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An Examination of Students' Use of Technology for Non-Academic Purposes in the College Classroom

Zachary G. C. Kornhauser[1], Andrea L. Paul[2], and Karen L. Siedlecki[3]

Abstract: Previous research has shown that students who use technology in the classroom for non-academic purposes suffer decrements to their academic performance. These findings are consistent with theories and research in cognitive science. However, no current study has examined the type of technology that students use in class, their reasons for using it, and whether they feel that it is acceptable to use it. The current study sought to quantitatively and qualitatively explore these questions across a sample (N= 105) of college students. Results reveal that the most common uses of technology in the classroom is text messaging and emailing, and that students regularly use technology for a variety of non-academic reasons. In addition, students commonly used technology in class because of boredom, and those students who used technology because of boredom scored lower than students who used technology in class for other reasons. Frequency of laptop and cell-phone use did not impact academic performance, however. Implications for this research are discussed.

Keywords: post-secondary education; media in education; pedagogical issues; teaching/learning strategies

Technology use and ownership have become ubiquitous amongst today's college students, many of whom are equipped with an array of mobile devices. For instance, estimates suggest that almost 90% of North American university students own laptop computers (Dahlstrom, Boor, Grunwald, & Vockley, 2011). Other estimates suggest this figure is as high as 99% (University of Virginia, 2009). The past decade has also witnessed the rapid introduction of an even more portable device- internet enabled smartphones, which are owned by 84% of college students today (Pearson Education, 2014).

Predictably, and perhaps inevitably, this increase in technology ownership across campuses corresponds with increases in the amount of software students use and the time they spend using it. Evidence suggests that, on average, students spend approximately 52 minutes per day using social networking sites, just over half an hour e-mailing, and nearly 45 minutes talking on a cell-phone or text messaging (Jacobsen & Forste, 2011). Other research suggests that frequent email users (75% of students) send and receive an average of 25 emails a day, frequent text-messagers (74% of students) send an average of 84 text messages a day, and frequent Facebook users (58% of students) check Facebook 13 times a day (Dahlstrom et al., 2011).

As technology ownership increases among college students in general, there has also been a documented rise of student technology use within the classroom. For instance, evidence suggests that 65% of students bring their laptops to class with them (Fried, 2008). Students

[1] Fordham University, Department of Psychology, 441 E. Fordham Road, Bronx, NY 10458, zkornhauser@fordham.edu
[2] Fordham University, andrealaurenpaul@gmail.com
[3] Fordham University, klsiedlecki@fordham.edu

might use technology in class for a number of purposes, including gaming, social networking, and web browsing, none of which necessarily relate to the course material being presented (e.g., Hembrooke & Gay, 2003; Witecki & Nonnecke, 2015). Thus, students' access to technology in the classroom has the potential to distract them from course material.

Indeed, several studies show that when students have access to laptops in the classroom, they often engage in distractive multi-tasking behaviors (Fried, 2008; Hembrooke & Gay, 2003; Kraushaar & Novak, 2010). For instance, Kraushaar and Novak (2010) tracked student laptop use during class time through the installation of computer-monitoring software and found that while technology is often used in the classroom for course-related purposes, it also frequently used for 'distractive' purposes as well; the authors found that students opened an average of 40.7 non course-related web browser windows, which is twice as many windows that students opened for productive, or course-related purposes. Indeed, for every 100 productive windows students opened, they also opened 33 surfing and entertainment windows, 27 email windows, 43 instant-messaging windows, 87 PC operations windows, and 19 miscellaneous windows. Furthermore, 91% of students were observed using email during class, and 61% were observed using instant messaging programs.

Some colleges have started to implement strategies to combat this usage, including banning technology use during class, asking students who use laptops or other technology to sit in the front of the class for monitoring, or setting up systems which allow instructors to switch off the internet during class sessions (Young, 2006). These strategies have been implemented with the assumption that in-classroom technology use distracts from lecture and decreases academic performance, but is this really the case? In the following paragraphs, background theory on cognitive load and attention will be presented followed by an examination of the empirical literature on the relationship between in class technology use on academic performance.

Theories and research findings in cognitive science generally lead to the prediction that non-academic technology use in the classroom hinders learning and, consequently, academic performance. For example, early theories of attention have proposed it to be a bottleneck, in that we are presented with more information that we can process at any given time (Broadbent, 1958). Applied to the classroom setting, if use of academic technology is occupying the bottleneck then it can be assumed that less attention is being paid to course material.

A second, more recent approach to understanding the problems that non-academic technology use in the classroom might pose to learning is cognitive load theory (CLT). According to CLT, our cognitive architecture is designed to process information in certain manners (Sweller, 2012). From a CLT standpoint, certain knowledge and skills, such as recognizing faces and learning how to speak, are biologically ingrained and occur outside of our conscious awareness. These skills are referred to as biologically primary knowledge. On the other hand, biologically secondary knowledge is knowledge that we are not adapted to acquire, and thus must do so consciously and effortfully. An example of this type of knowledge would be educational information taught in college (Sweller, 2012). In order to acquire biologically secondary knowledge we utilize cognitive processes such as working memory, which is an information processing and storage unit that is limited both in capacity and in duration (Leahy & Sweller, 2011). Due to the limitations inherent to our working memory systems, we can only process a limited number of items at any given time. Every task we complete competes for our attention, and those that we attend to have a cognitive cost on our working memory (Sweller, 1988).

The notion of how much cognitive load we can manage at one time also depends on the information itself and the way that it is presented. Intrinsic cognitive load refers to the complexity of the material being taught, and cannot be modified. Extraneous cognitive load, on the other hand, depends on the way that material is imparted, and is very much within the control of the instructor (Wong, Leahy, Marcus, & Sweller, 2012).

According Sweller (2011), we are most successful in learning information when that information does not exceed our working memory capacity, and the extraneous cognitive load is low. Thus, instructors who are able to present material within the limits of students' processing capacity are most likely to facilitate effective learning environments for their students (Sweller, 2012). However, this model would predict that student learning would decrease in instances where students are straining their working memory by using technology for non-academic purposes while also attempting to pay attention to course material. Furthermore, this model also posits that the use of technology can present extraneous cognitive load on students, even if this technology is being used for educative purposes (Sweller, 2012).

A further cognitive perspective through which non-academic technology use in the classroom can be understood is divided attention, or our ability to focus on two tasks being performed at the same time. Research on divided attention has generally demonstrated that attending to two tasks simultaneously, such as listening to a lecture while also using a computer for non-academic purposes, decreases our ability to perform either task effectively. Some of the research on the topic has found that performing a concurrent activity while also attempting to encode a memory leads to decrements in recalling that memory (Baddeley, Lewis, Eldridge & Thomson, 1984). In these instances, it appears that retrieving information becomes difficult if that information was not encoded well in the first place.

The above theoretical perspectives suggest that technology use in the classroom leads to decrements in academic performance, and research on the topic has generally revealed this to be the case. Multiple researchers have found a negative relationship between non-academic technology usage and academic performance (Fried, 2008; Junco & Cotten, 2012; Kraushaar & Novak, 2010; Wood, et al., 2012). For instance, Fried (2008) demonstrated that laptop usage was significantly and negatively related to class performance (out of a score of 100) even when other factors have been controlled for. Further, Kraushaar and Novak (2010) demonstrated that use of distractive technologies during class was inversely related to multiple measures (e.g., quiz score, final exam score) of academic performance. Wood et al. (2012) found that students who do not use technology in class outscored students who did use technology on a multiple-choice quiz. Finally, Junco and Cotton (2012) showed that the detrimental impact of technology extends beyond the classroom, as using Facebook while completing schoolwork outside of class was negatively associated with academic performance.

In addition, research has shed light on the specific technologies that lead to the aforementioned decrements in academic performance, including laptops (Fried, 2008; Hembrooke & Gay, 2003), text-messaging, (Rosen, Lim, Carrier, & Cheever, 2011), and Facebook use (Wood et al., 2012; Junco & Cotten, 2012). These findings are consistent with those from cognitive science that predicts that attempting to pay attention to more than one stimulus will affect students' ability to accurately pay attention to either stimulus.

Previous research has demonstrated that there is a negative relationship between non-academic technology use and academic performance (Fried, 2008; Kraushaar & Novak, 2010; Junco & Cotten, 2012; Wood, et al., 2012). However, many questions surrounding students' use of technology in the classroom remain unanswered. Specifically, no studies to date have

adequately examined what sorts of non-academic technology are being used during class, why students are using it, and their thoughts regarding the acceptability of using it. Are students using some forms of technology more than others? Also, what factors underlie their reasons for using it? Might students be having difficulty concentrating on the course material for long stretches of time, or are their instructors not adequately engaging them? Finally, do students feel it is acceptable to use technology for non-academic purposes during class? The purpose of the current study is to quantitatively and qualitatively examine these questions, while also examining the relationship between in-class technology use for non-academic purposes and academic performance as measured by course grade. The results may have important implications for the way that college classes are taught, and the way that students' use of technology is approached by instructors and college administrators alike.

Method

Participants and procedure

Participants were recruited for this study through an "event" created on Facebook. Undergraduate students from across the United States were invited to the event. If they chose to "attend" the event, the event page held a short explanation with a link to an online survey. Links to the online survey were also posted on related websites and were e-mailed to selected undergraduate classes at Fordham University, a private college in New York City. Inclusion criteria included being an undergraduate college student, and having completed four courses within a year of completing the survey. One hundred and five participants, comprising 53 females (50.5%) and 21 males (20.0%) (31 participants declined to state gender), completed the survey.

Materials

Participants completed a survey designed to assess frequency and types of technology use and the relationship between these variables and academic achievement (see the Appendix). Participants were instructed to reflect on an undergraduate course they had taken in the past year. For this class they reported the name of the course, the frequency (always, often, sometimes, rarely, or never) of using a laptop and cell phone for non-academic purposes, how many minutes they spent using technology per class meeting, and the grade they received in the course, on a scale from A to F. They were also asked why they used technology in class, and the respondents were asked to check all the answers that applied among the following options: boredom, long class, needed to talk to someone, needed information for class, felt the need to stay connected to the outside world, or other (in which the respondents were given room to elaborate).

In addition, participants answered questions regarding gender, college year, their overall GPA, and their major GPA. Finally, participants also answered the following qualitative questions:

1. *Acceptability*: Do you think it is acceptable to use technology in the classroom? (First, they selected "Yes", "No", or "Sometimes" and then filled-in an open-ended response box labeled "Explain").

2. *Type of use:* If you use a cell phone or computer for non-academic purposes in the classroom, how would you describe your use? (e.g., long chunks of time browsing the internet, shooting a quick text message, etc.)
3. *Variation:* Do you use technology for non-academic purposes more frequently in certain classes? Why? (e.g., a particular subject, a particular professor, a longer class, etc.)

Results

Quantitative analyses

Descriptive statistics were conducted to determine which technologies students used during class, how often students used them, and their reasons for using them. In regards to technology use, results revealed that 45 participants (43.3%) reported using laptops in class and 83 (79.8%) reported using cell-phones in class. One response was missing from both calculations. Laptop use was positively correlated with cellphone use ($r = .41$, $p < .01$) and with average number of minutes of using technology during class ($r = .57$, $p < .01$). Cellphone use was also positively correlated with average number of minutes of using technology during class ($r = .40$, $p < .01$).

Of those participants who reported using laptops in class, participants most commonly reported using them in every class ($n = 16$; 35.6%) followed by rarely using them ($n = 12$; 26.7%). Of those participants who reported using cell-phones in class, participants most commonly reported using them rarely ($n = 28$; 33.7%) followed by using them every class ($n = 20$; 24.1%). A complete list of participants' reported frequency of laptop and cell-phone use can be found in Table 1. Results of a chi-square analysis indicated that students who reported using laptops frequently in class also tended to use cell-phones frequently in class, while students who rarely or never used laptops in class also tended to rarely or never use cell-phones in class ($\chi^2 = 33.46$, $p < .05$).

Table 1. Participants' frequency of laptop and cell-phone use in class

	Laptop use ($N = 45$)	%	Cell-phone use ($N = 83$)	%
Every class	16	35.6	20	24.1
Most classes	11	24.4	19	22.9
Some classes	6	13.3	16	19.3
Rarely	12	26.7	28	33.7

Reasons for use. Regarding reasons for using technology in class, 55 (52.9%) reported that they did so out of boredom, 33 (31.7%) reported that they did so due to the length of the class, 27 (26%) reported that they did so because they needed someone to talk to, 22 (21.2%) reported they did so to look up information for class, 19 (18.3%) reported they did so because they felt they needed to be connected to the outside world, and 18 (17.3%) responded with 'other.' More information on the reasons for use can be found in the qualitative analysis section. Chi-square analyses were conducted to determine if duration of laptop and cell-phone use (e.g.,

always, sometimes, rarely, and never) were correlated with particular reasons for use (e.g., boredom, length of class, needed to talk to someone). Results revealed that students who always used laptops tended to do when they felt their classes were too long ($\chi^2 = 19.27$, $p < .01$), and used cell-phones when they felt their classes were too long ($\chi^2 = 15.88$, $p < .01$) or when they were bored ($\chi^2 = 33.04$, $p < .01$).

Technology use and academic performance. Chi-square analyses were conducted to examine the relationship between in-class technology use and course grade. For course grade, due to the large portion of students who received course grades of 'A,' data was coded in such a way that grades were coded as 'A' ($n = 59$, 56.2%) or less than 'A' ($n= 44$, 41.9%). One response was missing from the calculation. Analyses revealed that duration of laptop and cell-phone use in class did not significantly impact course grade ($\chi^2 = 6.44$, $p = .96$; $\chi^2 = 7.05$, $p = .13$). Further analyses were conducted to determine if particular reasons for using laptops and cell-phones related to course grade. Results indicated that students who used technology out of boredom ($\chi^2 = 4.83$, $p <.05$) tended to score lower than students who used technology in class for other reasons.

Acceptability of technology use. Additional analyses were conducted to examine whether individuals who answered "yes" to the question of ($n = 37.1\%$) "Do you think it is acceptable to use technology in the classroom?" differed in use of in-class technology compared to individuals who answered that it is "sometimes" acceptable ($n = 44$; 62.9%). Only four participants answered "no" to the above question and were therefore excluded from the analyses. Independent sample *t*-tests indicated that those individuals who thought that technology use is always acceptable reported using laptops and cell-phones more often, $t(68) = -3.32$, $p = .001$ and $t(68) = -2.62$, $p = .011$.

Qualitative analyses

Categories were created to describe participant responses for each open-ended question (type of use, acceptability, and variation) and two independent raters classified each participant response into as many categories as were appropriate. Because one response could be classified into more than one category, the percentages in the tables below exceed 100%. The mean correlation between the two independent raters across all the categories was .88 for type of use, .77 for acceptability, and .86 for variation. Responses that were categorized differently by the raters were resolved in a meeting between the two raters.

Type of use. Frequencies of the responses for the type of use question (*If you use a cell phone or computer for non-academic purposes in the classroom, how would you describe your use?*) are presented in Table 2. Seventy individuals answered the question, and the most frequent response ($n = 50$, 71.4%) to the question was that they texted in class. The next most frequent response was that they used their computer for non-academic purposes for browsing or surfing the internet ($n = 10$, 14.3%), and checking email ($n = 9$, 12.9%). In addition, 43 students (61.4%) used a term (quick, brief) in their descriptions to signify that their use was done quickly.

Table 2. Themes identified in the open-ended responses to the "Type of Use" question

TYPE OF USE ($N = 70$)	Total	%
Texting	50	71.4

Browsing/surfing	10	14.3
Checking email	9	12.9
Chatting with friends	6	8.6
Playing games	4	5.7
Facebook	4	5.7
Checking the time	2	2.9
Look something up	1	1.4
Working on work from other classes	1	1.4
Multitasking	1	1.4
Check messages, but not replying	1	1.4

Acceptability of use. Sixty-three individuals provided an answer to the acceptability question (*Do you think it is acceptable to use technology in the classroom? Explain).* The most frequent response concerning using technology for academic purposes, included taking notes (*n* = 25, 39.7%). Other common responses included using technology in times of emergency or when needing to communicate with someone else (*n* = 13, 20.6%), and when used as a resource to look something up (*n* = 12, 19%). A complete list of identified themes is presented in Table 3. An example of a response that was categorized under *Academic purposes* is "Only when it is called for, or for note-taking. I think it is extremely rude to use technology to communicate or play games during class." An example of a response categorized under *Boredom* is "Sometimes a class is too long or just too boring. Without the use of technology, I wouldn't make it through the class without falling asleep." The following response was categorized under several categories (*Academic purposes*, *Beneficial learning tool*, *Resource for looking things up*, and *Multitasking*): "If one feels confident multitasking then they should be able to use technology. It can also be a helpful tool to find out information about the subject and/or take notes more quickly/efficiently."

Table 3. Themes identified in the open-ended responses to the "Acceptability" question

ACCEPTIBILITY (*N* = 63)	Total	%
Academic purposes (taking notes, if computers are necessary for class)	25	39.7
When necessary to communicate/ Emergency	13	20.6
When used as a resource to look things up	12	19
Comfort with multi-tasking/ doesn't hinder the learning process	6	9.5
Depends on class size/structure	5	7.9
Beneficial learning tool	4	6.3
Unless disturbing others	4	6.3
Boredom	4	6.3
Used in the "real world"	2	3.2
During breaks or downtime	1	1.6

Unless used to cheat	1	1.6

Variation of use. As shown in Table 4, 68 participants responded to the variation question (*Do you use technology for non-academic purposes more frequently in certain classes? Why?).* The most common response was that non-academic technology use was used in classes that were considered long (*n* = 21, 30.9%). For instance, one response categorized under *Long class* and *Class size* is "I use technology for non-academic purposes more frequently in larger classrooms with longer class periods." Boredom (*n* = 16, 23.5%) and having a boring, unengaging, or dull professor (*n* = 14, 20.6%) were also commonly cited as reasons for using technology in class. An example of a response that was categorized in both of the aforementioned categories is, "I do when professors are extremely dull or if I am not interested in the subject material at all." Eleven participants (16.2%) answered that the type of class did not influence their use of technology for non-academic purposes.

Table 4. Themes identified in the open-ended responses to the "Variation" question

VARIATION (*N* = 68)	Total	%
Long class	21	30.9
Boredom	16	23.5
Boring/ unengaging/ dull professor	14	20.6
No difference	11	16.2
Non-interactive classes , lectures	6	8.8
Classes that require technology/ when a computer is provided	5	7.4
Depending on interest in subject matter	5	7.4
Size of class	4	5.9
Significant down time, a break during class	3	4.4
Depending on how much prof noticed or cared	3	4.4
Class is easy	2	2.9
During a group activity	1	1.5
Seminar oriented classes	1	1.5
Professor teaches from textbook	1	1.5

Discussion

The current study aimed to examine what type of technology students used during class, how often they used it, their reasons for using it, and their thoughts about the acceptability of its use, while also examining whether in-class use of technology led to decrements in academic performance. Results indicate that many more students use cell-phones in class than laptops, and that students most commonly use academic technology when they are in a long class or when they are bored. Also, most students believe it is not acceptable or is only sometimes acceptable to use technology in class for non-academic purposes.

One main objective of the study was to examine whether using technology for non-academic purposes in class led to decrements in academic performance. In contrast with previous

research that found that using such technology use lead to decrements in academic performance (e.g. Fried, 2008; Junco & Cotten, 2012; Kraushaar & Novak, 2010), the current study did not find this to be the case.

One possible explanation for why the current study yielded discrepant findings from previous studies may be attributed to the nature of our sample. Of the 103 participants who provided their course grade, 59 reported receiving 'A's,' 36 reported receiving 'B's,' and only 8 reported receiving a course grade lower than a 'B.' This relative homogeneity in reported grades may be a function of the sample of participants, or it could be due to the influence that social desirability may have on participants' responses. A second explanation for our findings is that when asked to describe the type of technology use that they engaged in during class, a large portion of the participants (61.4%) reported that they did so either briefly or quickly. Examples of responses to the question of "If you use a cell phone or computer for non-academic purposes in the classroom, how would you describe your use?" include: "quick text messages, brief Facebook checks"; "Quick texts or looking something up really quickly"; "checking messages quickly, or writing a quick text/email." A total of 34 participants (49%) specifically mentioned that they texted during class and that they did so quickly (i.e., "shooting a quick text message") in their response to the type of usage question. If students are not using technology consistently throughout the duration of a class for non-academic purposes, then technology use may not be any more detrimental than usual in-class distractions (e.g., daydreaming, doodling). However, it worth noting that in-class technology use for non-academic purposes may adversely influence students sitting near the student using the technology for non-academic purposes. Thus, technology use differs from usual in-class distractions because those distractions are unlikely to affect others, whereas technology use has a high potential of distracting others. Future research could focus on the difference between brief and prolonged in-class technology use for non-academic purposes and how it affects academic achievement as measured by course grade, and also how it affects students who are seated near individuals who use technology for non-academic purposes.

The other major aim of the study was to determine what type of technology participants were using in the classroom, their reasons for using it, and their thoughts on the acceptability of using it. The vast majority (80%) of participants reported using cell-phones in class, while comparatively fewer reported using laptops (43%) in class. This finding is interesting because it might be assumed that computers would be used more commonly for non-academic purposes than cell-phones, since presumably using computers would be more discreet as they also can be used for academic purposes in the class. On the other hand, cell-phones are more portable than computers, so perhaps more students bring them to class than they do computers.

