-	✓	-
Total	**-**	**2**	**-**	**8**	**1**

Table 3

Teaching and Assessment: Results from Scales: Students: Control Group

Teaching					
	Not Really	**Slightly**	**Not sure**	**Highly**	**Extremely/ Extensively**
I felt excited to be in the lesson	1	12	2	5	-
I participated in the lesson	-	14	-	4	2
I felt free to ask questions during the lesson	3	13	-	3	1
I could relate the teaching methods to my culture and language	10	9	-	1	-
I could relate the learning activities to my social context	4	13	1	2	-
The learning environment was appealing and attractive	-	17	-	3	-
Assessment					
The teacher allowed me to assess my work during the lesson	6	14	-	-	-
I received immediate feedback in the course of learning	14	6	-	-	-
I received delayed feedback in the course of learning	-	-	-	20	-
I received personalized feedback from the teacher	8	11	-	1	-
Total	**46**	**109**	**3**	**39**	**3**

Table 4

Teaching and Assessment: Results from Scales: Students: Control Group

Teaching					
	Not Really	**Moderately**	**Not sure**	**Highly**	**Extremely/ Extensively**
I felt excited to be in the lesson	-	6	-	11	3
I participated in the lesson	-	3	-	13	4
I felt free to ask questions during the lesson	2	2	-	12	4
I could relate the teaching methods to my culture and language	-	3	-	15	2
I could relate the learning activities to my social context	-	4	1	11	4
The learning environment was appealing and attractive	-	3	-	3	14
Assessment					
The teacher allowed me to assess my work during the lesson	-	5	-	10	5
I received immediate feedback in the course of learning	-	3	-	10	7
I received delayed feedback in the course of learning	-	12	-	8	-
I received personalized feedback from the teacher	-	-	-	10	10
Total	**2**	**41**	**1**	**103**	**53**

Student Performance

The students were given pretests and posttests which were useful in determining the effectiveness of instructional processes in the blended learning, and face-to-face classrooms. Tables 5 outlines the students' results.

Table 5

Results for the pretest and the posttest for the Experimental and the Control Groups

Pretest Results			
Speaking		**Writing**	
Face-to-face Mean (out of 50)	**Blended learning Mean (out of 50)**	**Face-to-face Mean (out of 50)**	**Blended learning Mean (out of 50)**
28.8 (Var = 3.1)	27.1 (Var = 3.1)	32.8 (Var = 3.7)	33.6 (Var = 4.2)
Posttest Results			
Speaking		**Writing**	
Face-to-face Mean (out of 50)	**Blended learning Mean (out of 50)**	**Face-to-face Mean (out of 50)**	**Blended learning Mean (out of 50)**
41.4 (Var = 2.1)	44.2 (Var = 1.4)	40.9 (Var = 2.4)	45.7 (Var = 1.3)

Note: Var = Variance

The tables above represent the results of the pretest and the posttest scores that the students attained for the two sections of the test including speaking and writing. The results show that after instruction, both groups improved in both areas. Even so, the experimental group had higher scores in both areas. Another notable trend from the figures is the reduction in variances recorded by the two groups.

The blended learning group also had lower variances than the face-to-face instruction group. The experimental group had recorded a lower mean in speaking which was 27.1 out of 50, the equivalent of 54%, in the pretest while the control group scored 27.1 out of 50 which is equivalent to 58%. The posttests depict improvements in both groups with the blended learning group showing higher levels of improvement. Posttest scores show that the face-to-face group scored 41.1 out of 50, which is equivalent to 82% while the blended learning group scored 44.2 out of 50 which is equivalent to 88%. Similarly, the face-to-face instruction group had a writing pretest score which was 32.8 out of 50 which translates to 66% and a posttest score of 40.9 which translates to 82%. The blended learning group scored 33.6 out of 50 which translates to 67% in the pretest, and 45.7 which translates to 91% in the posttest.

Discussion

According to Stockwell (2002), improved instruction and better assessment are some of the benefits of blended instruction. This is supported by the findings of this study which have confirmed that the processes of learning and assessment are improved as a result of using blended instruction. The results of this study are similar to those of the case studies reviewed earlier. The study by Chatel (2002) which was reviewed earlier reported improved instruction.