In terms of reasons for using technology, according to the qualitative analyses the most common responses provided by participants was that they did so because they felt the class was long, they were bored, or they felt that their instructor was boring or unengaging. In regards to the length of class as a reason for using technology, a question that should be considered is how class time relates to students' attention span. In comparison to high school classes which are typically less than 50 minutes, college classes are commonly 75 minutes or longer (Reardon, Payan, Miller, & Alexander, 2008).

Boredom in academic settings is composed of lack of psychological arousal or cognitive stimulation, and desires to escape the feelings through disengagement (Pekrun, Goetz, Daniels, Stupinsky, & Perry, 2010). According to this definition, students who are bored in class may very well disengage with the material and use technology for non-academic purposes, so it is not

surprising that boredom was a recurring theme mentioned by students for using technology in class. It is not known, however, what specifically led to students becoming bored or disengaged. The question should be explored as to whether it is the material that students are bored with, the instructor, the instructor's teaching style, or some combination of these factors. Also, worth noting is that according to previous research, boredom correlates negatively with academic achievement. In line with this previous research, we found that students who used technology because of boredom tended to score lower than students who used technology in class for other reasons.

Regarding participants' thoughts on the acceptability of using technology in class, many participants (40%) reported that it was acceptable if such usage had an academic purpose, while fewer participants reported feeling it was acceptable to use technology for non-academic purposes. When asked to explain their position, most individuals indicated that using computers to take notes and get information for class were the most acceptable uses of technology. One respondent expressed that it is unreasonable for instructors to forbid computer use, as fast lecture pace demands quick note taking. Other students felt that looking up information pertaining to class material aids in class discussions, and the Google search engine can be used as a learning tool to clarify unclear points in lecture. Participants who felt that technology was only acceptable in certain circumstances expressed the view that technology use can be distracting to other students and disrespectful to instructors. One individual felt that technology use for non-academic purposes only occurs with students who do not care about their education, while another felt that the experience of learning is diminished with the use of technology. For those participants who did report it was acceptable to use technology for non-academic purposes, common reasons mentioned were that they felt the class was easy or as long as they were not disturbing others it was acceptable. A few respondents mentioned technology use as a way of keeping awake in class and expressed that being distracted was more beneficial than being asleep.

It is interesting to note the discrepancy of the large amount of participants who reported using technology for non-academic purposes in class, compared to the smaller number of participants who felt it was acceptable to use technology for non-academic purposes. According to classical cognitive dissonance theory (Festinger, 1957), people experience tension when they engage in an activity that is inconsistent with their beliefs or attitudes. People then become motivated to resolve this tension by changing their existing beliefs or by developing new ones that are compatible with their behaviors. Applied to the current study, it might be assumed that participants who frequently used technology for non-academic purposes would develop a rationale for why their use was acceptable rather than using it but believing it was not acceptable to use in the classroom. Not surprisingly, individuals who felt technology use was always acceptable also tended to use laptops and cell phones more often.

While the current study yields interesting findings regarding students' use of technology during class, it is not without limitations. Chief among these limitations is the sample of participants used for the study. As mentioned earlier, the participants in this study achieved relatively homogenous grades, as the vast majority of participants in this study achieved grades of a 'B' or higher.

Future research should seek to build on the current findings by examining some areas of inquiry that the current study was not able to address. For instance, future research should seek to determine whether technology use is prevalent in classes that are shorter in duration, and whether in-class technology use could possibly be decreased by diminishing the length of class or by the

instructor offering breaks during the course of class. In addition, future research should seek to identify effective strategies for preventing or managing students' use of technology for non-academic purposes. As part of the current study, the authors contacted university professors regarding what methods they employed to curb or prevent such usage of technology. A number of responses were received in regards to this inquiry, and strategies that were identified as being successful included having Teaching Assistants monitor technology use, adding disclaimers discouraging such usage in the syllabus, enacting institution-wide policies with standard penalties for using technology, asking students to vote on an acceptable policy at the start of each semester, integrating different forms of technology into the class, and designating particular times in the class during which technology can be used. Since these methods have only anecdotally been identified as being effective, future research should seek to empirically examine the effectiveness of these methods. The benefits of identifying effective methods of managing students' usage of technology are more than academic; if such teaching methods can be employed on a large scale, then our educational system can better prepare a more educated populace.

Appendix 1: Technology Use Questionnaire

For "Section I", please reflect on an undergraduate class you have completed in the past year.

SECTION I: CLASSROOM ACTIVITY

CLASS 1: Name of class _____

1. How often did you use your laptop in class other than to take notes? (ex. Internet or Games)

Always (Every Class)_____

Often (Most Classes)_____

Sometimes (Some Classes)_____

Rarely (Very Few Classes)_____

Never_____

2. How often did you use your cell phone in class? (ex. Texting, Internet, or Games)

Always (Every Class)_____

Often (Most Classes)_____

Sometimes (Some Classes)_____

Rarely (Very Few Classes)_____

Never_____

3. Why did you use technology during class? (Select all that apply)

Boredom_____

Long Class_____

Needed to talk to someone_____

Needed information for class_____

Felt the need to stay connected to the world outside the classroom_____

Other (explain)_____

4. What grade did you receive in this class?

A____B____C____D____F____

5. Average number of minutes you used technology per class meeting_____

SECTION 2:

Are you:

Male_____Female_____

What year are you in school?

Freshman____Sophomore___Junior_____Senior_____

What is your:

Overall GPA_____Major GPA_____

Rank the level of difficulty of your university

Extremely Challenging_____

Challenging___

Average _____

Easy_____

Extremely Easy_____

Do you think it is acceptable to use technology in the classroom?

Yes___No___Sometimes___

Explain:

If you use a cell phone or computer for non-academic purposes in the classroom, how would you describe your use? (ex. Long chunks of time browsing the internet, shooting a quick text message, etc.)

Do you use technology for non-academic purposes more frequently in certain classes? Why? (ex. a particular subject, a particular professor, a longer class, etc.)

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Influence of Word Clouds on Critical Thinking in Online Discussions: A Content Analysis

Beatriz M. Reyes-Foster[1] and Aimee deNoyelles[2]

Abstract: This article presents an exploratory research study about the influence of word clouds on critical thinking when they are incorporated into online discussions. In an online discussion, students were asked to critically analyze two speeches, being assigned to one of two conditions: one in which the text was linear, and one in which the text was presented in the form of word clouds. Discussions posts were coded in two blended sections of an undergraduate anthropology course to assess the type and frequency of critical thinking demonstrated therein. Students in the word cloud condition exhibited more instances of critical thinking than students in the linear condition, and more often paired articulation of thought with the citing of evidence. The article concludes with recommendations for other educators interested in implementing a similar approach.

Keywords: online discussions; word clouds; critical thinking; content analysis; online learning and teaching; undergraduate education

Introduction

Online and blended course enrollments continue to rise in higher education institutions in the United States. While the overall student population has grown at an annual rate of 2.5% from 2002-2012, students taking at least one online course grew 16.1% to reach an all-time high of 33.5% (Allen & Seaman, 2014). With the increased popularity of online instruction, it is concerning that in such environments it can be challenging to support student development of critical thinking skills, which is an overarching goal in higher education (Behar-Horenstein & Niu, 2011). While there are many definitions for critical thinking, for purposes of this article, it is defined as the ability to purposefully reflect and articulate one's own thinking while engaging in tasks that require evaluation, analysis, and application of previous knowledge. Learners with critical thinking skills have the ability to analyze and evaluate information, make reasoned judgments, consider alternatives, think open-mindedly, reflect on the thinking process, and communicate effectively (Beyer, 1987; Facione, 1990; Simpson & Courtney, 2002). Lai (2011) recommends that educators use ill-structured problems that involve authentic contexts and support multiple perspectives to stimulate critical thinking. Effective assessments of critical thinking require that students make their reasoning visible, with the measure being the quality of the response rather than "right" or "wrong" answers. Communication and collaboration with peers are essential elements, as they allow multiple viewpoints to be shared and negotiated.

While previous research has found that students in online courses express a stronger preference to seek opportunities to use their critical thinking skills more than students in face-to-

[1] Department of Anthropology, University of Central Florida, 4000 Central Florida Blvd, Orlando FL 32816, beatriz.reyes-foster@ucf.edu.

[2] Center for Distributed Learning, University of Central Florida, 4000 Central Florida Blvd, Orlando FL 32816.

face courses (Stedman & Adams, 2014), it can be difficult to "provide opportunities, structures and formats that increase meaningful interaction and give students opportunities to practice and demonstrate critical thinking skills" (Joyner, 2012, p. 35) in the undergraduate online environment. For this reason, it is important to identify tools and strategies that support online learners to develop and exhibit critical thinking skills. One very popular tool used in online courses is the asynchronous discussion, in which students communicate mainly through text (although audio and video are sometimes supported) by posting messages, typically in response to a provided discussion prompt which asks them to think about the course material. Discussion prompts can range from simple question-and-answer, to open-ended, to highly structured. In a survey of instructors, Lynch, Kearsley, and Thompson (2011) found that 88% of participants believed or somewhat believed that online asynchronous discussions positively impacted student learning.

Word clouds, which are visual representations of a document's text (Kaptein, Hiemstra, & Kamps, 2010), emerge as a tool to potentially further support critical thinking within the context of online discussions. A word cloud takes the most frequently used words in a particular text and randomly displays them by size, based on their frequencies (DaPaolo & Wilkinson, 2014). Word clouds show promise to encourage critical thinking in online discussions because more critical thinking occurs when students are active in thinking about the content (Paul & Elder, 2000). DaPaolo and Wilkinson (2014) offer several ways they could be used to assess learning, such as providing a graphical representation of student learning, analyzing papers or writing, and comparing responses. Hayes (2008) emphasizes that word clouds aid students' reading and writing skills by requiring that students make connections between the large and smaller words. They can help a student understand major themes, identify unfamiliar terms, review previous materials, theorize connections among words, and encourage students to read the full text (Bandeen & Sawin, 2012; Bromley, 2013; Edyburn, 2010). Ramsden and Bate (2008) propose issues to consider when implementing word clouds, such as paying careful attention to the ways the words appear in the cloud and removing words that are misleading or unnecessary. They also caution that word clouds do not always portray the context of the words accurately.

Online discussions provide a forum for students to make their reasoning visible, and communicate and collaborate about ill-structured problems that enable multiple viewpoints. In this exploratory study, we examine how critical thinking is influenced and exhibited when word clouds are incorporated into an online discussion. We compare results with an online discussion which does not feature word clouds.

Literature Review

While online discussions have the potential to support the development of critical thinking skills, mixed findings exist in the literature. Online discussions rarely exhibit the highest levels of cognitive presence such as connecting ideas and viewpoints, and applying ideas to other contexts (Celentin, 2007; Darabi, Arrastia, Nelson, Cornille, & Liang, 2011; Garrison, 2007). There are several factors to explain this. The structure of the discussion board has been found to be an influence. For instance, Tu, Blocher and Gallagher (2010) explored threaded versus unthreaded discussions and found that while threaded discussions helped students reply to postings more easily, unthreaded discussions helped synthesize students' ideas in a more linear manner. Past research suggests (see Darabi et al., 2011; Kanuka, Rourke, & Laflamme, 2007, Nussbaum, Winsor, Aqui, & Poliquin, 2007) that discussion prompts which require students to form arguments and solve complex problems encourage a higher level of critical thinking than basic

question-and-answer formats. While students may prefer open-ended prompts, prompts such as debate and case-based scenarios generally exhibit higher levels of critical thinking (Richardson & Ice, 2010). Facilitation techniques are also an influence. Questioning (Darabi et al., 2011; Yang, Newby, & Bill, 2005) and challenging (Gerber, Scott, Clements, & Sarama, 2005) are two techniques identified in past literature as being supportive of critical thinking. Arend (2009) found that less frequent but purposeful facilitation, such as asking neutral probing questions, is associated with more instances of critical thinking in online discussions.

There is growing anecdotal evidence concerning the effectiveness of word clouds in learning environments. Past articles have described strategies such as reviewing word clouds which encompass student notes on a subject (Huisman, Miller, & Trinoskey, 2012), asking students to identify familiar and unfamiliar words related to an upcoming lesson (Nickell, 2012), and analyzing public speaking performances (Perry, 2012). However, there is little empirical research concerning the effectiveness of word clouds in learning environments. Baralt, Pennestri, and Selvandin (2011) asked students to create word clouds from their own writing and found that students generated more vocabulary and new grammatical tenses, and student comments exhibited engagement and peer interaction. They recommended that word clouds be used to promote reflection and brainstorming, as well as define main ideas. Student creation of word clouds has also been found as a strategy to manage a subject with extensive information, an important skill to exhibit in the workplace (Miley & Read, 2012).

There is even less known concerning the incorporation of word clouds into online discussions. A notable exception is Joyner's (2012) study, which evaluated the use of word clouds in a discussion assignment to see if it stimulated deeper levels of critical thinking. Joyner found that converting students' posts into word clouds and having them reflect on the resulting visual elicited greater evidence of critical thinking. In a related study, Hamm (2011) examined students as they created word clouds that displayed their perception of course content and posted them in an online discussion. It was found that students engaged in critical reflection of their work and the work of classmates.

In a related article (deNoyelles & Reyes-Foster, 2015), we found that when students interpreted text in the form of word clouds, they reported higher critical thinking scores on a survey than students interpreting the same text in the traditional linear fashion within online discussions. The goal of this paper is to extend that emerging finding by analyzing the content of the discussions themselves. *While students interpreting text in word clouds within online discussions perceived higher critical thinking than students who did not, did the discussions actually exhibit it?* Through this analysis, our growing knowledge extends past the after-the-fact self-report of the students.

Methodology

Participants and Context

Research was conducted in two class sections of an upper-division undergraduate anthropology course called *Language and Culture* at a large southeastern university in the United States. The course is a requirement for the anthropology major and fulfills requirements in several different programs as well as a diversity requirement, so the course attracts a large and diverse group of students. The course instructor (Reyes-Foster) was the same for both classes. Course enrollment in the Fall 2013 semester was 87, while 66 enrolled in the Fall 2014 semester. Both class sections were offered in blended format, meaning that class was held in person twice a week, with the rest

of the coursework to be completed online. As part of the coursework, students participated in five online discussions, accounting for 40% of the final grade. The word cloud strategy was implemented in the fifth and final graded discussion of the two semesters.

Data Collection and Procedure

At the beginning of the semesters, students were randomly assigned into online discussion groups of 8-10 students each, which resulted in approximately 10-12 groups. These groups remained the same throughout the semester. For the final graded discussion, the groups were evenly randomly assigned into two conditions: word cloud and linear. For instance, in Fall 2013, Groups 1-6 were linear, while Groups 7-12 were word cloud. All students regardless of condition were provided with an identical discussion prompt (Appendix 1). This prompt, which asks students to read two speeches and guess the speakers, was designed to promote critical thinking. Because the topics covered in class focused on gender and race, a speech by Susan B. Anthony and a Civil-Rights era speech by John Lewis were selected for this discussion. The only difference between the two conditions was that students in the word cloud condition were presented with the speeches displayed in the form of word clouds (Figures 1, 2), while the students in the linear condition were presented with the speeches displayed in a typical linear fashion (Figure 3). For accessibility purposes, students in the word cloud condition were also provided with a list of words and frequencies they could download in case they were unable to view the word cloud images.

Figure 1. Speech #1 in word cloud form.

Figure 2. Speech #2 in word cloud form.

Speech 1

Friends and fellow citizens, I stand before you tonight under indictment for the alleged crime of having voted at the last presidential election, without having a lawful right to vote. It shall be my work this evening to prove to you that in thus voting, I not only committed no crime, but, instead, simply exercised my citizen's rights, guaranteed to me and all United States citizens by the National Constitution, beyond the power of any state to deny.

The preamble of the Federal Constitution says:

"We, the people of the United States, in order to form a more perfect union, establish justice, insure domestic tranquility, provide for the common defense, promote the general welfare, and secure the blessings of liberty to ourselves and our posterity, do ordain and establish this Constitution for the United States of America."

It was we, the people; not we, the white male citizens; nor yet we, the male citizens; but we, the whole people, who formed the Union. And we formed it, not to give the blessings of liberty, but to secure them; not to the half of ourselves and the half of our posterity, but to the whole people--women as well as men. And it is a downright mockery to talk to women of their enjoyment of the blessings of liberty while they are denied the use of the only means of securing them provided by this democratic-republican government--the ballot.

Figure 3. Screenshot of excerpt of Speech #1 in linear form.

After participating in the discussion, all students were required to complete a feedback survey (Appendix 2) in which they were asked to assess their own critical thinking and engagement vis à vis the discussion assignment (see deNoyelles & Reyes-Foster, 2015, for results).

As per IRB approval, before the discussion commenced, the second author (deNoyelles) visited the classrooms and conducted Informed Consent protocols in the absence of Reyes-Foster, who was the instructor of record. Study information sheets were distributed and students were instructed to contact deNoyelles to opt-in to the study. Students who opted in received 3% extra credit added to their grade as an incentive to participate, but were also presented with an alternative extra credit assignment in case they did not wish to participate. Students who did not opt in to the

research study still were expected to complete the discussion for class, but were not included in the data analysis. 71% of students in the Fall 2013 semester and 62% of the Fall 2014 semester consented to participation in the study outlined in this article. We analyzed results only from the students who opted into the study. In addition, we downloaded participant discussion posts and replaced names with numbers to preserve confidentiality. In this article, we are concerned with the qualitative analysis of the discussion posts.

Data Analysis

While both critical thinking and engagement were explored, in this publication, we focus only on the analysis of critical thinking. We analyzed discussion posts using the Text Analysis Markup System (TAMS), an open-source qualitative analysis software designed for discourse research which aids in identifying themes in text. We used an iterative process to develop the critical thinking indicators to categorize the discussion data. To begin, we read several articles about the concept of critical thinking (Behar-Horenstein & Niu, 2011; Facione, 1990) and explored coding processes previously employed by Yang et al. (2005), who studied critical thinking in online discussions. We created a preliminary coding template, and proposed codes such as identifying areas of disagreement, application, and justification. Then, each researcher independently coded one linear group and one word cloud group using the codes initially formed, but also developed new ones when applicable. Each 'complete thought' within a discussion post was coded, and it was possible to have several codes exist within the same sentence. We then reconvened to share and compare the emerging analysis in order to identify areas of disagreement, negotiate meaning, and agree on a preliminary list of codes. We independently coded two more groups (one word cloud and one linear), compared results, and further refined the list of codes to include only those which incorporated elements of critical thinking. The final list of codes, descriptions, and discussion examples related to critical thinking are presented in Table 1.

Table 1. Final codes.

Code	**Description**	**Discussion Example**
Relating prior knowledge	Relate prior knowledge to their guess	"Tubman was known to be involved with the church during her women's rights activism so it seems fitting."
Articulating thought process	Articulating the sequence of thought; making thinking visible	"When I looked at the frequency list, other words stood out to me such as bill, discrimination, law, citizens, United States, ballot."
Citing evidence	Makes a claim and provides information to support it	"The first speech is probably written by a female. There are several tips that would make me believe this, such

		as the issue of the right to vote."
Reflection	Re-examining experience in the light of other viewpoints; integrating new knowledge into one's conceptual framework	"Looking back at what I had read, it really allows me to consider these speeches to be an example of language as a display of verbal artistry."
Integration	Forging connections between ideas and/or speeches	"The authors of each speech were members of social groups in different periods of U.S. history that were marginalized…the purposes of these speeches was to raise awareness of issues, to educate fellow members and address the perpetrators…"

We then coded together until we reached point of saturation at four groups, approximately 1/3 of the posts. After this process, we separated all of the discussion posts into four sets divided by semester and prompt type (Fall 2013 word cloud, Fall 2013 word cloud, Fall 2014 linear, Fall 2014 word cloud). Because we had already reached saturation, we decided that it would be sufficient to code half of each group. Reyes-Foster coded half of the discussion posts from Fall 2014 (66 posts), and deNoyelles coded half of the discussion posts from Fall 2013 (68 posts). Because we had already conducted the initial coding together, we coded 20% of each other's sets (resulting in about 14 posts) in order to ensure inter-rater reliability in the coding procedure. We then ran an analysis using TAMS that compared each researcher's ratings, and found that we had 91% agreement. We found 12 codes in this group of 20% in which we disagreed. We discussed the discrepancies until we reached 100% consensus.

We conducted several descriptive analyses including the number of codes generated altogether, the number of particular codes, and the co-frequency of certain codes, in order to better understand the relationship between certain dimensions of critical thinking.

Results

In this section, we share results, including the total number of codes contained within the discussions, the frequency of codes related to critical thinking, and the co-frequency of particular codes related to critical thinking.

Total Number of Codes

For all of the discussion posts, a total of 708 critical thinking codes were generated. The majority occurred in the word cloud condition (Table 2). In total, there were 418 critical thinking

codes in the word cloud condition and 290 critical thinking codes in the linear speech condition. This indicates that critical thinking was displayed more prominently for participants who received the speech in word cloud form.

Particular Codes

For all critical thinking categories but one, the word cloud condition outscored the linear (Table 2). The most dramatic result involved the code 'articulating thought process.' There were 90 more instances occurring in the word cloud condition than in the linear condition. The word cloud condition also outscored the linear in 'citing evidence' (16 more instances) and 'integration' (21 more instances). In addition, the word cloud condition had 24 more instances of 'reflection,' often occurring in the peer reply posts. The only code in which the linear condition outscored the word clouds was 'relating previous knowledge' (23 more instances). These are interesting results, given that the discussion prompt was identical for all students, regardless of the condition in which they were assigned.

Table 2. Frequency of critical thinking codes.

Code	**Word Cloud**	**Linear**
Articulating thought process	145	55
Citing evidence	135	119
Integration	65	44
Reflection	39	15
Relating previous knowledge	34	57

Beyond the larger frequency of critical thinking codes in the word cloud condition versus the linear speech condition, the overall content of the analysis contained within the discussion posts in each instance differed considerably from one another. Table 3 presents examples of what discussion posts looked like for each critical thinking code under both conditions. Examined in this way, the reader can see how having an entire linear speech available, as opposed to a word cloud which lacks context, results in somewhat different demonstrations of critical thinking.
While participants in both conditions usually arrived at the same conclusion about the origins of the speeches, it was expressed differently depending on the condition. This was especially so with the codes 'articulating thought processes,' 'citing evidence,' 'relating prior knowledge,' and 'integration.'

Table 3. Critical thinking codes in word cloud vs. linear speech condition.

Code	**Word Cloud Condition**	**Linear Condition**
Articulating thought process	I found the words "freedom", "march", and "revolution" and	It is obvious that a Civil Rights activist is speaking, because in the

	immediately thought of the civil rights movement.	beginning he talks about the inadequacy of "the administration's civil rights bill.
Citing evidence	The key words in the cloud that lead me to believe this are "Kennedy," "peaceful," "south," "revolution," "king," "Georgia," "political," "government," "politicians," and "congress."	She states, "an oligarchy of race, where the Saxon rules the African, might be endured", and subsequently, "every discrimination against women… is today null and void… as is every one against Negroes."
Integration	[In the first wordle] the use of the words "Makehateful", "mockery" and "crime" give it a much darker tone. The second wordle speaks more of "love", "peaceful", and "protect" giving a sort of hopeful message.	While both speeches are aimed at drawing attention to discrimination and speaking out against certain legal practices, Speech 1 is overwhelmingly more docile than Speech 2.
Reflection	By examining the Wordle lists, I already take more of a liking to the second speech over the first. Although I am unsure if these connections are made in the second speech, the prevalence of key words ("streets", "police", "people", "want", "revolution") make me feel particularly reminiscent of current events regarding police brutality, ranging from the Wall Street protest to the Ferguson shooting of Michael Brown.	I think this is a reason why my interpretation of these speeches is what it is. I knew they were speeches and I knew how powerful they were and how it affected history so my interpretation became skewed.
Relating previous knowledge	The second speech has to do with civil rights considering the fact that Danville was a hot bed of civil rights activity and Mississippi was as well.	I thought the speaker may have been Susan B. Anthony or Elizabeth Cady Stanton, since they were both prominent female leaders concerned primarily with ending the disenfranchisement of women.

When those in the linear group 'articulated thought processes,' it tended to be expressed in a more sequential nature. For instance, "*The third and fourth sentence lets you know the speaker*

is pissed off" exhibits a more linear reading and articulation of the text. The word cloud posts were more non-linear, stitching together randomly scattered words; *"The first two words that hit me straight off were women and citizens, and as you continue reading through them, you see words like sex, inequality, disenfranchisement and qualification, all things a woman would be a lot more likely to experience than a man."* The words in the cloud are not listed in any particular order, so the student is more pressed to articulate how he or she approached the analysis. The language in these posts is overall more instinctive. For example, the student in Table 3 describes seeing certain words and "immediately" thinking of the Civil Rights movement.

For the code 'citing evidence,' the linear group referenced phrases more than single words. For example, a student wrote, *"The mention of 'women as well as men' was a dead giveaway that it was a women making this speech, which means it had to be around the late 1800's when all the women suffrage stuff was going on."* Many more quotes from the speeches were used to back up points formed by participants in the linear group. In contrast, participants in the word cloud condition were forced to rely on words instead of phrases or quotes since there were no phrases or quotes contained within. One example from the discussion is, *"Based on the words 'women' and 'sex' that are used frequently as well as specific notes of 'men' and 'male,' I am almost certain it is a female speaker."* Only having single words prompted the student to closely examine the possible relationships between the words.

Students called upon their existing knowledge in different ways depending on whether they had the word cloud or the linear text. Without context, students in the word cloud condition generally associated their existing knowledge with specific words. For example, a number of them provided definitions for the word "oligarchy" in the first word cloud. Others flagged the presence of various place names in the second word cloud to identify it as a Civil Rights speech. For example, a student wrote, *"I believe that the second speech has to do with civil rights considering the fact that Danville was a hot bed of civil rights activity and Mississippi was as well."* In contrast, students in the linear condition frequently relied on their previous knowledge of both the Women's Suffrage and the Civil Rights movements to contextualize their writing, sometimes pulling large amounts of text from the prompt to support their opinions. One student wrote, *"Referring directly to the protesting events of Americus, Georgia, the speech must have taken place during or after 1963, but before the Voting Rights Act of 1965."* Thanks to the context clues present in the linear speech, the student is able to draw on their own knowledge of the Civil Rights movement to pinpoint when the speech was most likely delivered.

Reflection was more prominent in the word cloud condition and most often occurred in the peer reply posts. For example, one student wrote to another, "Your post made me think about my own interpretation of the first speech and I realized that I probably misjudged the time period. You brought to my attention the words "sovereign" and "oligarchy," and also the fact that "African" is used as simply that, rather than African-American in the latter speech." Reflection in the linear group was more often expressed on an individual level.

Finally, it appears that students in the linear condition had an edge in attributing tone to the speeches. In the examples in Table 3, for instance, the student in the linear condition goes as far as to characterize Anthony's speech as "docile." An interesting contrast also appears in how students integrated the two speeches: the word cloud students tended to characterize the first word cloud (Susan B. Anthony's speech) as "angry," whereas this word was more frequently used to describe the second speech in the linear condition.

Co-Frequency of Codes

While each of these codes indexed critical thinking, we were interested to see whether particular codes frequently appeared together. An analysis examining the co-frequency for every code was conducted for both conditions. The most noteworthy finding was that there were many more instances of the co-frequency of *articulation of thought* with *citing evidence* in the word cloud condition (43 times) than the linear condition (4 times). No other substantial co-frequencies were found in either condition.

The passage below illustrates the co-presence of *articulation of thought* and *citing evidence* in the word cloud condition:

> *The words "women" and "citizens" seem to be the focal point which makes me believe the main topic in the speech. Some other key words I noticed were "constitution", "right", and "vote." The speaker must have been pushing, or fighting for women citizens' right to vote. I think that the other important word to mention is "oligarchy." I believe that that along with the mention of the word "sex", which I believe to be referring to gender, may mean that the "government" is led by the dominant sex. As we have mentioned many times is class the dominant sex tends to be "male". Though I can't remember her name I feel positive in guessing that this speech may have been written by a feminist who wanted to push women's rights to vote.*

In this passage, the student cites specific words (*citing evidence)* in the word cloud as s/he articulates her/his interpretation (*articulation of thought)*. The student explains how s/he arrives at the conclusion that the speech was written by a suffragist. Although the student does not clearly propose a name, the reader can clearly see how s/he arrives at this conclusion. Hence, the post above is an example of how the word cloud condition may illustrate process.

The co-frequency of these codes in the linear condition is much lower. Moreover, these posts also appear rather different than those in the word cloud condition:

> *The first clue about the author is the statement that read, "It was we, the people; not we, the white male citizens; nor yet we, the male citizens; but we, the whole people, who formed the Union." This statement is crucial to understanding the frustration that the author, who is most likely a woman, as she directly addresses the problem of inequality between the two sexes in the United States.*

The student above cites an entire sentence from the speech, and notes that the quoted statement is a "clue" about the author's identity. In contrast to the word cloud condition example, where the reader can see the student working through the words to come to a conclusion, this student's thought process seems complete. Rather than expressing a guess, the student is making an argument. Thus, this post more clearly illustrates the student's command of content over process. However, this interpretation should be tempered by the fact that the co-frequency of these two codes was dramatically lower in the linear condition than it was in the word cloud condition.

Discussion

Through analysis of code frequency and the content of the discussion posts, there are several implications about the integration of word clouds into online discussions pertaining critical thinking. While participants in both conditions were encouraged to think critically during the discussion, it appears that analyzing text in word cloud form prompts discussants to exhibit the

thinking in a more visible manner. Importantly, participants in the word cloud condition exhibited a greater amount of critical thinking in general; a greater amount of indicators such as articulating thought, citing evidence, integration, and reflection; and more overlapping of different dimensions of critical thinking in the form of articulating thought processes and citing evidence. However, it should be stressed that the differences between the posts in both conditions point to the need to consider assignment objectives before implementing this teaching strategy. For example, the linear speech condition resulted in posts that predominantly rely on context and previous knowledge to build an argument, while the word cloud condition resulted in process-oriented, exploratory discussion posts that highlight the thinking process. Instructors must be mindful of these differences and consider what the overall learning objectives are for the discussion.

Looking more deeply at the actual discussion content, there appear to be certain conditions in which having word clouds is particularly advantageous. Our data suggests that the lack of linear text and context experienced through word clouds provides an environment that is more effective in prompting students to articulate their thought processes, cite evidence, integrate, and reflect in online discussions. As one student explained in the feedback survey, "Word clouds force you to look at specific words and derive meaning from those individual terms instead of just reading an entire sentence and taking it for what it is." Thus, the word cloud teaching strategy is more appropriate for use in process-centered assignments that have the development of critical thinking skills as a main objective. It is recommended to use word clouds when the instructor expects the student to show their active process of thinking, which can reveal their first impressions of content and what is relevant for them. Main ideas and themes can be explored without being too thrust into a complex context, such as a lengthy speech. In the survey, one student analyzing the word clouds expressed, "I felt this assignment was very valuable. I enjoyed the free-thinking that came with it." In addition, exploration between peers may be richer when exploring word clouds. The free thinking nature encouraged students to speculate together, rather than simply agree or disagree.

Based on what was found in this exploratory study, analyzing text in a traditional linear fashion appears to be more appropriate if the overall discussion objective is content-centered. If the instructor's goal is to have students form well-reasoned arguments backed up by specific evidence (and relating previous knowledge), then the linear option may be more suitable. The use of linear texts may also be more appropriate for true reading comprehension. The linear condition also appears to capture the tone and emotion of a text more accurately than word clouds.

Conclusion

Supporting the development of students' critical thinking skills is a priority in higher education, and particularly challenging in online undergraduate environments. With the rise in online courses, mixed results have been found regarding critical thinking within online discussions. This exploratory study is significant in that it provides empirical evidence suggesting that analyzing text in word cloud form within online discussions is associated with higher levels of critical thinking in the online environment. In the study, the actual content of participants is analyzed to better understand the dimensions of critical thinking when faced with different text displays.

Research findings, student feedback, and trial-and-error over the course of several semesters have lead us to formulate recommendations to improve this and other assignments involving word clouds. First, it is important to explain what word clouds are. Some students reported difficulty with interpreting the word clouds at first. Particularly in blended settings, it may be advisable to analyze a word cloud together as a group before incorporating them into an

assignment. By the same token, the analysis of word clouds should challenge students to think differently, so some difficulty should be expected. The location and placement of words is important and warrants some attention. If possible, certain words should be kept together in order to preserve certain phrases that are crucial for understanding.

Although these research findings are promising, this study faces certain limitations. The research is limited in scope and must be considered purely exploratory. The sample size is small and was limited to one course, one instructor, one institution, and one discussion assignment. Future research could include a larger sample size and other kinds of discussion assignments across two or more disciplines, professors, and institutions. Moreover, as described above, there are many ways to incorporate word clouds into online discussions beyond the single approach presented in this research. Future research should include assessment of other word cloud techniques. A promising research direction could be to examine the effectiveness of designing an assignment that pairs the two conditions. For instance, the word cloud can initially be used to explore ideas about the text, followed by an analysis of the text in its entirety. Students can then reflect on their perceptions about their first impressions, and be asked if their viewpoints have changed. It is important to note that this strategy could easily be applied to a face-to-face environment, with word clouds being projected on a screen and discussed as a group. It is recommended to research this direction as well to understand how analyzing word clouds in the moment differs from an asynchronous setting.

With the rise in online courses, students need to have multiple ways to develop and demonstrate critical thinking skills. Our study finds that word clouds emerge as one potential tool to accomplish this need.

Appendices

Appendix 1. Discussion Assignment 5.

We're doing something a little different for our final graded discussion of the semester! For this assignment, I selected two speeches written at different points in history written by two people involved in important social movements. I'd like you to:

Click on your group to view the speeches. They are contained in the first post.

- FOR WEDNESDAY: Analyze these speeches, and speculate about who might have written them, at what point in history, and with what purpose. Explain what particular words tipped you off, and why. Getting the author "right" isn't as important as analyzing the text for themes and meanings. Once you have analyzed the texts, compare them to each other and reflect on how the use of language might have changed over time.
- FOR FRIDAY: Once you submit your answer, go back to Module 8. Review the concept of performance as a display or verbal artistry and performativity (both in Austin's construction of language as action and Butler's work on gender and performativity). How might these theories inform your analysis of these texts? Take some time to give this some thought. Then, click on "reply" which is right underneath your first post, and reflect on how these theories can inform your interpretation of the text above (do not edit your first post).
- ALSO FOR FRIDAY: Next, pick someone in your group who has a different guess or a different interpretation, and respond to them.

- FINALLY: Take the Discussion Survey to provide feedback about this activity

Do not Google the texts, it will ruin the fun! I will reveal who wrote what passage after the assignment has closed :).

Appendix 2. Survey Questions (critical thinking items marked with *)

5-point Likert scale: Agree-somewhat agree-neither agree nor disagree-somewhat disagree-disagree

1. The assignment instructions were clear. I understood what I was supposed to do.
2. I enjoyed doing this assignment.
3. I was more motivated to complete this assignment than other discussions.
4. I found this assignment: intriguing; exciting; both intriguing and exciting; neither intriguing nor exciting
5. I think this assignment is valuable.
6. *This assignment required me to use my critical thinking abilities.
7. *Not knowing the names of the authors of the speeches encouraged me to think about the speech in a more objective manner.
8. *This assignment challenged the way I think.
9. Having to guess the authors of the speeches made the discussion activity more engaging.
10. *This discussion activity encouraged me to think about the class content in a new way.
11. *This assignment encouraged me to write about how I think rather than what I think.
12. This discussion activity held my attention longer than other discussion activities.
13. This assignment promoted interactions with my classmates.
14. *Reading my peers' responses encouraged me to reflect on the way I thought about the discussion.
15. *This assignment encouraged me to think "outside of the box."
16. It took me an excessive amount of time to complete this assignment.
17. How much time did you spend on this assignment?
18. This assignment should be used in future classes.
19. Please use this space to give me any additional feedback about this assignment.

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To Like or Not to Like: Facebook in the Higher Education Classroom

Pamela Ezell[1]

Abstract: Facebook is prevalent on university campuses, and yet, available data have revealed a distinct absence of Facebook in the higher education classroom – except possibly when used by distracted students during a lecture (Abe & Jordan, 2013). Facebook has pedagogical potential, but some faculty have expressed resistance to using Facebook for purposes of teaching and learning (Ajjan & Hartshorne, 2008; Prescott, 2014). Although there is limited empirical research to support the use of Facebook, there is a growing body of faculty experience with the platform. This article addresses the ways in which faculty have used Facebook for pedagogical purposes, and its effectiveness as a teaching tool. Also included will be examples of best practices.

Keywords: Facebook, social networking sites, SNSs, higher education classroom

Despite its potential to create virtual communities and facilitate communication between users, and its adoption by more than 1.23 billion users worldwide (Kiss, 2014), Facebook, the social networking site (SNS), has not been equally popular among higher education faculty for purposes of pedagogy. As a Pearson survey of 1,920 U.S. faculty at all levels of teaching (i.e., tenured, non-tenure track, adjunct) revealed, although more than 90% of higher education faculty members are using some sort of Web-enabled technology in their teaching (e.g., online videos, blogs, wikis, podcasts), less than 10% are using Facebook (Moran, Seaman, & Tinti-Kane, 2011). After a survey of 142 faculty at a large southeastern U.S. university, Ajjan and Hartshorne (2008) reported 74% neither used nor had any intention to use an SNS for teaching. More recently, Prescott (2014) surveyed 172 faculty members in the United Kingdom, and 63% responded they had *no desire to use* Facebook as a pedagogical tool. Even in programs where the use of Facebook might be pedagogically appropriate as a means of replicating *real life* scenarios within a controlled environment (e.g., journalism), there is a distinct absence of Facebook in the classroom (Aayeshah & Bebawi, 2014).

Meanwhile, Facebook use remains strong among students: the EDUCAUSE Center for Applied Research (ECAR) studied 3,000 U.S. undergraduates from 1,179 colleges and universities, finding 90% use Facebook and more than half (58%) log on numerous times in a single day (Dahlstrom, de Boor, Grunwald, & Vockley, 2011). In another survey (Junco, 2011), undergraduates were observed spending an average of 101.9 minutes per day on Facebook during approximately six visits. Due to the popularity with students of Facebook and other Web 2.0 platforms (e.g., Twitter, Instagram), some scholars have stated how important it is for professors to better appreciate the power and reach of SNSs (Holland & Judge, 2013; Joosten, 2012; Prescott, 2014). Several others have suggested examining Facebook closely for its pedagogical potential both within the higher education classroom and as an extension of the learning space (Aayeshah & Bebawi, 2014; Best, Buhay, McGuire, Gurholt & Foley, 2014; Dogoriti & Pange, 2014;

[1] College of Educational Studies, Chapman University, One University Drive, Orange, CA 92866 ezell@chapman.edu

Haipinge, 2014; Jaffar, 2014; Rasiah, 2014; Saykili & Kumtepe, 2014). Howard (2013) went further and stated that both university professors and K-12 teachers had a *deontological* duty to understand SNSs in order to prepare students for the challenges of the contemporary classroom and workplace. However, the benefits of being part of a social networking community may be incomprehensible to faculty outside that virtual community (Joosten, 2012). Through the examination of the literature and cases of faculty applying SNSs in the classroom, this study attempts to determine the rationale for and against the adoption of Facebook as a pedagogical tool, and analyses the literature in terms of possible challenges, application and best practices, and teaching methodology surrounding the use of (SNSs), particularly Facebook.

Although the majority of faculty may be reluctant to employ Facebook in the classroom, students reportedly welcome the addition of the platform into the learning environment (Ponnudurai & Jacob, 2014; Rasiah, 2014). After a Facebook pilot program, Ponnudurai and Jacob (2014) surveyed 96 students at a private university in Malaysia who were enrolled in Humanities, Languages, and Social Science courses using Facebook for some types of writing assignments. On a 4.0 scale, the students gave Facebook high marks for convenience and utility: a mean of 3.19 for assignment convenience, a mean of 3.26 for useful peer feedback, and a mean of 3.10 for useful instructor feedback. In a separate survey, 120 Malaysian students used Facebook in five different sections of a Macroeconomics course, and in the qualitative data collected following the course, included terms such as *meaningful* and *inspiring*, and *the best part* of their university experience to describe their Facebook assignments (Rasiah, 2014). Donlan (2014) surveyed 112 students in the U.K. to determine their attitudes toward and readiness for using Facebook, finding 84% were interested or very interested in using Facebook as a means of contacting and communicating with professors, and 82% said they would like to use Facebook for educational purposes.

Early adopters of Facebook for teaching have stated many reasons why: social media and the University share many of the same values such as constructivism, the creation of intellectual property, and collaboration (Diaz-Gonzalez, Gonzalez, Froufe, & Pumarola, 2013). According to Joosten (2012), Facebook is social, creating opportunities to share information and dialogue between and among faculty and students outside the boundaries of the classroom or the face-to-face encounter. Kessler (2010) observed that social media includes numerous collaborative opportunities for students and teachers. Holland and Judge (2013) noted how, as faculties have moved to a more student-centered, active learning paradigm, there is an increase in the use of Web 2.0 technologies, which can provide greater expression of students' voices, a forum for various points of view, and the opportunity for all users to contribute to the collective intelligence.

The Ubiquity of Facebook

Exactly how much time are students spending on Facebook? In the spring of 2007, in what he claimed was the first empirical study of its kind, Strayhorn (2012) found that 54% of the students he surveyed used Facebook or MySpace up to five hours per week, while another 25% reported using SNSs up to 10 hours per week. Strayhorn's (2012) study not only presents an early examination of the issue, but also occurred just weeks before the introduction of the iPhone, which Grossman, writing in *Time*, called "a genuine handheld, walk-around computer, the first device that really deserves the name" (para. 8). With the advent of mobile computing devices over the past few years, a greater percentage of university students – and their faculty – are accessing social networking than in 2007, and are using those sites more frequently than their earlier counterparts did. According to the Pew Internet Project (2014), 71% of online adults in the U.S. are using

Facebook, and cell phones are an important factor in this statistic: 40% of adult cell phone users in the U.S. access an SNS on their phones. Mobile devices allow the use of social media *anywhere, anyplace, anytime* (Joosten, 2012) since we are no longer tethered to a stationary computer.

Even in circumstances where there exists a *digital divide* – a separation between those with access to computers and the Internet and those without – there is a growing adoption of and access to Facebook via mobile phones. It its 2013 survey of 24 emerging nations, The Pew Research Center's Global Attitudes and Trends survey found cell phone use *nearly ubiquitous*. Although Internet access may still be out of reach for the majority of the population in these countries, among those with access, Facebook was the number one SNS among users in 23 out of 24 nations ("Global attitudes," 2014).