This is because the students were taught using materials that were linguistically relevant to them therefore their needs were met. The study by Chatel (2002) also recorded improved student collaboration. These are effects that were also recorded in this study when the experimental and control group findings were recorded.

The study by Gimeno-Sanz (2010) also reported improvements in instruction as a result of using the blended learning approach. This was evidenced by improved student performance. Similarly, this study established that the positive influence of blended learning on the instructional process led to better student performance. Though all students in both groups performed better in the posttests, there were significant statistical differences in the mean scores of the experimental and control group with the former performing better in general. A similar finding was reported by Zygadlo (2007) in the case study conducted in Poland. The assessment improvements recorded in case studies reviewed are also evident in this research. They reflect higher effectiveness in blended learning compared to face-to-face instruction.

This case study also recorded findings that are similar to those of the study by the University of Manchester (2010). Though in the current study the pretests and posttests were not diagnostic in nature like the tests used in the case study by the University of Manchester (2010), the findings are similar because both studies recorded improvements in efficiency. Ware and O'Dowd (2008) touched on differences in feedback and this was recorded in this study. The students and teachers reported higher levels of feedback (especially immediate feedback) in the experimental group than in the control group. Even so, the control group in this case experiences higher levels of delayed feedback.

Recommendations

One of the recommendations is that teacher training should be improved to ensure instructors are conversant with the use of blended learning approaches in classrooms. For example, Sugar, Crawley & Fine (2004) cited that teachers' decisions to use technology are partially determined by their knowledge and skills. Teachers who do not integrate technology in their classrooms cite lack of knowledge as a main reason for not doing so.

The study conducted by these researchers reported that only one-third of the teachers were either "very well prepared" or "well prepared" to integrate technology in their classrooms. Similar findings were also reported in the studies by Rizza (2000) and Saglam & Sert (2012) who cited ICT knowledge is crucial in determining the integration of technology. This integration has been proven to be useful, and as such, it is necessary for proper teacher training (Stacey & Gerbic, 2009). This will increase the likelihood of technology integration and in turn improve instruction and assessment. The same applies to training on strategies such as online instruction, classroom-based instruction, performance support, paper-based learning and best practices in integration.

In close relation to the recommendation above is the concept of professional development at the in-service level. While teacher training programs focus on the pre-service level of development, professional development at the in-service level will be useful in ensuring teachers who are already practicing adopt positive attitudes towards blended learning and that they use blended learning it in the best possible ways. This means that there should be better plans and increased support for professional development which supports continual learning.

The technologies and other teaching strategies used in classroom settings are constantly evolving. It is important for teachers to learn how to use new technologies in ways that support

the realization of maximum benefits for all stakeholders. Laborda & Royo (2007) claimed there is need for language instructors to use the latest computer technology, software and the latest internet technology. Professional development will also assist teachers to adopt attitudes that support the use of blended learning systems in English language instruction. Laborda & Royo (2007, p. 321) cited that through systematic training, teachers will understand the benefits of blended learning and how to use them.

It is also recommended that more schools adopt blended learning as a major instructional strategy. This study has established that blended learning supports better instruction and improved assessment in English language teaching. However, not all learning institutions have fully embraced blended learning in English teaching and those that have adopted it are not necessarily utilizing it to the maximum levels. As such, it is necessary for institutional leaders to review the current use of blended leaning in English teaching to establish whether the levels of adoption and use are optimal.

Future Research

There are opportunities for further research. Conducting further research in this area will support more effective development of blended learning strategies and in turn improve outcomes of blended learning. One important area that can be researched relates to intervening factors that define the learning process and in turn learning outcomes.

In this case study, even though most of the students in the experimental group performed better than those who were in the control group after the posttest, some of the scores showed that some students in the control group outperformed those in the experimental group. There is therefore need to research further the specific elements that may work as intervening factors in determining the effectiveness of blended learning and how the negative influences can be countered. Further research can also be conducted to establish the particular benefits of instruction and assessment in blended learning to the process of curriculum development.

There is minimal research in that area considering the recent adoption of blended learning in classrooms. Conducting such research will ensure that schools maximally utilize results collected in relation to blended learning. Research in that area will be instrumental in supporting long-term improvements in the use of blended systems and in the curriculums to which students are exposed.