Method

The collection of documents for this study was guided by three areas of inquiry: (a) ethics of and attitudes toward the use of Facebook in the higher education classroom, (b) empirical research regarding the use of Facebook in the higher education classroom, and (c) recent published instances (case studies) and best practices for the use of Facebook in the higher education classroom. Documents compiled for the study include recent research published in professional journals or books. Searches were restricted to works published during or after 2004, the year Facebook was founded. Articles were selected for further analysis if they included not just instances of using Facebook for pedagogical purposes but also empirical data about the effectiveness or limitations of the platform. Articles were coded for themes based on major uses and commonalities, including challenges to overcome, positive experiences using the platform, and recommended strategies for other faculty. Several authors have written about the adoption of Facebook in their teaching (e.g., Everson, Gundlach & Miller, 2013; Jaffar, 2014; Joosten, 2012): the search term "Facebook use in higher education" resulted in 1,339 articles, so this is not an exhaustive review of *all* the literature published that mentions the use of Facebook.

Attitudes Surrounding the Decision to Forego Facebook

Mark Zuckerberg and the other creators of Facebook intended Facebook for university use: it was designed as a tool for Harvard University students to establish virtual connections (Jenkins 2013). Regardless of the original social intentions for Facebook, it now has substantial potential as a pedagogical tool (Aayeshah & Bebawi, 2014; Best et al., 2014; Dogoriti & Pange, 2014; Jaffer, 2014; Joosten, 2012; McEwan, 2012; Saykili & Kumtepe, 2014). In particular, the features Facebook Pages and Facebook Groups have been used for academic purposes (see section below titled Case Studies and Best Practices). Why, then, have the majority of faculty decided to forego its use in the higher education classroom?

The first possible reason is because Facebook operates on the exchange of personal information, so using this technology for teaching and learning can be challenging for some faculty (Aayeshah & Bebawi, 2014; Auld & Henderson, 2014; Howard, 2013; McEwan, 2012). In the U.S., there are concerns about the Family Educational Rights and Act (FERPA). Several scholars have urged instructors to exercise caution when using Facebook or another SNS for teaching and learning to maintain students' rights to privacy (Auld &Henderson, 2014; Aayeshah & Bebawi, 2014; Everson et al., 2013; Howard 2013; Joosten, 2012). Instructors were reminded, for example, never to post grades of any kind inside a shared or public SNS space (Joosten, 2012). There is a

vulnerability to student privacy within the Facebook environment because student profiles, pictures, and personal information may be viewed by instructors (Aayeshah & Bebawi, 2014; Soitu & Paulet-Crainiceanu, 2013).

Next, there are concerns about the faculty member's privacy. At its core, the faculty-student relationship is a professional relationship, and faculty who wish to maintain a separation between their personal and professional lives may find this difficult to do if they engage with students on an SNS (McEwan, 2012). If, for example, they *friend* students in the process of teaching and learning with Facebook, and then post something political, their political preferences become known to their students; any posted picture from any activity is potentially available to every Facebook friend (McEwan, 2012).

Whether or not to friend students in the first place is probably the most controversial question regarding the use of Facebook (Soitu & Paulet-Crainiceanu, 2013) and is an ethical question faculty must answer for individually. Some faculty may be more comfortable friending students after they graduate; others may wish to friend graduate students only, but not undergraduates (Everson, Gundlach, & Miller, 2013). However it is done, it must be done fairly; if a faculty member friends some students and not others, there could be a perception of *playing favorites* (McEwan, 2012). Even within their article, Everson, Gundlach and Miller (2013) admittedly could not agree on the best strategy for friending students. To avoid some of these possible problems, Haipinge (2013) recommended that both students and faculty establish multiple Facebook profiles, with one for personal use and one for educational purposes. This is, however, in violation of Facebook's policies, which limit all users to one account ("Managing a page," 2015).

Faculty may not be the only group who wish to keep their personal lives and their professional lives separate (Donlan, 2014). Since students may feel obligated to accept a professor's friend request, educators must remember there is a power differential in the student to faculty relationship (McEwan, 2012), where educators have the ability to influence future outcomes for student through the determination and assignment of grades. Furthermore, faculty who engage with students online on personal versus professional topics may be perceived as prying.

In addition to this blending of personal and professional lives, there exists concern among some faculty that Facebook can be used to perpetrate cyberbullying and other sorts of victimization (Auld & Henderson, 2014; Howard, 2013). This, too, contributes to resistance among faculty to employ Facebook in a classroom setting. However, some authors argue that it is faculty who must teach students how to use SNSs safely and responsibly (Auld & Henderson, 2014; Churcher, Downs & Tewksbury, 2014; Everson, et. al., 2013; Howard, 2013; Soitu & Paulet-Crainiceanu, 2013). Just as a teacher is required in an *on ground* classroom to ensure its success, a teacher is required inside an SNS to ensure its success as an online learning environment (Churcher et al., 2014). It is the responsibility of the faculty member to teach respect for the rights of others in the on ground classroom as well as in the virtual classroom (Auld & Henderson, 2014; McEwan, 2012).

There are other factors preventing faculty from exploring the pedagogical applications of Facebook more fully. It may be difficult for educators to keep pace with what may seem to be a constantly changing array of Web 2.0 options (i.e., Instagram, Snapchat, Vine). Cao and Hong (2013) found that faculty who did not use Web 2.0 tools for teaching reported being unfamiliar with the mechanics of how to employ it.

Some scholars believe the benefits of SNSs are greater than the risks (Abe & Jordan, 2013; Joosten, 2012; Kessler, 2010). These reported benefits include increased levels and frequency of communication between faculty and students, as well as between students (Hogg, 2014; Rasiah, 2014); a continuance of classroom discussion and learning beyond the four walls of the classroom (Dogoriti & Pange, 2014; Jaffar, 2014; Saykili & Kumtepe, 2014); and an approximation of real world situations (i.e., a virtual newsroom, a marketing-communications client) for the purposes of teaching and learning (Aayeshah & Bebawi, 2014; Adi, 2013). If the goal is to provide a safe SNS alternative where students can practice social networking skills, this can be accomplished with a learning management system (LMS), such as Blackboard or Edmodo (Howard, 2013). However, an advantage of using Facebook vs. an LMS is that students are already *on* Facebook several times a day and many of them *only* use Blackboard for educational tasks (Rasiah, 2014).

Do Digital Natives Need More Time Online?

Several scholars who have written about Facebook and the use of SNSs in the higher education classroom have cited Prensky's (2001) article (e.g., Aijan & Hartshorne, 2008; Cao & Hong, 2011; Donlan, 2014; Holland & Judge, 2013; Howard, 2013; Jaffar, 2014; Krischner & Karpinski, 2010; Saykili & Kumtepe, 2014), specifically Prensky's (2001) division of university populations into *digital natives* and *digital immigrants*. It was suggested by Prensky that digital natives are more comfortable than their older counterparts using and being surrounded by technology because they have used various forms of technology since they were very young. At the same time, Diaz-Gonzalez et al. (2013) asserted that more conventional modes of education (i.e., large group lectures) are unfamiliar and *foreign* to the digital native. Abe and Jordan (2013) argued that students have always found the means to be inattentive in classes, but their *fixation* on something like Facebook might be a stronger distraction than simple daydreaming. Prensky (2001) believed "today's students think and process information fundamentally differently than their predecessors" (p. 1). Whether or not students actually process information differently than their predecessors, they are undoubtedly bombarded with more opportunities to interact with information due to the ubiquity and popularity of Facebook and other Web 2.0 technologies.

To Kirschner and Karpinski (2010) the digital natives appeared to be a generation of inattentive and ineffective *multitaskers*, who, while attempting to complete more than one processing task at time may be incapable of deep learning. Furthermore, Kirschner and Karpinski (2010) took issue with a belief in the ability of students to multitask and observed that, just because one witnesses a student engaging in more than one activity at a time, one should not assume that the student does so without sacrificing any loss of efficacy. Kirschner and Karpinski's 2010 survey of 219 Midwestern university undergraduate and graduate students revealed that Facebook users had a lower grade point average than non-users, spent less time studying than non-users, were more social than non-users, and spent more time on extracurricular activities.

On the subject of multitasking and deep learning, neuroscientist Russell Poldrack warned about the addictive nature of mobile devices and SNSs: "The brain systems that drive us to habitually check our devices… are the same ones that drive drug abusers to wreck their lives in search of the next hit," (Head, 2011, para 8.) Completing one task at a time uses a different part of the brain than multitasking, because "even if multitasking doesn't prevent people from learning, it can change how they learn in ways that are not beneficial" (Head, 2011, para. 12). A condition labeled Internet Addiction Disorder (IAD) has been reviewed for inclusion in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) (White, 2013).

White (2013) explored the addictive nature of technology in an experiment titled Digital Social Media Detox (DSMD), during which 25 California university students voluntarily abstained from using any form of technology for 10 hours, and instead engaged in face to face communication, game playing, and nature walks, all the while being videotaped by researchers. Based on surveys conducted before the experiment, it was determined that the students in the sample used Facebook more than any other type of digital technology. During the experiment, participants were observed reaching for their devices and exhibiting signs of discomfort due to *disconnectivity*. Following this one-day intervention, White (2013) interviewed and surveyed the participants. One student observed *talking to people is not all bad*. Another student admitted a *need* for Facebook. Others reported the experiment was *liberating*, *bittersweet* and *actually fun*.

Why is there an ethical imperative to teach students how to use a technology many of them are already using too much? Authors have cited a need to teach digital literacy as a 21st century skill (Holland & Judge, 2013; Howard, 2013; Joosten, 2012), which may include modeling for students how to establish limits on the use on technology and how to avoid multitasking. Simply because students can Google an answer to a research question does not mean they can comprehend the veracity of the results (Kirschner & Karpinski, 2010). In a similar fashion, students – even those who are expert in the ways of using Facebook – may not understand the complete implications of an SNS without guidance from an instructor (Donlan, 2014; Haipinge, 2013; Howard, 2013). There may be much the digital immigrant professor can offer the digital natives.

Case Studies and Best Practices Concerning the Use of Facebook

When considering the application of an SNS, or Facebook in particular, there is an established pattern of experiences documented through the literature. These studies can be clustered into global phenomena, the pivotal study, examples for pedagogical purposes, and application.

Global Phenomena

Facebook is a global phenomena and it was possible to find faculty exemplars located all over the world: in Africa (Haipinge, 2013), in Europe (Dogoriti & Pange, 2014) and in the U.S. (Joosten, 2012). Although faculty who teach public relations, journalism, marketing, or other pre-professional courses may share Howard's (2013) deontological obligation to prepare students to use a platform they will encounter on the job in the world beyond the classroom (Aayeshah & Bebawi, 2014; Adi, 2013; Faulds & Mangold, 2014), the use of Facebook for teaching has not been restricted to specific disciplines. Faculty in Media Literacy (Churcher et al., 2014) , Filmmaking (Hogg, 2014), Statistics (Everson, et al. 2013), Teacher Education (Baya'a & Daher, 2014; Haipinge, 2013) and other fields have adopted Facebook into their teaching methodology and measured the results.

The Pivotal Study

One pivotal study that emerged from the literature was Jaffar's (2014) study. A professor in the United Arab Emirates, Jaffar (2014) established the Human Anatomy Education Facebook Page in 2011, which included 110,925 *likes* or fans of the page on June 11, 2016. The purpose of the page was to support and enhance the anatomy education of second-year medical students.

Participation in the page was optional and ungraded. At the time of Jaffar's (2014) research into the use of the page, it included 6,881 likes. Sixty-nine percent of the Facebook fans were between the ages of 18-24. Fans came from 20 different countries, with the highest percentage of fans (13%) from Mexico. The students in Jaffar's (2014) on-ground classes numbered only 157 over a period of two years, so the page was accessible to and reached a much larger audience than just current students. Jaffar's research (2014) included a paper survey of the 157 students in the on-ground classes. Ninety-four percent (n = 125) rated the Facebook page very good to excellent. Eighty-nine percent (n = 118) responded that the page contributed to their learning of anatomy. Eighty-four percent (n = 117) agreed or strongly agreed that Facebook was an appropriate learning environment. Sixty-four percent (n = 89) said they felt *safe* expressing opinions, even though the site was administered by a faculty member.

Jaffar (2014) also used Facebook Insights ("Page insights," 2015) for further research, an analytical tool available to administrators of Facebook pages, which indicates to the page administrator how many Facebook users have seen each post, how many have shared it, as well as how many have indicated their interest in the post by *liking* it. According to Jaffar (2014), this was the only research study of its kind to use Facebook Insights as a tool for analysis of a page dedicated to higher education. Jaffar (2014) was immersed in the use of Web 2.0 technology to support teaching, and also established a YouTube channel and a Twitter feed, and used Screencast and Google Docs in classes. However, Jaffar (2014) wrote that Facebook was the logical place to begin to integrate Web 2.0 tools into the classroom.

Examples of Facebook for Pedagogical Purposes

At the time of this writing, the particular features of Facebook most adaptable for classroom use are the Facebook Page ("Page basics," 2015) and the Facebook Group ("Group basics," 2015). In the instance of the Facebook Fan Page, typically employed for commercial marketing purposes (Joosten, 2012), students opt to receive course information by liking the page. This allows an instructor to post content on the page and communicate with all class members who have liked the page (Joosten, 2012). For example, in Israel, students studying with Baya'a and Daher (2014) to become teachers established Facebook fan pages for famous mathematicians for the purpose of fostering mathematical conversations outside the classroom among pre-service teachers. In Namibia, where access to computers and the Internet is highly limited (Haipinge, 2013), but access to mobile phones is on the rise, Facebook Groups have been used to instruct pre-service teachers. Haipinge (2013) established *learning communities* with the purpose to facilitate the construction and sharing of information, and the blending of theory and practice. This Facebook Group consisted of teacher candidates and alumni who were practicing educators. Within the group, students and teachers were paired and assigned to discuss certain topics, including theoretical questions and the use of technology in the classroom. *Offline*, students wrote papers detailing what they had learned.

Professors of journalism courses in Australia (Aayeshah & Bebawi, 2014), media production in the U.K. (Hogg, 2014), and media literacy in the U.S. (Churcher et al., 2014) have studied the use of Facebook in their courses. According to Aayeshah and Bebawi (2014), after journalism students communicated with each other, shared drafts of stories, and discussed sources on Facebook, they described the experience as *great*, *excellent*, *useful* and *the best platform to use*. Hogg (2014) tasked students with producing a short film from beginning concept to finished product and posted film clips to the Facebook Group meant to inspire students, along with links to

instructional web pages. Soon, students began to share examples of their own work, as well as use the page to send messages to other members of the class. The qualitative responses to the use of Facebook were all positive: 100% of 25 students answered in the affirmative that they believed Facebook had enhanced their learning experience. Churcher et al. (2014) surveyed 30 students following their use of Facebook to post materials related to the course and to respond to discussion questions, finding 27 who stated they had learned more about their classmates' opinions than they otherwise would have known through the use of Facebook. Faculty have utilized Facebook in foreign language classes (Dogoriti & Pange, 2014; Saykili & Kumtepe, 2014), statistics (Everson et al., 2013), and environmental studies (Petrovic et al., 2014). Educators who wish to move students from a passive to an active mode of learning can find support to do so through the use of Facebook for the sharing of original student-generated ideas and content (Aayeshah & Bebawi, 2014; Dogoriti & Pange, 2014; Everson et al., 2013; Hogg, 2014; Holland & Judge, 2013; Saykili & Kumtepe, 2014). Faculty who seek to build community between and among students may find the experiences of Churcher et al. (2014) and Petrovic et al. (2014) particularly helpful.

Application

Facebook has been used in larger classes (Everson et al., 2013; Jaffar, 2014) and in smaller classes (Churcher et al., 2014; Hogg, 2014). Student participation has been graded in certain instances (Aayeshah & Bebawi, 2014; Churcher et al., 2014) and non-graded (Everson et al., 2013; Haipinge, 2014; Jaffar, 2014) in others. In all cases, once the Facebook Page or Facebook Group has been established, the option to interact with Facebook is a choice each student in the class must make for him- or herself. First, students must either accept the instructor's invitation to the page, in the examples of closed groups, or select to follow the page, in the event of an open group. Students who fail to in some way select the page could potentially miss important information about assignments, course updates, or class meetings. Second, students who do not use Facebook at all or use it infrequently may also be left out of potentially meaningful conversations and exchanges between the instructor and other students that occur online, and could feel themselves excluded from the course. Third, the instructor must take into consideration the algorithm of Facebook which controls the pages and friends that appear in a Facebook member's *feed*. The people and organizations a student interacts online with most frequently, or which the student has prioritized by selecting the option to see particular content *first* ("Adjust news feed," 2016") come into view most often. However, if a student has a preponderance of friends, is a fan of a large number of organizations, or fails to assign priority to the course, quite possibly a course page or group could be hidden from view, even when it contains critical information. During a Facebook intervention, students are required to seek out the course-related Facebook site on a regular basis to ensure currency in the class.

Results

Although Facebook may be popular with many university students (Dahlstorm et al., 2011) and may have pedagogical potential, its capacity has yet to be either fully explored on a large scale by faculty or completely researched by investigators. Both students and faculty may be frequent Facebook users for personal or professional purposes, but may be uniformed about its possibilities for teaching and learning. There are barriers surrounding privacy issues to overcome before adopting Facebook in a higher education classroom (e.g., the ethics of the friending of students,

the power differential between faculty and students, the separation of personal and professional space) and educators must weigh these concerns against possible benefits.

Despite the views of some educators who consider the use of Facebook for teaching and learning controversial (Jaffar, 2014) or suspicious (Rasiah, 2014), some faculty have experimented with Facebook in the classroom. When they have, they were prompted to do so by a variety of objectives, including the desire to educate digital natives with at least one of the platforms many of them are already using in their personal lives and may wish to explore in their academic lives (Abe & Jordan, 2013; Donlan, 2014; Joosten, 2012; Kessler, 2010; Ponnudurai & Jacob, 2014). A commitment to teach 21st century literacy skills is another factor in the decision to adopt Facebook for teaching and learning (Aayeshah & Bebawi, 2014; Churcher et al., 2014; Holland & Judge, 2013; Howard, 2013; Joosten, 2012). Finally, Facebook aligns with the collaborative nature of education (Kessler, 2010) and the constructivist theoretical perspective of many educators (Churcher et al., 2014; Rasiah, 2014; Soitu & Paulet-Crainiceanu, 2013).

Conclusion

There is a paucity of research concerning the use of Facebook in higher education classrooms (Ajjan & Hartshorne, 2008; Dogoriti & Pange, 2014; Hew & Cheung, 2013; Holland & Judge, 2013; Prescott, 2014) and much of the research that does exist is anecdotal or based on conjecture (Hew & Cheung, 2013). In a review of 4,640 studies of the use of Web 2.0 technologies, Hew and Cheung (2013) discovered only 27 that met their criteria as evidence-based, not anecdotal, and none concerning the use of Facebook. I could find no studies that attempt to predict the rate of Facebook adoption by faculty for teaching purposes. Best et al. (2014) urged faculty to wait for more evidence of the efficacy of all Web 2.0 technologies before adopting them, but Rasiah (2014) urged educators to *take managed risk* and investigate the use of Facebook now, without waiting for further research. At the very least, it would seem that more research is needed. However, according to Kirschner and Karpinski (2010), such research may be difficult, since locating a naïve group of participants who are completely unfamiliar with Facebook is probably impossible.

Even without empirical evidence, faculty should consider the implementation of digital tools in their teaching (Holland and Judge, 2013) since Web 2.0 technologies have the power to transform teaching strategies. Howard (2013) observed that Facebook and other SNSs can enhance collaboration in ways unimaginable a few years ago. Joosten (2012) urged faculty to make a commitment to learn to use social media tools. Despite the privacy issues and ethical questions surrounding Facebook in a higher education classroom, educators must weigh these concerns against the possible benefits. The time for that determination is now, because the benefits of using Facebook outweigh the drawbacks, and educators who embrace Facebook will find it has the potential to enhance and improve student learning.

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Students' and Instructor's Attitudes and Receptions of the Viability of Using a Flipped Classroom Instructional Model in a Technology-Enabled Active Learning (TEAL) Classroom: A Preliminary Study

Taotao Long[1], Joanne Logan[2], John Cummins[3], Michael Waugh[4]

Abstract: The flipped classroom is an instructional model in which the students are initially exposed to subject matter concepts outside classroom through instructor-provided video lectures or other pre-class learning materials, and utilize classroom time for active learning, such as problem solving and group work. The Technology-Enabled Active Learning (TEAL) classroom is a small capacity classroom equipped with multimedia projectors, white boards, laptops, and tablets, and utilizes modular tables for flexibly configured working arrangement. This paper reports the initial findings from interviews with five students and the instructor about their experiences, attitudes, and perceptions regarding the Flipped-TEAL instructional approach, which is the use of a flipped classroom instructional strategy in a TEAL classroom. This paper also reports the participants' suggestions for improving the teaching and learning efficiency in the Flipped-TEAL course.