Limitations of the Study

This study is undeniably useful in highlighting the differences that using blended learning can bring about in English learning, it however has several limitations. The first limitation lies in the use of a case study. Cassell and Symon (2004) stated that one major limitation of case studies is linked to the generalizability of the findings.

The findings cannot be generalized to expansive areas or to other learning institutions because the results are specific to the selected institution. This case study involved participants from one school who had specific characteristics, therefore that limits the extent to which the results can be transferred to similar situations. The study is also limited because it was conducted by a single researcher. According to Cassell and Symon (2004), studies conducted by single researchers may be biased because they make interpretations without involving other parties. In

the presented case, it was aimed to overcome this challenge by combining different data collection measurements and different types of data.

The data was collected using questionnaires and the pretest-posttest experimental design. Therefore data collection was not biased especially because the students' performances remained objective and complemented the information collected through questionnaires. These data collection measurements supported the collection of both qualitative and quantitative data. Collecting quantitative data about students' performances was useful in fine-tuning conclusions on the interconnections between instructional and assessment processes. The collection of quantitative data limited the extent to which bias could influence the results.

Another limitation is the possibility of variations in the selected cohort following differences in previous exposure. Though the sampling process was developed to ensure that the group was as homogenous as possible, there is a possibility that the students have had different instructional and non-instructional experiences that influenced learning. These experiences may have worked as intervening variables in defining student learning and in turn performance. Even so, threats to internal validity were reduced through the selection of students with closely related characteristics.

Conclusion

In consideration of the quantitative and qualitative data reported in this study, it is feasible to conclude that the use of blended learning supports better instruction and assessment than traditional face-to-face instruction only in English teaching. The results are indicative of the need for instructors to use blended learning to support English language teaching and learning. English language teachers should work collaboratively to come up with blended learning programs that support improved instruction and assessment. This will not only support language learning but also other areas of learning because English is a language that is used for instruction in other subjects.

Students need to learn how to express themselves using English. The usefulness of blended systems in language learning is therefore useful to other areas by extension. Though blended learning is useful for language learning as established by this study, it is important for instructors to come up with blended learning programs that are aligned to the context of use as suggested by Bonk & Graham (2005). These scholars noted that there are endless opportunities for developing blended systems for instruction within different contexts. English language teachers should ensure that they leverage on each opportunity that supports the development and use of blended learning.

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Using e-book annotations to develop deep reading

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Framework

In the course of conducting two SoTL studies on the benefits and challenges of using e-books in place of paper books we have refined and are sharing a handful of best practices to enhance the development of critical reading. Critical reading has been the focus of a great deal of research (Collins, Brown & Holum, 1991; Handsfield & Jimenez, 2011), and some of this research has focused on the ways that annotation practices enhance critical reading skills (Hoff, Wehling & Rothkugel, 2009; Zywica & Gomez, 2008). Our approach is distinctive insofar as we combine apprenticeship and comprehension strategies immersed in the e-text environment as part of a semester-long effort at the collegiate level.

Critical readers of primary texts have typical foundational goals: they aim to discover an author's central message, thesis, or narrative. But critical readers also want more. For example, they pay attention to the genre of the text and what might be known about the author's context. They aim to make sense of the author's support, defense, and development of the central message. They also challenge the text, raising questions and objections not only about the truth of the central message, but also about the author's argument in its defense. In the end, they see each text as part of a conversation in which their own reflections become new contributions to advance our collective understanding of the issues in question.

Although we can explain what behaviors we expect of critical readers, the practice of critical reading is challenging to cultivate (Conley & Wise, 2011). The practice itself is typically carried out privately and individually. Critical readers outline, extract arguments, mark critical passages and important claims, and write out notes alongside the text that include their own observations, questions, objections, and commentary. To be sure: teachers can present the *results* of exemplary critical reading, but our challenge is to find a way to model the *practice* of critical reading and to design courses that provide opportunities for students to develop as *apprentices* in this practice (Collins, et al., 1991).

Paper textbooks present obvious challenges to modeling and apprenticeship due to the relative permanence of annotations on paper, the lack of space to make more than short notes, and the difficulty for instructors to access and provide feedback on the quality of the annotations. Prior marks and notes in used textbooks are especially challenging as they may distract or shortchange readers when they attempt to make connections on their own. When books are in good condition, many students are loath to mark them up for fear of reducing resale value.

E-texts and e-readers offer tools that overcome the challenges posed by paper textbooks (Anderson-Inman & Horney, 2007). In an e-text, students can insert (and delete or change) highlights and annotations and they won't ever run out of room to elaborate their thoughts. More importantly, with some thoughtful course design, teachers using e-texts in the classroom can publicly model the art of critical reading while students can work as true apprentices, receiving feedback as they work in class or through the easy electronic sharing of annotations. In our

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view, the fact that e-texts can make the previously private act of critical reading into a public act represents one of the most positive transformational aspects of these new technologies.

Making it Work

The courses that we've investigated are small, upper-level reading-intensive courses in Philosophy, but the practices we suggest could be adapted for courses of any size with required reading. We set aside time in an early lesson to train students how to annotate using the tools available within our e-reader platform (Kindle app for the PC). We now incorporate intensive initial training because we learned that a short overview of annotation approaches and software features was not sufficient to make students likely to use the annotation tools of the e-reader. We begin with a bare text passage projected onto a screen at the front of the classroom. Our students have this same text on their laptops in an identical software environment. We then walk through four specific annotation practices associated with critical reading: outlining, connecting, questioning, and objecting to a text.

1. *Outlining*. The objective of an outline is to reveal the structure of the text, which is more challenging in primary texts due to the lack of headings and detailed tables of contents. We train students how to recognize and make note of signposts, especially key words such as, "first," "next," "therefore," and "moreover."
2. *Connecting*. Connections to other persons, texts, and objects help identify the author's context. Understanding the context is an important part of understanding the text itself as well as the larger conversation in which that text is but one part. We train students to note these connections.
3. *Questioning*. Every text requires interpretation. Readers do not share the mind of the author and texts are imperfect media for communication. We train our students to make note of issues that they don't understand or pique their curiosity.
4. *Objecting*. Texts contain assumptions, claims, practices, principles, etc., that are open to challenge. We train our critical readers to raise objections to their texts as they read.

While it's a good rule of thumb for readers to understand a text before they raise objections to it, we are not suggesting that these practices should be taught sequentially or that, in reading a text, readers should always follow the order above. Different texts will elicit different responses from readers and different readers will approach the same text differently. In other words, these four practices will increase a reader's critical engagement with a text but the specific nature of their employment will depend on the text and the reader.

We therefore introduce all of these practices in a single session, demonstrating how these practices might be undertaken in the e-book app and providing students with a chance to practice on their own machines. At present, electronic tools for most e-book platforms permit students to highlight, bookmark, and comment on an e-text. While highlighting alone can be useful, our focus is training students to use the commenting feature to accomplish the four annotation tasks described above. Outlining can be accomplished by using a numbering system in the running comments, perhaps with titles bolded to distinguish them from connections, questions, and objections. These latter elements can be indicated in a variety of ways; for example, one can begin each of these with a distinct symbol, e.g., "Q:" for question. While students are allowed to create personalized systems of annotation, they are told that any system should distinguish these four different types of critical engagement.

Our tutorial is only the beginning of the development process. Throughout the semester, we make use of several techniques to reinforce and refine the critical reading practices. The existence of multiple opportunities to practice a skill is foundational to skill development. Further, several of these techniques incorporate some form of feedback, which is also a crucial component of developing a skill (Svinicki, 2004).

The first technique is used when discussing passages in the text as a class at large. The instructor projects the text with his annotations visible for students to compare with the annotations that they've done on the same passage. During discussion, both the instructor and the students share the connections, questions, and objections that they've marked in the text. In this way, there is both public modeling of the instructor annotations as well as engagement and feedback about his and the students' annotations. Our second technique involves an in-class reading workshop in which students work together in small groups to make sense of the author's line of reasoning. They must work together from the text, pointing to the specific passages that animate their connections, questions, and objections. Third, as part of their daily work for the course, students select from their annotations what they regard to be their most significant connection, question or objection and submit this to the instructor before class begins. This assignment holds them accountable for critical reading and also provides support for class discussion. Finally, we require students to turn in a portfolio that contains all of their annotations for each e-text that we assign during the term. While not graded, collection of these portfolios reinforces the value the course places on annotations, and they provide samples of student performance and development so that we can continue to adjust our methods to better cultivate student mastery.