Keywords: the flipped classroom, TEAL classroom, interview

Introduction

The flipped classroom is an instructional model in which students are initially exposed to the learning content outside the classroom through instructor-provided video lectures or other learning materials before class, and utilize in-class time for active learning, such as problem solving, group work, laboratory experiments, and product creation (Gannod, Burge, & Helmick, 2008; Gerstein, 2011; Warter-Perez & Dong, 2012). In contrast to the traditional [5]instructor-centered, lecture-based instructional model, in the flipped classroom, the two main phases of instruction are "flipped," so that the presentation of the initial learning content is completed before class. This first phase of the flipped classroom model is a self-directed learning phase in which students interact with instructor-provided learning materials (O'Neil, Kelly, & Bone, 2012; Knewton, 2012). The second phase of the flipped classroom instructional model is the active learning experience that occurs during in-class time (Gerstein, 2011). The flipped classroom model can be adapted to many different classroom environments (Warter-Perez &

[1] Department of Educational Psychology and Counseling, The University of Tennessee, 1122 Volunteer Blvd, Knoxville, TN 37996, tlong11@vols.utk.edu
[2] Department of Biosystems Engineering and Soil Science, The University of Tennessee, Knoxville, TN, USA
[3] Department of Plant Sciences, The University of Tennessee, Knoxville, TN, USA
[4] Department of Educational Psychology and Counseling, The University of Tennessee, Knoxville, TN, USA

Dong, 2012), such as a computer lab (Gannod et. al, 2008), a collaborative experimental classroom (Frydenberg, 2012), or the traditional lecture classroom (Gehringer & Peddycord, 2013).

Creating opportunities to improve students' active learning is one of the aims of the flipped classroom instructional model (Frydenberg, 2012; Warter-Perez & Dong, 2012). Because of this, the flipped classroom instructional model seems ideally suited for use in a Technology-Enabled Active Learning (TEAL) classroom. Compared to the traditional lecture classroom, the TEAL classroom provides more helpfulness and opportunities for active learning (Dori, Belcher, Bessette, Danziger, McKinney, & Hult, 2003; Dori & Belcher, 2005). TEAL classrooms often have smaller capacities (20-40 students) and more flexible seating arrangements than traditional lecture classrooms. In the TEAL classroom, students usually sit around modular tables in groups (Dori et.al, 2003). Typically, numerous whiteboards, large screens, laptops, and other technologies, are provided for students to use in collaboration and presentation activities (Belcher, 2003; Shieh, 2012). Instructors do not stand at the front of the TEAL classroom but rather move around and interact with students (Belcher, 2003; Breslow, 2010). Student-centered active learning activities, such as collaborative projects and problem solving, are preferred in TEAL classroom instruction.

This paper describes a preliminary study of the use of a flipped classroom model with a TEAL classroom (Flipped-TEAL) at a large research university in the Southeastern US. This preliminary study investigated the instructor's and the students' attitudes and perceptions towards their Flipped-TEAL instructional experiences and their suggestions for improving the teaching and learning effectiveness in the Flipped-TEAL course.

Theoretical Framework

Davis (1989)'s Technology Acceptance Mode (TAM) was adopted as the theoretical framework of this study. The TAM model is widely used by researchers to predict and explain user acceptance of new information and communication technologies (Davis & Venkatesh, 1996). The TAM model takes forward the idea that a user's acceptance of new technologies can be predicted from two factors, which are the perceived usefulness and the perceived ease of use (Davis, 1989). Perceived usefulness is defined as the degree to which a user believes that a new technology will enhance job performance, while perceived ease of use is defined as the degree to which a user believes that the new technology would be free of effort (Davis, 1989). Additionally, the TAM model is used as a path model that identifies the impact of external factors such as system design, user characteristics, task characteristics, nature of the development or implementation process, political influences, and organizational structure (Davis, 1989; Davis, 1993; Szajna, 1996). The TAM model is widely used as an instrument to understand how users come to accept a new technology and to continue to use it in education (Roca & Gagne, 2008; Lee & Lehto, 2013; Edmunds, Thorpe, & Conole, 2012).

In this study, the TAM model helps to assess how the users, who are the instructor and the students, perceived the Flipped-TEAL instructional approach on its usefulness and ease of use. The questions from the TAM model about how the Flipped –TEAL instructional approach enhanced the teaching and learning performance, and how the teaching and learning had been eased, were incorporated in the interview of the instructor and the students.

Method

Qualitative case study was utilized in this study because it facilitates the exploration of a phenomenon within its context using a variety of data sources (Yin, 2003), and through a variety of perspectives, in order to reveal and understand multiple facets of the phenomenon (Baxter & Jack, 2008). The data for this study were obtained from semi-structured interviews of the instructor and five students who participated in the Flipped-TEAL course.

The Course

The course, "Water and Civilization," was an introductory level undergraduate course in environmental soil science at a large research university in Southeastern US. In order to keep the class size small, there were two sections of the course, but the instructor and the syllabus for the two sections were the same. There was one ninety-minute classroom meeting per week in the TEAL classroom.

Before each classroom meeting, the students were required to watch an instructor-provided video which lasted for 20-30 minutes, and then complete an online quiz containing 5-8 questions on the topic in the video. The students were told at the beginning of the semester that each pre-class quiz grade would be calculated in the final course grade. During the in-class time, the students were required to participate in various active learning activities, such as collaborative projects focused on exploration and demonstration, field trips and presentations, and role-play games. Most activities required the students to work collaboratively, but the group numbers and organizations varied across activities. There was no content-related post-class assignment.

The Participants

The instructor and five students among the 55 students in the two Flipped-TEAL sections volunteered to be interviewed for this study. Although the course is part of the environmental soil science curriculum, the 55 students registered for this course were from various majors in science and engineering. The instructor indicated that for most students, this was their first experience taking a course using the Flipped-TEAL approach.

Five from the ten randomly invited students volunteered to participate in this study. The five students were from different majors (*e.g.*, Environmental Soil Science, Animal Science, Plant Science, Microbiology, Chemical Engineering) and their engagement levels in the learning activities also varied. The instructor was also interviewed in order to collect the data regarding her perspectives on the Flipped-TEAL instruction. The instructor was experienced in using active learning approaches in instruction. She also had the experiences with teaching this course, Water and Civilization, in the TEAL classroom, for more than two years. This study took place during the second time that she used the Flipped-TEAL approach to teach this course.

All the participants participated in the interview voluntarily. The students were also informed that their participation, rejection, or withdrawal from the interview would not affect their grades in this course.

Data Collection

An individual, face-to-face, semi-structured interview was conducted with each of the six participants. The interviews varied in length from 30 to 45 minutes. All the interviewees gave informed consent for audio recording of the interviews and were also informed about the purpose of this study. Each recording was transcribed and then destroyed. The student's interview questions were about their experiences in the pre-class and in-class learning activities, their collaboration in class, their attitudes towards learning in the Flipped-TEAL sections, difficulties with respect to their learning performance and motivation, and their suggestions for improving the course. The instructor's interview questions collected information about her preparation for the students' pre-class and in-class learning activities, the learning evaluation activities, difficulties with respect to time and effort investment into instruction, and suggestions for improving the Flipped-TEAL instruction. Table 1 and Table 2 provide examples of pre-designed questions asked during the interviews.

Table 1. Examples of the pre-defined interview questions to students

What do you think of your learning in this course, in comparison to other courses you have had?
Do you think learning in this course is easy?
What difficulties do you have during your learning in this course?
What do you think of this classroom?
What are your suggestions to improve your learning experience in this course?

Table 2. Examples of the pre-defined interview questions to the instructor

What do you think of your preparation work in this course?
How are about the affordance of this classroom?
How can you improve students' participation in the in-class learning activities?
What do you think of the students' learning performance in this course, in comparison to other courses you have taught?
How do you evaluate students' learning?

Data Analysis

Interpretative phenomenological analysis was used for this study. The interviews were audio recorded and transcribed. Then, each transcript was interpreted with the aim of identifying the key features of the interviewee's experience, their cares and concerns (Heaney & Arroll, 2010; Cornelius, 2013). Next, themes were identified and sorted to identify initial similarities and differences among participants' responses. These themes were then re-analyzed to ensure their applicability across cases. A master table of themes was created to make cross-case comparisons (Cornelius, 2013). Notes and reflections were made during data analysis, and an iterative cross-checking was undertaken by repeated reference back to earlier interpretations and the original transcripts (Cornelius, 2013). Pseudonyms were used to preserve the anonymity of the student participants. The findings of this study were organized by the major themes.

Findings and Interpretations

Pre-class Learning: Preparation

The term "preparation" is used to characterize the participants' insights on students' pre-class learning in the Flipped-TEAL sections. The students shared that the pre-class learning enabled them to prepare for the in-class learning, while the instructor shared thoughts on her preparation for the students' pre-class learning videos and assignments.

All six participants described the pre-class video as a valuable resource for conveying the subject matter knowledge required for the in-class learning activities. Ann stated that by viewing the pre-class videos provided in this course, she came to "know lots of issues outside her world". Martin also expressed that he "liked the videos" because "the videos are interesting and expand my knowledge beyond my major."

Besides the pre-class video, the pre-class assignments were well received by the students. All five students indicated that the pre-class quizzes were useful for them to understand the knowledge covered in the videos, and helped them be prepared for the in-class activities. For example, Ann stated that she had to "pay attention during watching the videos to make sure to pass the quizzes," but "the quizzes are not difficult, not long," so she could "get the credits [for completing the pre-class assignment] in 5 minutes." Bob and Martin both revealed they had to take notes while viewing the videos, in order to get high scores on the pre-class quizzes, and to be prepared for the in-class learning activities.

The instructor focused on different aspects of the values of students' pre-class learning. She indicated that a critical responsibility for instructors who use the flipped classroom model was to "prepare to make the students *be prepared* for in-class activities."

Referring to the design and development of the pre-class videos, the instructor commented that the technical development was not challenging. She shared that it was convenient to produce the videos through Camtasia, a screen capture software, or in a studio on the university campus, or by using pre-existing Youtube videos. However, the instructor suggested that the content design for the pre-class videos was the key issue. She also shared that "videos should not be too long, but cover all the contents," so she had to "think about what should be covered in the pre-class videos, and what concepts were important to learning, and be really careful to cover all the concepts in videos." Additionally, the instructor suggested that in designing the pre-class videos and pre-class assignments, instructors should keep in mind the in-class learning activities and relate them to the pre-class learning videos and assignments. The instructor also suggested that the pre-class quiz was necessary to ensure that the students watched the pre-class video and help them to be prepared for class, because "if you [instructor] only ask students to watch the video, they [students] won't."

In-class Activities: Students Were Engaged

All six participants agreed that students in the Flipped-TEAL sections were more highly engaged in learning than in the typical lecture-based courses. All five students responded that their learning interest had been improved by participating in these activities and that they enjoyed their experiences in learning by exploration in this course. Bob and Martin compared their experiences in the active learning activities with those in traditional lectures to illustrate that their learning in the Flipped-TEAL sections was more engaging and required more in-depth thinking.

They indicated that the students had to think and explore by themselves, such as "seeking the materials and choosing which one is most suitable to present" (Bob), and be responsible for their own learning for "contributing to [their] personal learning process" (Martin).

The students also explained that their exploration in problem solving, collaborative projects, field trips, and other active learning activities in class, enabled them to have a "different way of learning" (David). The students explained that through getting engaged in activities, they "studied together, explained to each other, and presented" (Linda), became "more knowledgeable about the subject based on the raw information [known from pre-class videos] to explore and study in an attempt to enhance the learning experience" (Ann), could "think deeper" (Linda), and could "think more" (Martin). The students also indicated that in the collaborative projects, they had to "think of some different answers, debate [with group mates]" (David), explaining and presenting their personal understandings to others who were "in other fields" and "understood in different ways" (David). In this way, the students' skills in independent thinking, exploration, and presentation, were improved. The students' positive reception to the in-class activities was also reflected by the instructor's statement "the attendance in this class was 95%," which was not typical.

Students' Collaboration: Get Improved from Conflicts

The collaborative project was the most frequently used active learning activity design in this course. All the participants agreed that collaboration and communication could make students' learning experiences more relevant and interesting. Students' collaboration also offered them the opportunities to view others' insights critically, such as "seeing more through others' comment" (Ann), "learning better from others [I am] not familiar with" (Linda). The collaboration led to more in-depth thinking, because the students "not only shared personal ideas, but also forced back [reflected on] to the ideas of others" (Bob).

Moreover, students learned to respect others' viewpoints and deal with the conflicts that occurred in their group work. Three students stated that although conflicts usually happened in collaboration, all group members understood that conflicts were unavoidable in collaboration and could make their group work better. These three students used the expressions "view clash" (David), "different ideas" (Ann), and "debate" (Martin) to describe the conflicts that happened in their groups, instead of the word "conflict." They all stated that the "conflicts" stemmed from group members' various backgrounds, but if all the group members "verified [others' viewpoints]" (Ann), "debated [among group members], went back [to reflect], read again and decided which one was found to be better [for completing the group work]" (Martin), then (who) "mixed together" (David) opinions of group members, their different ideas could be meaningfully incorporated into the group work. In this sense, conflicts, and their resolution processes helped students learn, and improved the quality of their collaborative work.

Students' Collaboration: Instructor's Facilitation

In this course, the instructor never told the students how to collaborate with each other. Rather, she only assigned them to different groups and informed them of the topic and requirement. The instructor suggested that in flipped classroom instruction, instructors should not intervene in students' collaboration, because students need to learn how to collaborate by themselves, but

instructors should work to facilitate students' collaboration, in order to improve every students' participation, active thinking, and creation.

From the instructor's viewpoint, peer pressure facilitated students' collaboration and participation in their group work. If someone in a group did not participate, s/he would feel guilty, because group mates were monitoring and urging them to participate. It also freed up some of the instructor's effort in classroom management. In order to keep the peer pressure and promote students' sense of collective engagement, the instructor highlighted that all the students in the same group would share the same grade based on the quality of their group work.

Additionally, the instructor suggested that in the students' collaborative projects, rotating roles enabled students to "play different roles" in order to "learn different things" (Linda). In this course, the instructor only assigned and rotated the role of group leader. The role rotation approach offered students opportunities to fulfill different responsibilities within the group collaborative projects, and to improve their abilities not only in learning subject matter, but also in organizing and communicating their ideas.

The instructor emphasized the importance of rotating the role of group leader. She "rotated roles to make everyone be the leader at least once." In her opinion, working as a group leader required a relatively higher level of engagement than just doing the work the leader assigned. From the students' viewpoints, group leaders always "kept everyone in the group on their roles" (Martin), assigned each group member the work, and "organized all the group work" (Martin). Students also shared that group leaders "had a hard job to understand all the information and present in class" (David). However, some of the students felt that their group mates behaved more passively in the collaborative projects. They "contributed no ideas, just did whatever told to do" (Ann). The role rotation approach forced these students into a higher level of engagement and independent thinking.

Evaluation: Keep Balanced and Fair

In this study, all participants responded that the formative evaluation approach used in this course decreased students' anxiety about exams and improved their motivation to learn. According to the students, they had to complete "lots of pieces of assignments to get the final grade" (Linda), but these assignments "were not tiring or boring" (Linda). Formative evaluation kept students engaged in each learning assignment, both pre-class and in-class, in order to get a high final grade in this course. However, the students indicated that it did not take too much time to complete the assignments, because "they were not difficult" (Linda), and the students would do well if they were "just focused" (David).

The instructor also suggested that the formative evaluation approach could keep the learning evaluation fair in the flipped classroom course, because it was impossible for a student to fail or get a low course grade by only doing poorly on one or two exams. Additionally, the instructor suggested that the learning evaluation was kept fair by keeping the balance between the group work and individual work. This evaluation approach not only helped to improve students' collaborative learning, but also individual learning.

The TEAL Classroom: More Opportunities

According to the participants' responses, the TEAL classroom, which offers a flexible seating arrangement and technology-rich environment, was very helpful in facilitating the teaching and

learning during the in-class active learning activities. The participants responded that compared with the other learning environments, the TEAL classroom seemed to foster students' collaboration. The seating arrangement could create a relaxed atmosphere for students' collaboration. The technical tools in the TEAL classroom were also helpful for students' information search, collaborative exploration, and presentation.

The participants indicated that the flexible seating arrangement enabled them to conveniently have many kinds of activities in this course. They stated that the modular tables and movable chairs allowed them to easily shift among groups of different numbers of members in collaborative activities. Additionally, all the five student participants shared that they had a deep impression on a role-play game about how water resources were distributed in the states along Colorado River. All of them indicated that the flexible seating arrangement enabled them to have this game in an easy way. In this game, the students put several modular tables together to "make a long table to simulate a river for the role play game about water resources distribution" (Ann). In the TEAL classroom, it was convenient to put modular tables together in a long row to simulate the river. Then the students were divided into different groups. Each group was assigned the role of a state along Colorado River and sat along the "long table." In this role-play game, the number of tokens a group had was used to represent the quantity of water resources a state possessed. The students explored and transferred the tokens to simulate the water resources transition among the states in different situations. After the game, it was also convenient to disassemble the "long table" and to make other seating arrangements. The instructor also shared that it was very difficult, even impossible, to have this role-play game in other kinds of classrooms, especially the traditional lecture classroom, because it would be difficult to configure the furniture.

The students also shared that in the technology-rich environment in the TEAL classroom, they could "choose whatever would like [to use in learning]" (Bob). In the TEAL classroom, it was very convenient for students to search information, explore, present, and demonstrate. In the collaborative projects, each student could work on a laptop. The students could also use their own mobile devices. Each group could have its own large screen and white board for collaborative exploration, presentation, and sharing. The students could shift their laptops' connections to the large screen very smoothly, so the collaboration inside groups, the communication between different groups, and the presentation to the whole class was very convenient. Besides the large screen, the students could use the white board for discussion and presentation, and the instructor could take a picture of the completed group work on the white board for evaluation. Additionally, tablets were also available in the TEAL classroom. Students could use tablets for information search and sharing. The instructor could also use tablets to assess students' understanding and get real-time feedback with Nearpod, which is an application that enables instructors to use their tablets to manage content on students' mobile devices.

When asking the perceived advantages of the TEAL classroom, the instructor shared that there were more "opportunities" in the TEAL classroom for students. She explained that "more opportunities" meant more resources for students' learning, more technologies to support their exploration and presentation, and more active learning experiences. The instructor also felt that she had more "opportunities" to implement the flipped classroom active learning activities by using the TEAL classroom, and to facilitate students' collaborative activities easily. According to her, the seating arrangement in the TEAL classroom enabled her to quickly assign students into groups in collaborative active learning activities. She also indicated that she "enjoyed" facilitating students' active learning in the TEAL classroom, because the seating arrangement

allowed her to reach any group within only a few steps, and to interact with students during their exploration.

Suggestions

The participants' suggestions on how to improve the teaching and learning effectiveness in the Flipped-TEAL sections are summarized in the paragraphs below.

First, the pre-class videos should not be too long. Linda and Bob complained that several videos were a little too long, which required too much time in pre-class learning. The instructor also noticed and suggested that the pre-class videos in the flipped classroom instruction should not be longer than 20 minutes, or the students' attention might be lost.

Second, the instructor and students suggested that the topic design for the in-class activities was critical. The students responded that the topics in this course motivated them to integrate the knowledge learned from this course, and the knowledge from their own subject fields, in completing the activities. The instructor also suggested the topics should be about real-world situations, and "without absolutely right answers."

Third, although the technology-rich environment in the TEAL classroom was appreciated by the participants, the distractions offered by technology could be problematic. Ann argued that sometimes when she and her group mates used some technologies for the first time, such as a Wiki for collaboration, too much time was spent on solving the technical problems associated with the technical tools, and their engagement with the subject matter was reduced.

Fourth, Linda complained that sometimes in collaboration, the group members rarely viewed group mates' work, and just sent their individual work to the group leader for integration. The instructor also indicated that some students did not pay enough attention to other groups' presentations. The participants suggested that a peer critique requirement might improve the type of students' engagement.

Discussion

Overall, according to the students and instructor, the implementation of the Flipped-TEAL approach in this study was successful in improving students' learning motivation and skills in collaboration, problem solving, and presentation. The Flipped-TEAL approach was well-received by the instructor and the students. However, this study identified some challenges associated with the Flipped-TEAL instructional approach. First, the technology-rich environment may become a distraction for students from the subject matter learning. Second, the class size of the TEAL classroom is usually small, and it might be a limitation for implementing the Flipped-TEAL approach in other large courses.

In this study, the flipped classroom model was combined with a TEAL classroom environment. Instructor-provided videos and various technologies in the TEAL classroom played an important role in improving students' active learning in this course. However, it is important for educators to keep in mind that the flipped classroom is fundamentally a strategy that empowers students to consume information outside of class and demonstrate understanding of subject matter concepts in various ways during class (Makice, 2011). Various media technologies and student-centered active learning activities, can be adapted in flipped classroom instruction to enhance its teaching and learning effectiveness (O'Neil et al., 2012).

Technology, and the technology-rich environment in the TEAL classroom, facilitated teaching and learning in the flipped classroom model, but cannot be viewed as a necessary component or a main focus of the flipped classroom model. The primary focus of the flipped classroom model should be on increasing students' engagement (Miller, 2012). A key aspect of the flipped classroom is to create opportunities for students' active learning (Gerstein, 2011; Frydenberg, 2012). This study confirmed that the success of the design and implementation of the flipped classroom model depends on whether the design of learning environment, choice of resources and technologies, and organization of learning activities can actually meet the students' needs. Moreover, the flipped classroom can be adapted in a variety of learning environments. The TEAL classroom is only one kind of learning environment for the flipped classroom instructional approach, and this study confirmed that the TEAL classroom is a good place for the implementation of student-centered active in-class learning activities, but, the technologies present in the TEAL classroom might serve as a possible distraction for students' learning. This study also confirmed that the TEAL classroom could be helpful for students' collaboration, but the peer review and critique on completed assignments among students was not enough, and it might be improved by revising the requirements of in-class activities.