Future Implications

It is our view that e-texts, especially in the collegiate setting, will eventually become the dominant media form (Simon & Will, 2013). Although we have some colleagues who show trepidation about allowing students to work on computers during class (Young, 2006), we believe that we should embrace possibilities for enhanced learning with e-texts, especially when it comes to critical reading. The approaches we outline above incorporate modeling and multiple opportunities for practice and feedback, all of which are known to support skill development (Svinicki, 2004). The increased access to and sharing of annotations is central to the benefit of the e-text environment, as these are especially difficult to acquire from students using paper texts, and thus, limit the important aspect of feedback.

Although our courses were face-to-face, many aspects of our approaches can be incorporated into online courses and across a variety of e-reader platforms. We also believe that in the near future, e-text annotation and sharing features will further improve; we have already experienced enhancements in the two years we have used e-texts. Finally, we believe that electronic portfolios including annotations will support assessment of important outcomes such as critical thinking, which will in turn support aspects of the accreditation process.

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LOOMing possibilities: Learning APA style the self-paced way

Carra Leah Hood[1]

I teach required, first-year writing courses at Richard Stockton College of New Jersey. Like many other teachers of first-year writing, I am used to complaints, grumblings from students (about my writing assignments), from faculty colleagues (about the quality of students' writing in their courses), and from employers (about their need for employees who can write well).

Faculty members frequently point to students' lack of preparedness for writing literature reviews in social science majors (McDonald, 2012). Until recently, very few first-year writing teachers at Stockton introduced students to APA research, writing, and citation style. That practice has changed over the past 8 years, and now, as is common practice in many first-year writing programs, students at Stockton receive an introduction to APA style in their first-year seminar, first-year writing course, or both. A collective commitment among first-year writing teachers to provide students with instruction in APA in-text and reference page citation forms did not really address the substance of faculty members' complaints: when students enter research courses in their majors, many do not understand the APA and social science concept of research and have no prior experience writing or reading literature reviews.

To address this, I created a first-year writing course, Introduction to Research that, although open to all students regardless of major, appeals primarily to social science majors. The course offers students who take it an opportunity to study APA research and writing style and to conduct and write up empirical research studies. The first semester it was offered, spring 2007, I taught 2 sections; it was not offered in the fall 2007. Since then, however, students can choose from multiple sections of Introduction to Research in both fall and spring semesters. This course has become a popular course among students, faculty members, and advisors. However, Introduction to Research is only one course; not all students who might benefit from the course have a chance to take it.

To reach those students, I facilitated a free, three-hour APA research and writing workshop one Saturday each semester. The workshop turned into two workshops and, then, turned into a month-long hybrid course offered through Continuing Education. A faculty member in the School of Business and I voluntarily co-facilitated the course each semester. When that faculty member left for a position in New Mexico, I taught the hybrid course for two more semesters.

In the fall 2013, in an effort to distribute the APA course more broadly, I met with the information technology department about recasting the hybrid APA course as a MOOC. We decided against that, though, as the student population for the course had been largely matriculated Stockton undergraduate juniors and seniors or graduate students, rather than a dispersed, global student population more suited for a MOOC. At that point, we worked to transform the month-long APA course into a Stockton-based "floating" online module or LOOM, Local Open Online Module. Any faculty member can import the LOOM into an existing course and fully customize the lessons. Alternatively, students can use the LOOM as a resource

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or as a self-paced learning opportunity. We completed that project and distributed the LOOM across the campus in February 2014.

Now, all faculty members can access the LOOM from among the shared course files in Blackboard, our learning management system (LMS), and import it into any course space on his/her Blackboard page. Once a faculty member imports the LOOM, he/she can modify it to fit a particular academic discipline and course content. A faculty member can use the LOOM in the way they might use a textbook in an existing course, post the LOOM to Blackboard as a resource for students, pick and choose which sections of the LOOM to use in a given course, or require students to complete the LOOM prior to the beginning of a particular course. In the latter case, results of the pre-test or the results of the pre and post-test can help a faculty member pitch any additional or reinforcing APA instruction in his/her course.

Contents of the LOOM

The LOOM begins with a note to faculty, offering some ideas for ways a faculty member can integrate the LOOM into an existing course. Since distributing the LOOM, faculty members in the School of Education and the School of Social and Behavioral Sciences have discussed adding the LOOM to courses that require research and writing. The Social Work and Criminal Justice Programs, for instance, are considering requiring the LOOM for undergraduate majors and Master's students. The Director of the Writing Center has incorporated the LOOM to the course that prepares student tutors. Because prospective tutors complete the course and have access to the lessons and resources after the course ends, they can refer to individual lessons or pass on particular resources during a tutoring session.

In the note to faculty, I suggest that faculty members customize the LOOM, in particular, adding discipline-specific examples of published articles written in APA form. The LOOM currently contains examples of articles in APA style from various disciplines, corresponding to the majors of students who took the hybrid version of the LOOM. Instead of using those examples, a number of faculty members in the School of Business have discussed collaborating to replace those examples with articles from business journals; that way, business faculty members who use the LOOM can share business-relevant APA article examples with students in their courses.

The LOOM was distributed to staff and administrators as well as to faculty. Recently, a staff person from the School of General Studies informed me that she is working her way through the LOOM in preparation to begin graduate school in the fall 2014.

When students enter the LOOM, they are prompted to take a pre-test. They do not have access to any other course materials until they complete the pre-test and click the submit button. A student does not receive a certificate of completion until after submitting the post-test. The pre and post-test consist of twenty-five multiple choice and true/false questions. The questions are randomized, and each has an explanation for wrong answers and for right answers as well as a notation about where to go in the *Publication Manual of the American Psychological Association* (chapter/page number) for fuller description; consequently, students can learn as they move through the questions. Faculty members who import the LOOM into their courses can assess students' learning from pre to post-test, too, and use the results to make any necessary adjustments to in-class instruction or to LOOM content.

After submitting the pre-test, a student can access the other course materials. The LOOM contains three assignments: 1) a references page, 2) a literature review, and 3) an annotated

bibliography. I created these assignments because they were common assignments among the students who attended the Saturday workshops or took the hybrid course.

Following the assignment descriptions are the course syllabus, a video overview, a folder containing APA resources, and twelve lessons. The lessons range from "What is APA Style?" to "Punctuation," "Information Literacy," "Headings," and "Plagiarism." Each lesson provides ample examples of ways to use the principle or practice in research and writing.

Benefits of a LOOM

The LOOM has all the benefits of a MOOC and none of the most commonly-cited disadvantages (Chen, Barnett, & Stephens, 2013; Dominique, 2014; Gerth, 2012; University of the People, 2014).

1. The LOOM is open, free, online, customizable, accessible to any faculty member who wants to use it, easily updated, and self-contained.
2. Because faculty members import the LOOM into existing courses, students can have faculty and course support as they move through the lessons (Coffin, 2013).
3. In addition, writing tutors complete the LOOM, which means students taking the LOOM can seek peer guidance, too, if they have questions or confront any difficulties.
4. Like some MOOC assignments, the pre and post-test is machine graded. However, students taking the LOOM in the context of a Stockton course have access to their teachers who can answer particular questions related to the tests (Coffin, 2013). Unlike the practice in MOOCs, faculty members using the LOOM grade students' writing assignments.
5. Unlike MOOCs, the LOOM does not attract tens of thousands of virtual students, many of whom do not engage with group members or in discussions; the students who take the LOOM are Stockton students taking Stockton courses.
6. The LOOM creates an opportunity for faculty members to collaborate for the benefit of students. At Stockton, co-teaching occurs infrequently, and there is no incentive for doing so; however, the LOOM facilitates pedagogical and content sharing among faculty members. If LOOMs become a more visible part of the Stockton landscape than they currently are, I can imagine a single course importing two or three LOOMs; in this way, LOOMs could offer a model for courses that regularly involve multiple teachers in content delivery.
7. The LOOM can be imported into more than a single course in a student's schedule in one or more semesters while they attend Stockton. Consequently, students can have access to LOOM resources over time, thus, leading to reinforced fluency with APA research and writing style.
8. The LOOM can be shared more broadly, outside of Stockton, through the Blackboard community, and because it can be exported in html, the LOOM can also be viewed on the Internet.