Limitations

A limitation of this study was that although the participants included students and an instructor, all the participants were from one course, so their viewpoints might be similar to some extent. Additionally, only six participants were involved in this study. As a result, this study may have limited generalizability.

Another limitation was that the data was collected only through interview. The results may yield to the shortcoming on internal validity (Merriam, 2009). Triangulation using multiple sources of data should be used in future research (Merriam, 2009). Additionally, the results of this study were all based on participants' self-reported data. No actual assessment of students' learning outcomes was made.

This study was a preliminary study with limited participants. Future research should involve more participants from various subject fields and various targeted groups of students. Future research should also focus on a closed examination on how the Flipped-TEAL approach affects students' learning in a rigorous experimental design, in order to examine the potential benefits of adopting the Flipped-TEAL approach in instruction.

Conclusion

As a preliminary study on the instructional approach of using the flipped classroom instructional strategy in a TEAL classroom, this qualitative case study examined the instructor's and the students' attitudes and perceptions towards their teaching and learning experiences in the Flipped-TEAL sections, together with their suggestions for improving the teaching and learning effectiveness in this course. This study demonstrated that the Flipped-TEAL instructional approach was well-received and successfully implemented in engaging students in active learning, and improving students' skills in problem solving and collaboration. This study suggested that the pre-class learning phase was important in preparing students for the in-class student-centered active learning experiences. In this sense, when preparing for the Flipped-TEAL sections, instructors should focus on how to help students be prepared for the in-class

learning, and the pre-class learning videos should not be too long. According to this study, students were actively engaged in the in-class, student-centered, active learning activities, and their collaboration skills were improved from solving the conflicts by themselves. However, the instructor's facilitation could not be ignored, in order to keep each student actively engaged in the collaborative work. A peer critique requirement might also be introduced to improve students' review of other groups' work. This study also suggested that the formative evaluation approach used in this Flipped-TEAL course decreased students' anxiety about exams and improved their learning motivation, but instructors should be careful to keep the formative evaluation balanced and fair. Additionally, this study suggested that instructors should be careful that the technology-rich environment in the TEAL classroom might become a distraction for students and should focus on the topic design of the in-class learning activities. However, the TEAL classroom could provide more opportunities for in-class active learning when instructors use the flipped classroom instructional model.

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Supporting the Adoption of Technology Enhanced Learning by Academics at Universities

Ann Thanaraj[1] and Steve Williams[2]

Abstract

This paper makes a number of recommendations to academic leaders and practicing academics on promoting the uptake of technology-enhanced learning (TEL) across their institutions and on their programmes. The approach throughout is to privilege the academic voice and to reflect the views of practicing academics and their students. The authors – the heads of an academic department and of a service department - describe their case study approach, primarily covering staff and students in two different universities. The results are analysed in the context of existing change and adoption models. The authors conclude that existing models are inappropriate and posit their own model for the adoption of TEL, described as 'Policy-led, large-scale, incremental adoption.' The impact of the study is assessed. The authors acknowledge that there is no single best practice for full adoption of TEL across a university. We contend that this analysis and these recommendations will equip academic leaders and curriculum designers to deliver the benefits of effective adoption of TEL across subject disciplines.

Key words: Technology enhanced learning, adoption theory, barriers and enablers, institutional factors

[1] Principal Lecturer in Law, University of Cumbria, Fusehill Street campus, Carlisle CA1 2HH, United Kingdom
[2] Director of University IT, Newcastle University, Claremont Tower, Claremont Road, Newcastle upon Tyne NE1 7RU, United Kingdom

The aim of this study is to raise the profile of how universities can support academics in implementing their university strategy on Technology-Enhanced Learning (TEL), thereby contributing to the transformation of students' learning. Our study suggests that individual universities should undertake a contextual analysis of the factors that motivate and constrain academics in their own organisations to engage with technology in curriculum delivery and development. It encourages each university to explore how the barriers and motivators can be used to develop and implement TEL in the specific circumstances of the institution.

For the purposes of this study, TEL is defined by the authors as the use of learning technology to make learning more effective.

To underpin the research, the authors considered a range of change and adoption models. Since each was found wanting in the context of TEL adoption, this study offers an adoption model designed by the authors. Through the model, a set of recommendations and guidelines have been developed on how institutional leaders should develop and publicise a vision for what TEL can do for their own organisation. The study acknowledges that, in the majority of universities, TEL alone is rarely the answer to enhancing the quality of the learning experience in higher education. The authors support, in most cases, a blended approach to TEL in partnership with face-to-face classroom learning experiences. However, the focus of the study is the adoption of TEL by academics and the factors that enable or hinder such adoption.

The authors hope that institutional leaders and academics will use this study to enhance their own plans for effective use of TEL.

An opinion paper was published in November 2014 with an initial treatment of this material (Thanaraj and Williams 2014.) The current paper provides a comprehensive analysis of our model of adoption of TEL which underpinned the research, a detailed discussion of our findings, a full set of recommendations and an outline of the desired impact of the work.

Rationale for the study

Research argues that many universities are still struggling to engage a significant percentage of students and staff with TEL and real development beyond projects by innovators has so far been modest (Beetham, McGill, and Littlejohn 2009.) This is despite the fact that embedding TEL is a stated aspiration of many policy-makers and senior managers. It is telling that the conclusions of this seminal paper still apply six years on, despite very rapid technological changes in the interim. In over a decade, Oliver and Dempster (2003), Kelton (2007) and Gourlay, Hamilton, and Lea (2014) have concluded that there is no ready model that universities can utilize to embed the adoption of TEL.

Much of the focus of past research on the adoption of TEL has been into the development of technologies or top-down policy aspirations (Salmon, 2005) and there is little on the human dimensions which inhibit or motivate academics to adopt TEL The authors believe that the behaviour of academics influences the learning of students, and it is therefore academics who must adopt TEL-friendly behaviours if the learning is to be enhanced This led to the authors embarking on this study. It will be difficult to implement TEL without the cooperation and support of the large majority of lecturers, as the degree of interaction between lecturers and students is still predominant in TEL environments (Warburton, 2009; Kirriemuir 2010a; Kelton, 2007, 2008). Academic staff will change their methods of teaching and learning and programme outcomes if they gain a deep understanding of what the

impact will be in terms of quality and any resultant benefits (Salmon 2005; Sharpe 2006; Gourlay, Hamilton, and Lea, 2014).

This research will propose that Universities require a fully articulated TEL strategy that aims to have a sustainable effect across the university, with the aim of transforming teaching, offering accessibility to education to a wider student population, internationalising the existing curriculum and developing holistic, well-rounded graduates with global and cultural knowledge. The TEL strategy can stand alone, alongside the Learning and Teaching strategy, or can be woven into it.

The research therefore proposes that, to develop strategies and vision for TEL that are successful, university leaders must give the opportunity to debate, discuss and develop action plans with policy makers on the reasons why their particular university is adopting TEL approaches, the educational experience that blended learning offers their students, the impact it has to subject areas, the change in expectations for staff and students and the process by which TEL adoption will be implemented. Furthermore, it must be recognised that adopting technology is 'a complex, barrier-ridden and time–consuming process…' (Jacobsen, 2000, p. 26).

Literature on the barriers and enablers to the adoption of TEL has ranged from surveys to questionnaires. Research has found that '…rewards such as a feeling of accomplishment and personal satisfaction', are key enablers (Larson, 2005, p. 104). Factors such as '…extra pay, recognition and awards, and royalties on copyright material', did not motivate academics to adopt TEL (Parker, 2003). Key factors leading to resistance in engaging or adopting TEL, including the lack of time (Berge et al. 2002; Maguire 2005; Lahaie 2007; Major 2010), increased workload (Maguire 2005; Lahaie 2007; Major 2010); lack of compensation (Berge et al. 2002), and lack of IT support (Maguire 2005) are well documented. Recent University and College Information Systems Association (UCISA) studies (2010, 2012) showed that the lack of academic staff knowledge was the top barrier for academics. An academic's experience and their expertise with the technology were found to be key indicators for successful adoption of TEL (Lane & Lyle, 2010.) There was a clear and real necessity for academics to understand how a particular technology operated and its stability and reliability towards delivering a specific learning objective were shown to be the top enablers to the adoption of TEL (Sharpe & Beetham, 2010).

Most research in this area investigates barriers, whilst enabling factors are seldom mentioned or examined. There also does not appear to be much research which privileges the academic's voice and lived experience. In spite of the work in this area to date, further study is needed to test several aspects around the question of the adoption of TEL. This will aid us in exploring how the motivators can be used as part of driving TEL forward in an institution, whilst addressing the restraining factors that could be in the way. This study advocates that the success of implementing TEL initiatives lies with academics as individuals and with academic leaders in establishing the right conditions.

Research question

How can universities support academics in implementing their university strategy on TEL so that it improves students' learning?

Sub-questions

1. What are the needs, concerns and motivating factors facing academics in the adoption of TEL?
2. How can universities balance the need for a coherent strategy on TEL with academic freedom and integrity towards different subject disciplines?
3. What is the most appropriate adoption or change theory that universities can utilize in aiding understanding of the data gathered in this study?
4. What stance should a University's IT Service take in its support for TEL?
5. How can institutional leaders support the adoption of TEL and make the benefits clear to academics?

Literature review on models for the adoption of TEL

The purpose of this study is to bring about sustained and transformative change to the ways in which universities encourage academics to adopt TEL. This in turn will meet the changing landscape of higher education in the UK and allow UK universities to stand as successful competitors in the wider global education sector.

It is appropriate to develop a model to help consider this. The apocryphal reasons for the reticence to adopt TEL are well known – time, technology, established practice, institutional inertia and so on. A model will help practitioners to formulate and test their ideas and thereby to reshape their practice.

To build understanding, the authors first considered whether a change or an adoption model was appropriate for the study. The authors developed an illustration of why it is appropriate to consider an adoption framework. For academic staff to adopt TEL, they need to alter their ways of working, but not the fundamental purpose or content of that work. Making optimum use of TEL is more than simply using what we have – it typically requires academics to use a range of different tools, some familiar and some initially unfamiliar. The core purpose, though, remains the effective learning of their cohort(s) of students. The authors used the following model:

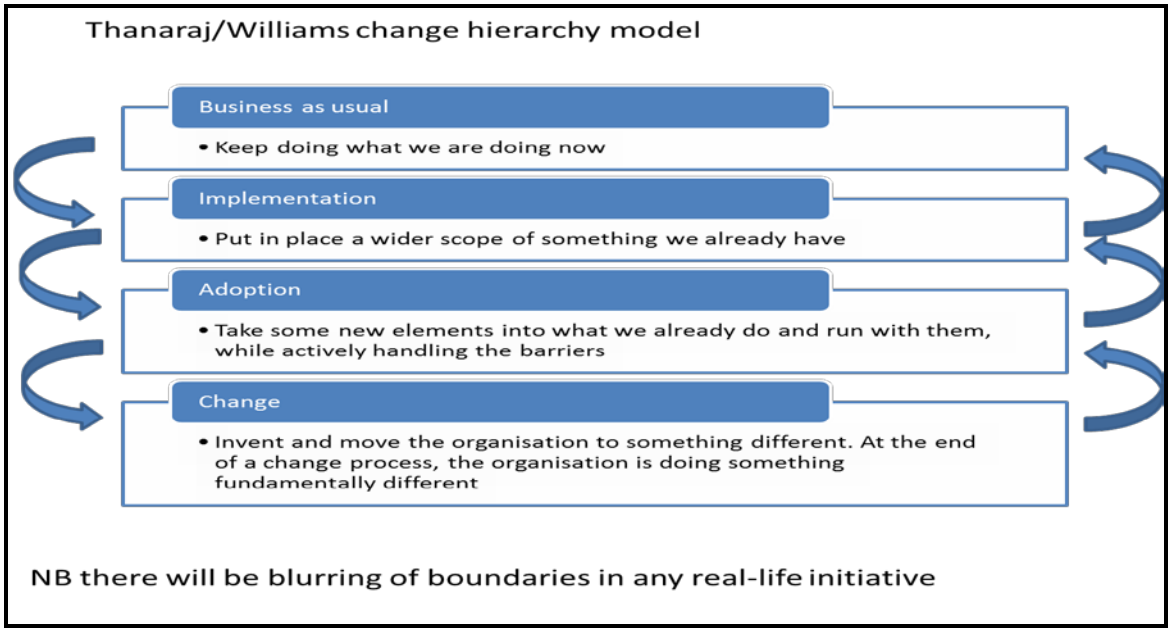

Figure 1: Change hierachy model, Thanaraj & Williams (2015)

The authors then reviewed a number of the well-known adoption models. Adoption usually starts with the recognition that a need exists and moves to searching for solutions. Then comes the initial decision to attempt the adoption of a solution, and finally the actual decision to proceed with the implementation of the solution (Damanpour and Schneider 2006; Gallivan 2001; Mendel et al. 2008). The authors argue that to support the adoption of innovation, the process needs to be made in a systematic and planned way, as the method of use will determine how successfully an initiative can be implemented and sustained.

In order to assess the most suitable model for bringing about adoption of TEL within universities, this study reviewed the different types of adoption frameworks by drawing out the key characteristics which are likely to increase adoption of innovation. The authors began by reviewing ten frameworks which address the adoption process. Two models which stood out were Rogers's Innovation diffusion theory (Rogers, 5th ed., 2003) and the Technology Adoption Model version 3 (Davies, 1985; Venkatesh and Bala, 2008).

There have been many studies within the education setting (Medlin, 2001; Dooley and Murphrey 2000, Graham 2006, Wilson & Stacey, 2003) which have used Roger's diffusion theory to examine the uptake of educational technology. Drawing upon the practicalities of the theory, Jacobsen (2000) makes the point that *'If campus wide integration plans are developed on the assumption that everyone will naturally use computers as readily and as easily as the early adopter, then they are bound to fail'* (p. 25). Instead, it is essential to recognise *that '… the adoption of information technology for teaching and learning is a complex, barrier-ridden and time–consuming process will help institutions understand that expectations for campus-wise technology integration will not happen overnight, and must allow for a cyclical and iterative implementation and evaluation process'* (Jacobsen 2000, p. 26).

Venkatesh and Bala's (2008) Technology Adoption Model (version 3) provides a framework to explain the factors which influence the adoption of technology such as user participation in the pre-implementation and implementation stages, aligning the invention with job requirements, training, peer and organizational support. These are valuable factors, however, studies such as Chutter (2009) have claimed that there are some doubts about its theoretical robustness and practical effectiveness.

In addition to adoption frameworks, the authors also frameworks which addressed the implementation, dissemination and sustainability of adoption. Most adoption models focused on the adoption of technology itself rather than the adoption of new or enhanced ways of delivery through technology, which is necessary for universities to model their strategies on. The findings of this analysis are presented below. In some cases, the authors have appended their views on how the factors reviewed impact on universities adopting TEL practices.

In order for technological practices to be adopted successfully, much of the research points to the successful and lasting impact which regulators, government policies and legislations have (Aarons et al. 2011; Berta et al. 2005; Feldstein and Glasgow 2008; Mitchell et al. 2010). Some kind of mandate is regarded as essential. Within universities, educational policies and funding changes, and the progressive change of the manner in which we teach our students are key factors for all academic leaders. The political and cultural climate of higher education (Glasgow et al. 2003), alongside successful collaborative activities with innovation developers, education consultants and students, are steps to ensure that TEL is

adopted for the right reasons and in a manner which is appropriate to the university concerned.

Any message of adopting something different or changing practices will require a clear need for motivation, urgency and readiness for change from all stakeholders concerned (Solomons and Spross 2011). In order to bring about successful adoption, organisations need to undertake an assessment of attitudes, barriers and facilitators towards change (Aarons et al. 2011; Gallivan 2001; Mendel et al. 2008; Solomons and Spross 2011), and to build in methods for rewarding adoption and innovation (Glasgow et al. 2003, Aarons et al. 2011). Feedback on the adoption process and consultation from those required to engage are useful in increasing adoption. Taking into consideration individual characteristics, such as skills and experience of staff, innovativeness, tolerance of ambiguity and propensity towards risk taking, is associated with increased adoption (Solomons and Spross 2011). Academics' lack of awareness and familiarity with a particular practice, the lack of time, autonomy, and ability to access research are also factors that inhibit the successful adoption of technology. The authors argue that these are key factors that must be considered carefully and woven into the adoption model for successful, risk-assessed and sustainable change.

New approaches will only be successfully implemented if they are led through effective communication with clear and focused messages, backed up by evidence of successful outcomes, including a clear advantage in effectiveness over the preceding idea, product, or program (Graham and Logan 2004). It is possible for adoption to be successful and sustainable where strategies are developed to suit organizational needs, compatible with practice norms, with evidence of practice efficacy (Feldstein and Glasgow 2008; Oldenburg and Glanz 2008;) Furthermore, organisations will need to be shown to invest in their strategies (Godin et al. 2008, Graham and Logan 2004, Mendel et al. 2008, Simpson 2002) with structures in place to support adoption through training and communication and consultation with stakeholders (Berta et al.2005; Solomons and Spross 2011).

Within this literature review, the authors have offered the key themes, at a generic level, to successful adoption of technology. However, the review suggests that none of the prevalent adoption models accurately reflects the needs of institutions in supporting the adoption of TEL. The authors believe that a new adoption model, tailored for TEL in universities, is needed. Educational organisations are commonly typified as professional bureaucracies employing numerous types of professionals. They often exhibit a dual hierarchical structure with considerable autonomy. Individual academics typically exercise substantial discretion. As a consequence, educational organisations continue to be distinctive in their organisational characteristics; decision-making tends to be more decentralised and more localised to specialised subject areas than in the typical organisation.

The authors believe that it is more appropriate to consider a model focused on the factors which university leaders should consider to bring about enhanced ways of teaching with technology. We have used some of the thinking in many of the models in the literature and attempted to craft something which is simple, appropriate for use in higher education, and builds on previous thinking in the adoption of innovation in other sectors.

Methodology and data collection

There were three parts to the study:

1. Context: Contextual analysis to determine academics' needs, concerns and motivations about the adoption of TEL

2. Case study: Two Higher Education Institutions examining their TEL practices and implementation strategies, using a combination of focus groups and interviews
3. Outcome: Recommendations and guidelines for sustainable and transformative implementation of TEL

The study featured two institutions in the North of England: Newcastle University, a research intensive institution, and University of Cumbria, a newer, teaching-led institution. These universities were chosen because of their diverse nature in their institutional objectives and missions. This provided rich perspectives on the similarities and differences in the factors that motivate or hinder the adoption of TEL. The TEL strategies for both universities are at different stages. Newcastle University has institutional wide TEL activities (such as wide-ranging lecture capture and ePortfolio projects) which are adopted by the majority of academic units. University of Cumbria has a variety of TEL initiatives developed through individual pockets of excellence; however these need to be shared across departments for institutional adoption and impact.

A case study methodology was used in this study. Case studies are especially useful when looking for patterns of behaviours concerned with 'how' and 'why' (Saunders et al., 2000) the use of TEL in teaching and curriculum design may, or may not be taken up by academics. Furthermore, the exploratory nature of the research questions, the study of participants' behaviour and the need to study the contextual situations of the institutions lend themselves to a case study approach (Baxter & Jack, 2008). The case study approach offers the opportunity to compare and contrast real life experiences (Yin, 1994; Stake, 2005) between academics from the same institution and across both institutions, allowing the researcher to capture the variation in experiences. This has assisted the authors in drawing out a more compelling and robust set of conclusions and recommendations from the study (Yin, 2009.)

One of the greatest strength of case studies is the multiple sources of data collection (Yin 2003). Stiles (2004) has argued persuasively that: *'understanding where you are starting from is as important as understanding where you want to get to. Expanding the use of eLearning in an institution requires a clear and honest analysis of the organisation in terms of strengths and weaknesses viewed against its strategic goals'*. (p.14). Friesen, Gourlay, and Oliver (2014) argue for the importance of developing an empirically grounded set of findings in order to take forward any technology based learning initiatives. This approach allowed the authors to expose the more personal, cultural and organisational reasons why individuals elect to take up or avoid online teaching, driven by the research questions of the study.

To underpin the case study, six focus groups with participation of just under sixty individuals, and a number of interviews were organised across both institutions. Although *'it is nearly impossible to replicate the original conditions under which the data were collected'* (Strauss and Corbin, 1998, p. 266), the authors considered carefully the make-up of the focus groups in both institutions alongside timing during the academic calendar and method of participant selection.

The focus groups offered a free space for academics and professional service staff to discuss the following statements, taking fifteen minutes for each:

- I would like to support students' learning more by using online tools, but…
- I see benefits in supporting students online, because…

- There are concrete actions that institutions can take to help staff become more effective in their teaching by using online tools.

The first and second questions are deliberately contradictory – the authors wanted the audience to adopt a negative and a positive outlook, respectively, influenced by de Bono's yellow and black hats (De Bono, 2004).

Each focus group lasted approximately one hour. The purpose was to examine how TEL is being adopted, embedded and used by those participating in the focus group. This will provide scope for university leaders and policy makers to assess where TEL is at the organisation and identify opportunities for progress in their own organisation. It is hoped that it will also assist in selecting key individuals who would be well suited to lead change within their own departments and academic subject groups.