Since distributing my APA LOOM, I have considered creating others. As learning modules, LOOMs can exist to provide instruction in the types of skills or content, such as APA research and citation style, that oftentimes fall through the cracks in the curriculum (Hollands & Tirthali, 2014, p. 169). I have been in conversations with math professors distressed because students in basic and pre-calculus math courses do not understand the number line, a foundational principle typically not covered in those courses; this topic is just waiting for a

LOOM. Most of the writing faculty members at Stockton no longer teach grammar and punctuation; a LOOM could aid students struggling with those skills. Students in teacher prep frequently have difficulty passing the PRAXIS exam in English; I can imagine a LOOM that guides students in English-language literary history, a necessary kind of knowledge for students preparing to take the PRAXIS II English subject test.

I can't say that LOOMs are the future of higher education, but they certainly offer a means to employ digital technologies in a new way that can fill in curricular gaps, help students through some difficult learning hurdles, and as a result, play a part in enhancing students' overall success in college.

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Using audio-visual material to enhance laboratory practicals

Jennifer Schneider[1], Irene Munro[2], & Siva Krishnan[3]

Keywords: audio-visual, laboratory, independent learning

Framework

Laboratory practicals are an important part of science and health professional training. The literature suggests that active participation in the learning experience increases the student's ability to retain information (Weaver & Jiang, 2005). Thus, the learning experience provided by laboratory practicals should give students the opportunity to expand, explore and experiment with ideas discussed in lectures (Guerrero, 2007), develop their hands-on skills and reinforce the theory delivered in lectures.

It is common practice for students to receive printed material for their practical laboratories prior to the scheduled laboratory session. The expectation is that the students will read this material and arrive at the laboratory well prepared and able to focus on learning. However, experience has shown that students often do not read through the supplied material and, if they do, may have difficulty translating words into required actions. As a result, practical laboratory sessions become more of a process of students focussing on step by step actions and not on the overall results or outcomes required. Spending time working in the laboratory is meaningless if students have merely gone through the motions and not considered their learning.

This generation of students, often referred to as "digital natives" (Prensky, 2001), has grown up with the internet and viewing videos on websites such as YouTube for both entertainment and learning how to do things. Therefore it seems logical to explore using this type of digital delivery as an alternative way for students to prepare for laboratory practicals and to assist their reflection on learning once the practical has been completed.

This article describes how teachers can use audio-visual resources to enhance laboratory practicals through:

- Providing an alternative and engaging method for students to prepare for practical laboratories
- Constructing a resource that can be easily referred to in the laboratory during practical laboratory session
- Developing resources which empower students to reflect upon their learning

Making It Work

While a decade ago, production of videos required expensive equipment and software and extensive training in using these, tools to produce videos quickly with minimal training are now readily available. Equipment such as the iPad, iPhone, similar tablet or smartphone devices or small portable video cameras can used to prepare videos. For laboratory practicals, each step of

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the practical and use of equipment can be captured using 2 people, one to perform the experiment and the other to operate the recording device. Each step can be recorded as an individual video file and these can be imported into software such as iMovie for easy editing. Using software such as iMovie on the iPad, the video can be easily edited and audio track added after video editing. Titles and jpg files containing pictures or words can be added at various points to emphasise key elements or points. The movie can then be uploaded onto a learning management system (LMS) for students to view before the class. Additionally, these videos can be made available on computers in the laboratory for students to revisit during the practical laboratory session or to watch again after the laboratory practical.

Audio-visual resources can also be used to reinforce important learning goals from the practical laboratory. Using software such as Captivate®, Camtasia® or Articulate Pro®, short presentations can be easily prepared. These can then be uploaded into the LMS as SCORM files which, when accessed in the LMS, open to start the presentation. Some software also allows the addition of quizzes during the presentation. Having these available after the practical laboratory allows students to reflect upon the practical exercises carried out in the laboratory.