Running the focus groups with a self-selecting audience of those who replied to the invitations opens up risks of possible bias. Indeed, these risks apply more widely to the whole of the case study approach and also apply to studies such as this where sample sizes are relatively small (two universities; some sixty people.) Other criticisms, such as the potential for sloppy procedures, poor analysis and lack of rigour, practical challenges with the quantity of data collected and the management of that data, also apply (Yin, 2009). To mitigate these risks, the authors consulted a professional statistician, who reassured them that the validity of the conclusions would not be compromised as long as the questions about positive and negative opinions were asked openly. No attempt was made to produce a representative sample, but following the principles of purposive sampling, (Bryman 2004) a cross section was sought, especially across a range of subject disciplines in both institutions.

To further enrich the data, the analysis was expanded by six semi-structured interviews with institutional representatives to provide the richest variety of evidence and insight into the 'human' motivations on the adoption of TEL. The guided, semi-structured nature of the interviews allowed the authors to ensure consistency in the topics covered (Cohen et al., 2007) while allowing for individual differences, and allowing the interviewer to bring out the experiences and viewpoints of each participant, raising issues that are important to individuals (Ritchie & Lewis, 2003) The interviews lasted around 40 minutes each.

Further, a content analysis method was employed to the interview data and to carry out analysis on strategy documents in learning and teaching, and in TEL. This method of analysing data offers the ability to analyse the same data consistently over two iterations (Babbie, 2010). Content analysis reveals differences in communication content by identifying the intentions, focus and communication trends through attitudinal and behavioural responses to communications (Nuendorf, 2002). It is an unobtrusive means of analysing social interactions and provides insight into human thought and language use (Lasswell, 1948).

The analysis of the case study results utilised all the evidence from the focus groups, interviews and documentary evidences. The authors examined the factors that influence academics' decisions to adopt and integrate learning technology, the pedagogical motivation or demotivation behind their decision and, drawing upon the specific structures of the two universities, the motivational and cultural values in the different academic communities.

The results of this study will focus on the needs, concerns and motivators to the adoption of TEL, assessed through the lens of personal, cultural and organisational factors in the two institutions. The authors believe that the findings may be of value to policymakers in other universities in considering their own positions, by understanding whether they can see any

similarities between the universities under study and their own (Mays and Pope 2000; Onwuegbuzie and Leech 2005).

Validity of the study has been established by showing the link between the research questions and the data collection questions and the possibility of generalizability of the findings (Eisenhardt, 1989). Reliability of the study has been established by demonstrating and explaining how the same data collection process was used in both universities, across all focus groups and interviews. The process was documented in detail and records kept to show appropriate links (Saunders, 2000; Eisenhardt, 1989.) Anonymity and confidentially were guaranteed and participants were offered the chance to withdraw from the study before, during and up to two weeks after their participation. In order to assist with reviewing the data at a later stage, permission was sought from participants to take written notes during the focus groups and interviews.

Philosophical and epistemological stance

This study was conducted in the belief that knowledge is built by actively interpreting or constructing meaning through experiences as opposed to being discovered (Jonassen, 1991; Guba & Lincoln, 1999; Richardson, 2004). The intention was to explore the perceptions of academics, to discover the extent to which different experiential and practical interpretations (Lincoln & Guba, 2000) of cultural, pedagogical and institutional factors may influence the adoption of TEL. A social constructivist stance was utilized in the collection, analysis, and interpretation of data for this study, to create, explore considerations, and develop an awareness of differing experiences and opinions (Fischer, 2003.)

Findings from the study

The authors captured all of the focus group and interview input about enablers, barriers and institutional measures and, using content analysis, summarised the data into the following findings:

Table 1: Findings from contextual analysis

	Enablers	
Both universities	Only at Newcastle University	Only at University of Cumbria
Student experience Identity and belonging Personalised learning Flexibility Creativity Access to education through widening participation and diversity	Motivated by the better retention of students Enhanced learning International / cross faculty / cross discipline opportunities Employability Staff development of skills TEL as a priority for the university, enhancing the university's reputations Staff recognition Scalability, reliability and innovation in the software	Staff gain better communication skills
	Barriers	
Both universities	Only at Newcastle University	Only at University of Cumbria
Sufficiency of digital literacy/fluency skills Lack of concrete pedagogic evidence in existing literature The extent of career recognition and progression Impact on time, resource and staff workload Lack of opportunity to communicate and share best practice Not knowing how it impacts student experience of learning Fear and reticence on the part of staff Lack of sign posting of support and tools Believing that just because it is E, it's not better	Staff support with the tools Social diversity, widening participation Legal issues (copyright, IP)	Developing multiple online personalities Design of online study spaces Staff disenfranchised Assumption that students are confident with the tools Student support with the tools
	Institutional Measures	
Both universities	Only at Newcastle University	Only at University of Cumbria
Embed TEL into Learning, Teaching and Assessment strategy, with QAA process Reflect TEL involvement in staff workload Localise use of TEL in Schools / Departments / Subjects (practice) Recognise research on teaching as a scholarly activity Make pedagogy fit the subject discipline Invest in software, people and training	Develop a long-term TEL plan (sustainability AND transforming learning) Staff digital literacy plan. Share best practice. Develop hybrid managers Be risk-aware rather than risk-averse in new developments Reward, recognition, incentive in TEL Put students at the heart of education Empower staff	Managing hardware and software well – don't change too much at once Use suitable, meaningful names for TEL projects

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Analysis of study

This study proposes that, in order to deliver institution-wide change, consideration of the needs, concerns and motivating factors of academics in adopting TEL in curriculum and pedagogy must be addressed. The authors asked 'How can universities support academics in implementing their university strategy on TEL so that it improves students' learning?' The findings set out above make it clear that actions can be taken both at institutional and individual level which will benefit students.

The starting point is to embed TEL into the Learning and Teaching strategy. This can be achieved either by having a separate TEL strategy or by having a TEL section in the overall Learning and Teaching Strategy.

Recognising TEL involvement in staff workload modelling is essential. Developing high-quality and effective online material is a time-consuming task. An academic with a 110% teaching and research load is unlikely to be able to invest sufficient time in developing high-quality TEL material.

Further, universities should recognise research on teaching as a scholarly activity, welcoming publications in this domain both from their education department and elsewhere.

Sub-questions

1. What are the needs, concerns and motivating factors facing academics in the adoption of TEL?

Three headings cover these factors – Time, Skills, and 'What's in it for me?' Universities need to designate TEL as a priority for the institution as a whole, as an activity that enhances their reputation. Staff need allocation of the time to develop the appropriate skills and then to use those skills to produce high-quality material. This activity needs to be recognised as a credible, essential and valued element of an academic's work.

2. How can universities balance the need for a coherent strategy on TEL with academic freedom and integrity towards different subject disciplines?

Practicing academics were particularly insistent, in both Universities, that use of TEL in Schools / Departments should be localised, reflecting pedagogical differences between academic subjects, and feeding different requirements into – potentially – different IT systems. However, it was also well understood that there are cost and efficiency advantages in standardising on a small number of software platforms.

Some differences were apparent between the two universities. It's likely that the cultural, pedagogical and institutional perspectives may lead to a different position on TEL. Factors which could lead to differing perspectives include the level of research-intensity in the university, the reward and promotion criteria and the availability and responsiveness of high-quality IT systems. Differences in the university ethos, values and heritage have a role to play. When applying these questions to other universities, it seems advisable to consider these differences.

3. What is the most appropriate adoption or change theory that universities can utilize in aiding understanding of the data gathered in this study?

The authors considered a range of theories, covered earlier in the paper. Adoption models offer several mechanisms for successful adoption of TEL practices in universities.

Leadership, fit with norms and values, and attitudes/motivation toward innovation are each mentioned in at least half of the theories and across organization, individual, and client contexts. Characteristics of adoption, however, are likely to have varying salience depending on the type of practice to be adopted and the type of organisation seeking such adoption. The literature to date provides thorough information on external, organizational, staff, and innovation characteristics. However, to apply this to each university, with its individual context, it is necessary to observe each of these characteristics and their fit from each organization's perspective. University leaders, policy makers and academic leaders need the scope to assess the level of TEL utilization and identify opportunities for progress in their own organisation.

Reflecting the fact that none of the models appears to fit the circumstances in individual universities, the authors developed an adoption model which universities could consider for their own TEL adoption. This is covered in the recommendations section below.

4. What stance should a University's IT Service take in its support for TEL?

This is tricky. IT consultants Gartner talk of 'bimodal IT' – some parts of an IT department need to focus on robust, reliable services, while others concentrate on innovation and creativity. A payroll system, or an ambulance control system, needs to be 100% reliable, whereas the development of a mobile app needs to be fast-moving and creative (Gartner 2013).

TEL spans both. For example, a Virtual Learning Environment is typically used as the main channel for accessing learning materials and submitting work – so it needs to be very reliable indeed. However, it also needs to be flexible, allowing for different pedagogical approaches. IT teams in Universities need to concentrate on the innovative elements early in projects, and hand over carefully to the robust running of live services.

In any case, managing hardware and software well is essential. Changing too much at once can be extremely inconvenient for people - 'I've just got used to using version 10 and you're now replacing it with version 11.'

There are understandable pressures on cost and efficiency in all universities. These must be balanced with the need to support different pedagogies in different subjects. One extreme is to support one standard system only and to mandate its use. The other extreme is to support whatever each academic wants. This trade-off depends on the culture of the organisation and the similarities and differences between the different academic programmes offered.

Some arguments are based on real substance. As an example, some VLEs are weak at handling symbols in mathematics – if the institution teaches a number of online maths modules, then that may be a valid reason to use a different platform for these modules, even if this adds both complexity and cost. Other determinants might include the culture of the University. In teaching-focused post-92 universities, academics may be more prepared to tolerate the institutional solution, accepting the lower cost and – perhaps – more limited functionality. In research-intensives, the culture is more towards tailoring the service towards individual preferences. There's no right answer – it is for each university to address the issues openly and come to a view.

Co-development of technology solutions with partner organisations, whether fellow HEIs or commercial companies, adds a further set of complexities. IT services need to be involved from the outset in all such discussions, to ensure that IT platforms work effectively, integrate with other systems, and are sustainable.

5. How can institutional leaders support the adoption of TEL and make the benefits clear to academics?

As so often, a long view is the starting point. This allows for universities to assess whether the new approaches to teaching and learning have been transformational and produced improved outputs. Further, it allows organisations to ensure that teaching approaches are sustainable.

Recognising the amount of work involved in effective TEL is the next priority. Then, institutions should support appropriate levels of investment in software, people and training and in establishing TEL-supported programmes. During our research, some academics called this a 'staff digital literacy plan.' A further aspect of developing staff is the idea of 'hybrid managers' – individuals who may have either academic or service delivery backgrounds, who understand both the pedagogy and the technology. To develop successful TEL programmes, universities need to reward, recognise and incentivise staff – principally academics, but also colleagues in service functions - for creating developments in TEL.

A positive, open attitude to risk is important – summarised as 'risk-aware, not risk-averse.'

Alongside these very practical measures, there are psychological imperatives too. Using meaningful, attractive names for projects makes them real to our customers – students and staff. For example, Newcastle's lecture capture programme is branded 'ReCap.' Having this name meant that the underlying software was able to be changed from one supplier to another without disruption to students' learning.

Conclusions

The authors noted above that the existing adoption theories had some value when applied to TEL adoption at universities, but were unable to tell the whole story. This study agrees with the observation made by Jacobsen (2000) that *'… the adoption of information technology for teaching and learning is complex, barrier-ridden and time–consuming… campus-wide technology integration will not happen overnight, and must allow for a cyclical and iterative implementation and evaluation process'* (p. 26).

The findings from the study, and the authors' analysis, indicated that there are common principles in TEL adoption in universities, but also marked differences. Therefore there is no single optimal way for each university to proceed. We recommend below a number of steps, in line with an overall adoption model, which any university could take.

Recommendations

In 'Rethinking Pedagogy for the Digital Age', Beetham and Sharpe (2013), explored the challenges involved in implementing TEL in universities, concluding that the focus to successful TEL initiatives is in the human and organisational aspects of teaching and learning, rather than placing emphasis on the technology itself (p.56). Our study is in agreement with their findings. The goal, of course, is successful and sustained use of technology to enhance the learning, teaching and assessment experience across all programmes of delivery. Based on the findings of the study, the authors suggest that it is essential to look beyond the technology itself and instead focus on the pedagogical, cultural

and social contexts of higher education in order to achieve successful and sustainable TEL adoption at universities.

The authors propose the following model for the adoption of TEL:

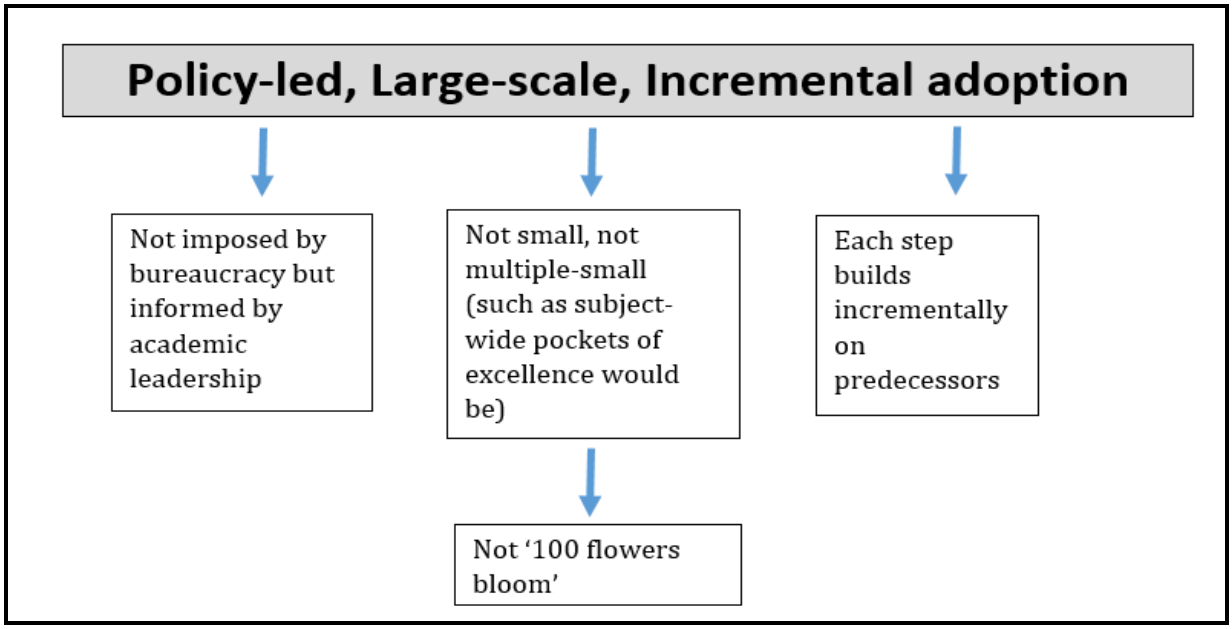

Figure 2: TEL adoption model, Thanaraj & Williams (2016)

Reflecting this adoption model, the authors now recommend the following actions to universities in order to bring about sustainable and transformative adoption of effective TEL. In doing so, the recommendations address the barriers to adoption which we outlined in the Findings section.

Policy-led:

1. For institutions designing strategies or policy in learning and teaching and the manner in which this is delivered, there is a real need to facilitate a two-way communication. Room for questioning is essential to build commitment and trust. Universities should design strategies that target all levels of the university hierarchy, creating opportunities for every individual to contribute to the initiatives. Academic champions and policy designers should promote the new vision to all members of staff, explaining the rationale for the change and the potential transformation that could take place.
2. Change the culture of academic practice and recognition: Academics face complex pedagogical, technological, institutional and cultural challenges in the delivery of their programmes and in the adoption of TEL. They must be able to ask policy questions, debate issues, and articulate a defensible rationale on the adoption of TEL approaches, the challenge TEL presents to traditional assumptions and practices and how TEL may change expectations for students and themselves. Our findings indicated that the resistance to the uptake of TEL has been largely due to the lack of institutional support, such as inadequate time set aside for developing and delivering online teaching, recognition and promotion. Fair allocations in workload models are essential. There is

unequivocal support in the literature for distance teaching taking more time to set up and facilitate than traditional teaching (such as Laurillard (2007) and Mancuso (2009)). There is a need for cultural change and a shift in the role of academics, their identity and methods of working, in order to ensure that facilitation and teaching online can be delivered satisfactorily.

3. Organisations should put in place a combined approach to TEL development. This approach should allow for mixing top-down and bottom-up strategy and activities. Senior management, practicing academics and members of service departments should interact and inform one another in order to integrate TEL more systematically and therefore bring about improvement in teaching and learning.
4. Universities should value both academic and technical support for TEL. Academics should be recognised as subject matter experts and content creators. Dedicated resources for technical support of TEL (such as IT and interaction design experts) need to be part of an integrated approach to programme development.
5. Use Meaningful names for TEL projects. Newcastle's lecture capture project is known as 'ReCap' – this has become a useful and popular brand with students and staff and has helped with the adoption of the service.

Large scale:

1. The strategies to achieve the vision should be offered as small and easy to achieve TEL projects, on a large scale basis across the university. As TEL moves beyond early adopters, universities should gently move towards a consistent set of technologies. When a university offers two or three TEL study programmes, then the technology platforms can be developed experimentally. Indeed, trying out different technologies and approaches is sensible. But as universities widen TEL adoption, they need to coalesce around a single set of standards, or at least a small number of options. It becomes unsupportable, both on technology and cost grounds, to do anything else. This needs to be handled sensitively, as academics and technical staff may need to redevelop early work in order to support the emerging standards.
2. In order to bring about sustained changes in practice, universities must address the myths of using technology in education. This requires concerted, university-wide attention. Some of these myths and barriers which arose from our findings included:
    a. "With TEL, there is no role for tutors." In fact, the role of the tutor changes from teaching to facilitating and collaborating. The authors have argued, in line with other established literature that the best learning involves a combination of classroom and online support, therefore still requiring a tutor's input to teach.
    b. "Tutors must be really skilled in IT." To make good use of educational technology available at the university, motivation, combined with a good understanding of digital pedagogy and basic IT literacy is all that is necessary.
    c. "I'll be constantly writing backwards and forwards with my students." There are very good strategies for efficiently dealing with the volume of communications.; these include stating times when the academic will be available and agreeing response times for communication.
    d. "Some subjects just cannot be taught using technology." The authors have argued that technology should never be used for the sake of it. However, we will continue

to advocate that the teaching and learning and assessment and support across all subjects can be aided and enhanced by using technology appropriately.

e. "It is one of those passing fads." This is not the case. The authors began these sets of recommendations by exploring the importance and rationale behind the drive for TEL initiatives. The Higher Education landscape has changed in many ways. Government directives, changes in the student population, and the changing consensus on what constitutes effective teaching practice each provide sound incentives for this shift. For education to reach a large volume of students who otherwise may not have the opportunity to study a particular course, technology can bridge this gap. Today, social media, VLEs and online research are standards expected by students. The authors have argued that universities need to provide the space and opportunities for academics to consider the reasons why TEL is necessary to support existing teaching and learning practices. Of course, subject differences are real. Use of TEL in mathematics will be different from its use in history in some respects. However, given that TEL is used widely across most universities, it's necessary to deal with this at scale.

Incremental adoption:

1. Universities should identify academic champions for each TEL initiative and then resource and support each. A lead academic will add credibility to the initiative, both with other academics and with students. S/he will often become an exemplar of practice.

The business case for Newcastle's lecture capture initiative, ReCap, was marvellously summarised in four words by the then Degree Programme Director of the prestigious MBBS programme, Professor Phillip Bradley:

"My students love it!"

Further, by considering these people as role models, the myths above – no time, no support, not relevant to subject discipline – are effectively deflated. Done well, good practice will then permeate through the institution. Universities should consider such roles as a marker of esteem for these individuals – supporting a future case for leadership roles.

2. Universities must allow for innovation to 'bubble up' across the organisation. This appears contradictory to the discussion above about an institutional approach, but it is not. Enlightened policy and operating at scale are important, but academics must also feel encouraged to experiment with their teaching. Each university will find its own balance between supporting experimentation and mandating standards – the authors suggest that this should be debated openly across the institution. Often, innovation

comes from collaborations between institutions. In these cases, technological solutions need to be crafted to fit the different needs of the organisations.

3. Universities must recognise that academics are coming from different starting points. Policies and training will need to address some of the practical considerations for implementing technology: Academics should be encouraged to start small with simple ways to enhance existing modules. Options might include increased collaboration between students, more self-testing and reflection opportunities, or greater interaction with relevant multimedia. A personalised approach to staff training and digital literacy is absolutely vital. TEL adoption must be tailored to real learning needs and the motivations of academic staff to have a sustainable effect that leads to transformative teaching. This needs to cover the different responsibilities that come with delivering teaching online such as facilitating, instructing, collaborating and enabling.
4. Universities must take into account students' aptitudes and attitudes. Consider and involve students, their skill set and how the use of technology can encourage and empower their learning. Move on to creating TEL initiative that are meaningful and useful for the students by highlighting the benefits of tasks which use technology and how the learning experience will be improved.
5. Universities need to offer more than just training on how to use software. TEL needs to be grounded in the pedagogical imperatives of the university. For example, the decision in Newcastle to offer lecture capture in many rooms was driven from an academic commitment to facilitate reflective learning, not by an inherent interest in the technology. Other considerations include:
    a) Understanding the necessity of social presence, collaborative learning, sense of belonging and transactional learning in the design of the curriculum.
    b) Designing online spaces for increased flexibility.
    c) Understanding how using TEL can enrich what the tutor is able to do in the classroom. This includes designing on-campus spaces to reflect the changed pedagogies of TEL. For example, the University of Newcastle Australia is constructing its new teaching centre with spaces specifically designed as 'flipped classrooms.' (Burd, 2013).
    d) Empowering students to become more self-directing, and less dependent on the tutor to provide explicit instruction.
    e) Designing and supporting collaborations which are simply impossible inside the classroom. Working with peers around the world allows students to benefit from a culturally rich exchange of ideas, and discussions of diverse beliefs and practices.