Preparing audio-visuals does initially add to the teacher's workload. However, once these are prepared, they can be re-used for a number of years in many areas. The benefits of having audio-visual resources available are that, if students are unsure about certain steps in the practical, they can access the audio-visual on a computer or device rather than having to get the teacher in the laboratory to explain. This can streamline practicals from both the teacher and student perspective. When multiple different experiments are being performed at the same time by different students, without audio-visual resources, students are often waiting to ask the teacher for help or they just go ahead and in so doing make mistakes. At the end of the practical students may seek to clarify some of the learning goals or points of the practical. An audio-visual resource can be used as their first point of call and this may answer many of the questions that they would normally individually seek the teacher out to explain.

It is essential to make students aware of these resources well before the practical laboratory. One way of introducing students to this concept is to spend a few minutes at the end of a lecture demonstrating what is available and how to use these resources. Ensuring that computers available in the laboratory have appropriate software available to play the videos is also important. When recording the audio, it is important to ensure that it is sufficiently loud but not distorted, clear and concise. Using a LMS such as Blackboard, access and usage of these videos can also be monitored by the teacher. Teachers can determine which students are accessing the resources when they are being accessed and frequency of access.

The authors have used audio-visual resources for laboratory practicals for several cohorts of students enrolled in pharmaceutics practicals. Teachers have reported that, by having videos available in the laboratory, practical laboratory sessions have run more efficiently. Student feedback has been very positive with students saying it is a much more informative way to prepare for practicals. The students have also reported that the reflect/review resources are very useful and have helped them achieve greater learning.

Future Implications

In this paper, we have described an approach that can be used to enhance laboratory practicals. A possible barrier for teachers is the perception that it takes considerable time to learn to use technologies available for teaching. A simple way to demonstrate how easy it is to produce these

resources could be to produce a short video demonstrating the steps involved (paralleling what is being done for student laboratories). The potential also exists for producing virtual laboratory practicals where students watch videos of experiments/procedures being performed and are able to record results from these procedures and analyse the data. This could be useful if a laboratory has limited access to expensive or specialised equipment.

Some practical laboratory sessions require students to generate a written report. Instead of a written report, the possibility exists for students to generate an audio-visual report which summarises what they did in the laboratory, what the results were and then discuss what their results mean and link the learning to core knowledge delivered in lectures. These audio-visual reports would also lend themselves to a peer review process.

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Style Sheet for the *Journal of Teaching and Learning with Technology*

John Dewey[1] **and Marie Curie**[2]

Abstract: This paper provides the style sheet for the Journal of Teaching and Learning with Technology. Manuscripts submitted for publication should adhere to these guidelines.

Keywords: radiation, metacognition, identity theory, constructivism, educational philosophy.

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Indent the first line of every paragraph and the first line of every footnote; all first line indentations should be 0.5". Use only one space after the period of a sentence (word processors automatically adjust for the additional character spacing between sentences). The keywords should be formatted identically to the abstract with one line space between the abstract and the keywords. Authors should use keywords that are helpful in the description of their articles. Common words found in the journal name or their title article are not helpful keywords.

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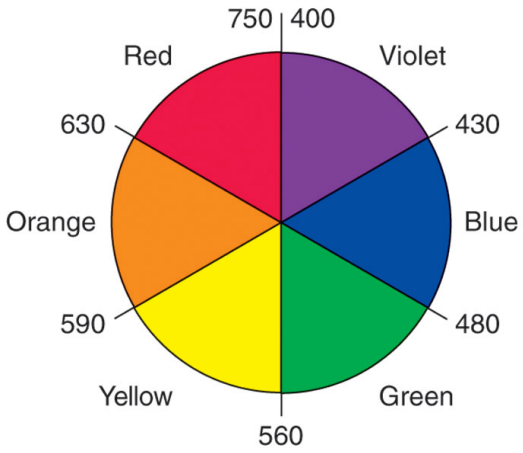

Figure 1. Color wheel with wavelengths indicated in millimicrons. Opposite colors are complementary.

Acknowledgements

Acknowledgements should identify grants or other financial support for this research by agency (source) and number (if appropriate). You may also acknowledge colleagues that have played a significant role in this research.

Appendix

Please insert any appendices after the acknowledgments. If your submission has only one appendix, this section should be labeled '*Appendix.*' More than one appendix will change the section label to '*Appendices.*' Each appendix should have a title; if you are including items from your class or research, please alter them to include a title. Appendices should be alpha-order (Appendix A, Appendix B, etc.) These labels and titles should be at the top of the page, left justified, italicized.

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