Summary of recommendations

Policy Led

1. Facilitate a two-way communication
2. Change the culture of academic practice and recognition
3. Put in place a combined approach to TEL
4. Value both academic and technical support for TEL
5. Use meaningful names for TEL projects

Large scale

1. Gently move towards a consistent set of technologies
2. Address the myths of using technology in education

Incremental adoption

1. Identify academic champions for each TEL initiative
2. Allow for innovation to 'bubble up' across the organisation
3. Recognise that academics are coming from different starting points
4. Take into account students' aptitudes and attitudes
5. Offer more than just training on how to use software

Impact of this study

This study offers the findings of a contextual analysis on the barriers and enablers to the adoption of TEL, privileging the academic's voice and lived experience. Using these findings, a set of recommendations has been designed for universities to support academics in implementing their strategy on TEL.

Individuals can use the analysis, model and recommendations to craft their own practice. Institutions can use the recommendations to move beyond adopting technology as a series of point solutions and towards a more efficient integrated approach, in support of their teaching and students' learning.

Although there is no single best practice for full adoption of TEL across a university, it is envisaged that the recommendations will equip academic leaders and curriculum designers to realise the benefits of effective adoption of TEL across subject disciplines. The effective adoption of TEL could transform universities to offer the much needed flexible learning, flexible teaching and flexible curriculum (Barnett, 2014), both to home students and students across the world. The findings will benefit University leaders (who may lack information on whether existing staff development approaches are sufficient) to explore how the barriers and motivators can be used to develop TEL in an institution. The study offers university leaders strategies to influence and inspire academics who are yet to fully engage with adopting TEL. For practicing academics, this study contributes to developing an underlying pedagogical rationale that changes the perception of TEL, allowing for adoption that is sustainable and transformative across a range of subject disciplines. Finally, for researchers, the details of the methodology used may inform future work.

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Student Perceptions of Self and Community within an Online Environment: The Use of VoiceThread to Foster Community

E. Gail Kirby[1] and Nancy Hulan[2]

Abstract: This paper investigates student responses to two tools used to create learning environments that encourage the sharing of ideas and discussion in online asynchronous university courses.

Keywords: asynchronous, VoiceThread, discussion board, participatory culture, student engagement, technology, New Literacies

The landscape of instruction has vastly changed teaching and learning in education during the last 10 years. With the emergence of technologies such as high speed Internet, virtual classrooms, blogs, wikis, and a plethora of other online tools, asynchronous online education has also become prevalent. A shift from face-to-face classes into the virtual world can seem a daunting challenge to many instructors and students. Some of us find ourselves trying the new bells and whistles, often unintentionally impeding instruction rather than reinforcing or furthering learning (Mandernach, 2006). Others search for ways to replicate the type of community and discussion that occur in face-to-face classrooms within the online environment. In this article, we describe our students' responses to the use of an asynchronous video sharing tool called VoiceThread in our quest to construct community within two university classes through the use of technology.

Theoretical Perspective

Drawing students into meaningful and engaging interactions and discussions in online settings can be difficult. This is a challenge because central to our understanding of how we learn is sociocultural theory, requiring that community and interaction play critical roles in learning (Vygotsky, 1978). We learn, process, are challenged, and have to rethink prior assumptions through interaction with others. It is our belief that such experiences can occur around the dinner table, on the playground, in the physical classroom, and when prepared and set up properly, in a virtual classroom. In fact, "both the process (the ways the instruction is delivered and the social interactions that contextualize the learning experience) and the content (the focus of instruction) are of major importance" (Snow, 2002, p. 16).

Rogoff (2003) studied learning within cultural contexts and the effects of culture on learning and teaching. A notable study she conducted involved children in African villages attempting to complete various tasks. These children were unsuccessful when they were given tools they were unfamiliar with-- when they were given tools with which they

[1] School of Teacher Education, Western Kentucky University, 1906 College Heights Blvd., Bowling Green, KY 42101, gail.kirby@wku.edu

[2] School of Teacher Education, Western Kentucky University, 1906 College Heights Blvd., Bowling Green, KY 42101, nancy.hulan@wku.edu

had experience, the children were successful in completing the task. Such also occurs with college students, many who feel comfortable within online environments and have "developed proficiency with gaming, social networking, video, and texting" (Leu, Forzani, Rhoads, Maykel, Kennedy, & Timbrell, 2014a, p. 334). This does not mean that they effectively use online information, however.

Research has demonstrated that many students do not have critical evaluation skills when reading online and that they are not skilled in reading to locate information (Arend, 2009; Carmichael & Farrell, 2012; Choy & Cheah, 2009; Henderson-Hurley & Hurley, 2013; Leu, Zawilinski, Forzani, & Timbrell, 2014b; Rowles, Morgan, Burns, & Merchant, 2013). The Internet "has brought unprecedented dimensions to both the speed and the scale of change in the technologies for literacy" (Coiro, Knobel, Lankshear, & Leu, 2014, p. 2). In fact, researchers in the field of New Literacies suggest that literacy acquisition be defined not in terms of a static technology (e.g., print technology), but as "using a larger mindset and the ability to continuously adapt to the new literacies required" by new advances and technologies that quickly spread and become ubiquitous (2014, p. 5). We use Leu and colleagues' (2004) definition of New Literacies as enabling individuals to "use the Internet and other Information Communication Technologies (ICTs) to identify important questions, locate information, critically evaluate the usefulness of that information, synthesize information to answer those questions, and then communicate the answers to others" (p. 1570). For those who are not comfortable with technology, its ubiquity can be overwhelming. It is clear that technology will continue to become more prevalent in our lives, as reading shifts from page to screen (Carmichael & Farrell, 2012; Leu et al., 2014a).

We examine the use of a specific online tool, VoiceThread, within an instructional context. This fits into Leu and colleagues' dual theory of New Literacies as an example of the lowercase perspective of new literacies. This examination is intended to determine the usefulness of one tool versus another. Such lowercase new literacy studies add to our more global understandings of uppercase New Literacies (Leu et al., 2014a; Leu et al., 2014b). One such understanding is that the Internet "makes new social practices possible" (2014a, p. 38); the use of VoiceThread for educational purposes and to foster community within an online environment fits within this understanding.

The Landscape of Online Teaching

Here we examine the world of online teaching in various groups, contexts, and subject matter to learn how it might benefit our own students.

Participatory Culture

In 2007, 1277 9-17 year olds spent their time online in various ways. They posted messages on message boards, shared music videos and photos, built sites, blogged, and created content (National School Board Association, 2007). These students are very creative with technology and use it in almost every facet of their lives. Yet, these are narrowed to social networking activities (Lenhart, 2015). Students are posting status reports about themselves and downloading photos and music, but they are not deliberately interacting with others. This showcases what they know best—themselves in the moment. Yet it does not encourage or involve the perspectives and experiences of others in their community.

According to the National School Board Association (2007), only 10% of tweens and teens participate in collaborative projects or send suggestions or ideas to websites. Fewer than 10% submit articles to websites or create polls, quizzes or surveys. While they are much more tech-savvy and prefer that the world around them offer access, they rarely participate in meaningful collaborative learning environments (Kelty, 2103; National Research Council, 2012; Turkle, 2011).

Such access to technology offers many opportunities and challenges to instructors involved in online teaching. There is unprecedented access to coursework due to the proliferation of high-speed Internet and online courses. In addition, due to the asynchronous nature of many online programs and courses, students have the option to complete class assignments at their convenience, in the comfort of their own home, and on their own schedules. As faculty in teacher preparation programs, we struggle to engage students through technology to learn in online environments. As previously stated, forty-one percent of students post personal messages (National School Board Association, 2007). They post their experience but don't interact with other students' contributions. This is important because learning stops at the student who does not engage with others (Pellegrino & Hilton 2012).

Learning is a socially mediated process (Vygotsky, 1978; Feuerstein, Feuerstein, & Falik, 2010), requiring that we take part in meaningful interactions with peers and pertinent content. Thus, the challenge we confront in this article is finding a way to build community and discussion in online coursework. Early work by Keller (1983) suggests that student curiosity through manipulation and exploration might sustain and increase learning when students are in charge of their learning environment. In asynchronous coursework, often students are asked to respond to one another's written contributions via Discussion Board. We contrast the traditional online discussion board with VoiceThread to examine students' preference of one tool versus another and ways the use of oral communication rather than written may boost a sense of community.

Discussion Boards

Most college students who have taken online courses have some experience with Discussion Boards. Discussion boards typically require students to respond to a prompt from a teacher or text and students are usually able to see all of their peers' written responses. Students feel comfortable with discussion boards, as the technology is not very challenging. However, discussion boards pose a few challenges to faculty. The set-up of discussion boards tends to cause students to reiterate what a previous post may have said, and limits students' need to go further, dig deeper, or challenge one's self or their peers. Many students admit to copying portions of their peers' posts and simply adding a few examples to make the submission their own. Other students feel comfortable with discussion boards because they are seen as "fluff" in a class—not seen as a tool for furthering understanding. In addition, many faculty find discussion boards to be excruciatingly boring to grade (because most students simply restate what previous students have written), and responses lack personality. It is impossible to really get to know someone through a written discussion board, so that sense of the face-to-face community is absent within the class that only uses such a tool.

VoiceThread

Brunyard and Byrd (2011) define VoiceThread as an "interactive, multimedia slideshow tool," which allows users to hold discussions around "images, documents, and video. This tool is easily accessible, cost-effective, applicable across most subject matter and grade levels, and adaptable to many learning settings" (p. 28). In addition, VoiceThread allows the users to choose their form of participation. One can choose to post an image or a video, type a response through speech bubbles or in a PowerPoint slide, use their phone to receive a call from VoiceThread, which allows them to speak their response, or a combination of the above. This ability to choose can increase intrinsic motivation (Keller, 1983; Malone & Lepper, 1983). VoiceThread has also been shown to be a useful tool to differentiate instruction for struggling students due to the expanded options for demonstrating understanding (Brunyard & Byrd, 2011). These options promote engaged collaboration that strengthens student participation in their learning environment. One of the features of VoiceThread for students with disabilities is the inherency of wait time, which allows students valuable time to form responses, often not available in the face-to-face pace of the classroom.

Methods

Through this research, we seek to answer the following questions:
What differences and similarities exist between graduate and undergraduate students' views of themselves as contributors to the online classroom environment via VoiceThread versus Discussion Board?
How does a technology such as VoiceThread create a sense of community in online discussion?

Population

Two classes in a School of Teacher Education at a university in the south were used in this study. One group consisted of 23 undergraduate students taking a Language Intervention Strategy class. Their class met regularly in person and used VoiceThread as a supplemental tool to foster community among students and discussion about theory. This group used VoiceThread three times to answer prompts from the instructor based upon readings, class activities, and classroom observations.

The other group was composed of 16 graduate students taking a Literacy Theory course, which was offered completely online and used VoiceThread 12 times during the semester as a way to foster community and discussion. The first VoiceThread was an introductory exercise in which students created videos to introduce themselves to their classmates. Students responded to at least three peers' entries. All other assignments involving this technology required the student to read articles dealing with literacy theory and to respond to one of a variety of questions specific to the readings.

Instrument

A questionnaire was created for administration to students in each of these courses. Questions were developed to glean information from students regarding their use of discussion boards versus VoiceThread. The questionnaire is included in Appendix A. Students were given online access to this questionnaire upon completion of the courses.

Data Analysis

Questionnaire results from undergraduate and graduate students were analyzed using the Constant Comparative Method of Qualitative Analysis (Glaser & Strauss, 1967). The authors read all student responses, identified and discussed themes, and then coded one set of responses separately to determine their interrater reliability of 89%. All responses were coded and codes were discussed among the authors to insure consensus and to refine codes and themes, as needed.

Results

Students answered questions related to their use of VoiceThread and Discussion Board in undergraduate and graduate course work. Here we describe students' reactions to each of the questions asked.

What do you like about using VoiceThread for class assignments?

Students' answers fell into the following themes: interactive, depth, intimacy, ease, and access. Examples of student responses that were coded with each of these themes are shared in the following table:

Table 1. VoiceThread themes

Theme	Examples
Interactive	• The video makes it feel more interactive. Hearing the voice of a classmate brings about feelings that a class discussion is taking place rather than reading something you have read from a faceless peer. • It makes discussion more interactive and expressive.
Depth	• I liked it because it seemed people could go more in depth and get out what they really wanted to say. • They helped me follow along and learn better. • I believe VT encourages a greater depth of understanding of not just the material relevant to the question being answered, but to the material in general. • You get to thoroughly plan out your responses prior to giving them.
Intimacy	• It creates a higher level of intimacy. • It is nice to be able to see my classmates and hear their voices since we don't meet in person.

	• It makes it (class) a little more personal. • I liked hearing people's thoughts better than reading them because it was easier to tell how the person felt when I could hear the tone of their voice.
Ease	• It saves time on typing and is easy to use. • It is easy to use and navigate through. • I like being able to communicate my ideas verbally as well as visually. • It is easier to listen to a lengthy discussion than to read a lengthy narrative.
Access	• It gives people who normally wouldn't talk a chance to give their opinion. • It is helpful for the student to be able to express him/herself.

In comparing graduate students' responses with undergraduate students' responses, they showed differences in feelings toward the tool. Graduate students responded with the following themes from most to least frequency: Intimacy, depth and ease, interactive, and access. Undergraduate students responded with the following themes from most to least frequency: Ease, intimacy, depth and access, and interactive. Slight differences indicate that the graduate students were more interested in the intimacy and depth that the tool provided than the undergraduate students who were more interested in the ease of the tool and then the intimacy it afforded.

What were your challenges in using VoiceThread for class assignments?

Students' answers to this question reflected a paradigm shift from the technology they were accustomed to (Discussion Boards) toward the new technology of VoiceThread. These shifts were evident in the fear of new technology, in their need to pay attention to the clarity of their speech to engage the listener, and a shift in time management, as VoiceThread was said to take more time to create than the more familiar Discussion Board.

What do you like about using Discussion Board for class assignments?

Students in graduate and undergraduate courses responded similarly to this question. Themes included: depth, ease, communication, and focus on self. The majority of all students said that they liked the ease of use and of the assignments on Discussion Board. Of statements coded for these themes, the following table shows student response rates and example statements.

Table 2. Student response rates and example statements

Theme	Undergraduate number of statements	Graduate number of statements	Example statements

Ease	9	13	• I like it because it is all on the Blackboard site. Everything is there together. • I like using discussion boards for class assignments because they are easy to use.
Depth	5	3	• They encourage me to think in greater depth and respond with clarity. • When completing discussion boards I feel more free to openly discuss ideas and thought with classmates and professors because they do not hold as much pressure as other assignments.
Communication	5	3	• It was a way for us as a class to share our thoughts and feelings about topics and a way to communicate.
Self-focus	3	0	• I like following what people have said about what I wrote. I can easily skip to posts by people who I think usually have something worth reading. • I like being able to give my opinion and read the responses to my posts.

What are the challenges to using Discussion Board for class assignments?

Graduate and undergraduate students overwhelmingly responded that there are no challenges in the creation of assignments using Discussion Board. However, many students did note that postings on Discussion Boards are often repetitive and redundant, and that it is very time consuming to read everyone's posts. The majority of the responses pointed to the notion that the written word in today's digital world is simply limited. It can be difficult for students to understand what their classmates are trying to say if their posts are not well-written and missing the inflection of a person's voice or the look on their face. Nonverbal cues are missed in responses that are written in Discussion Boards.

What mode of communication requires more preparations and effort?

Almost unanimously, students responded that VoiceThread required more preparation and effort. They described the need to write out their answer in an outline or script, rehearsing their responses, and then ultimately recording it. Students reported that for Discussion Boards they simply typed their answer and were done with it.

How was your preparation for creating VoiceThreads different from your preparation for creating Discussion Boards?

Students were split on this question, but overall felt that preparation for submitting a response on VoiceThread was more intensive. This was attributed to a need for learning new equipment, to write a script and then practice saying/reading the script several times before recording, and a general requirement to spend more time on their responses and assignments. While a Discussion Board typically only required typing an answer, a VoiceThread response often required many more steps.

One striking difference involved students' need to seem prepared and knowledgeable in their VoiceThreads that was not evident in the preparation for Discussion Boards. One student stated, "I prepare what I am going to say first and type it into a word document. Then I create a PowerPoint for my presentation and upload it to VoiceThread. Once I have done all of that, I record my voice for the presentation." In contrast, this same student stated, "For Discussion Board, I prepare a word document for my response and then I post it to the Discussion Board." Another student stated, "You can't fake your way through it (VoiceThread)," insinuating that you can, in fact, fake your way through a Discussion Board.

While this question asked students to think about preparation, many wrote about their level of understanding resulting from the different types of assignments. For instance, several students stated that they learned more through the preparation of VoiceThreads than through the preparation of Discussion Boards, "Preparation is more in-depth, and is more focused on delivery as well as content, as both affect each other. I think a greater depth of understanding of the material is necessary, and sometimes it is necessary to project self into the picture, asking one's self if the content inspires reflection by the reader."

In contrasting undergraduate responses to graduate responses, it was clear that graduates were more focused on meaningful results from assignments than the undergraduates, who focused more on the equipment and the time spent than the meaning they reaped from experiences.

In which format are you more inclined to participate beyond the required amount?

In response to this question, graduate and undergraduate students were very different. The majority of graduate students (13 out of 17) responded that they were more inclined to participate beyond the required amount using VoiceThread. Reasons for this included "VoiceThread resembles the classroom setting more," "People just use Discussion Boards for 'fluff' and don't really try to interact," and "I am more inclined to participate in the VoiceThread because I feel I have learned more that way."

In contrast, undergraduate students were split on this question. Of 22 responses, 10 preferred VoiceThread, 9 preferred Discussion Board, and one student didn't have a

preference. Reasons varied, but the majority of respondents chose Discussion Board because they were comfortable with it and it took less time, and those who chose VoiceThread did not share reasons. One student had a mixed response, "I prepare a better initial answer for VoiceThread but post more responses and look at the posts of my peers more on Discussion Boards."

How would you like instructors to use Discussion Board/VoiceThread in future classes?

Due to the logistical differences between groups (synchronous vs. asynchronous), undergraduates suggested a few ways that faculty might use VoiceThread: as a "check for understanding" discussion feedback type of exercise following what was covered in class, as a way to voice opinions, receive constructive feedback, or as an explanation of upcoming assignments that students could go back to view as a reference. Some suggestions were more vague, such as "mix them up." One student reported that VoiceThread "was just a more complicated Discussion Board."

The graduate students were more creative with their suggestions: VoiceThread could be used on group projects, peer assessments, collaborative scoring, presentations of learning, open forums for questions, and Blogs. One student wanted a discussion board set up 'where students could talk about issues they were having with the class or a specific concept" so they could help each other. Some responses were ambivalent, but many of those included the observation that VoiceThread became easier once practiced. Above all, one student summarized that "If discussion board or VoiceThread is going to be used, it should be something useful and not just busy work."

Do you feel VoiceThread increased your engagement and interest in the course content?

An overwhelming response from graduate students to this question was that VoiceThread did increase engagement, but not interest, in the course content. Truly, an online tool meant to foster discussion and community is not expected to increase interest, but rather a sense of community that would help to promote engagement. Thus, the reaction from students makes sense. Of undergraduates, again the group was split between whether VoiceThread increased engagement or not. Eleven undergraduate students agreed that VoiceThread fostered engagement but not interest. Seven students did not think that VoiceThread increased interest or engagement.

Does VoiceThread make your class experience feel more personal than a Discussion Board?

Students responded to this question by addressing the tool's ability to make the course seem more interactive, to add to the depth of answers—in that students were more likely to open up about their answers, to add to the sense of relationship within the class, and to help students to understand the clarity of a student's intention (based on tone). Graduate students felt that VoiceThread did make the class experience feel more personal; undergraduate students were split due to the limited number of experiences they had with the tool and the fact that they already held class face to face. Students made statements

such as, "The assignments allow us to get to know each other better." One student did not like the fact that VoiceThread made the experience more personal.

Discussion

Analysis of these results yields some interesting conclusions. We find that there are, in fact, differences between the undergraduate and graduate students' views of themselves as contributors to the online classroom environment. Graduate students were more focused on the depth and content of their contributions than the undergraduates, who were more focused on the ease or difficulty of using the tool. Undergraduates tended to be more passive learners, while graduate students seemed to have more agency, and were more active learners.

In addition, graduate students were much more focused on their classmates than the undergraduates. Graduates wanted to craft their contributions to be engaging and thought provoking for the other students. Few undergraduate students mentioned the impact their contributions might have on their peers. For undergraduates, the patterns described from 2007 still prevail. The generation of our undergraduates is used to ubiquitous access and a focus on themselves in the media. They can create content via blogs, wikis, YouTube, snapchat, etc. However, this focus on self-created content also leads these same students to a self-focus in the classroom, rather than the stance of critically analyzing the thoughts and contributions of others. Their focus is more on themselves rather than on collaboration or community, even in the online environment.

Finally, there was more of a focus on preparation for VoiceThreads among all students than for Discussion Boards. These took extra steps and often rehearsal, while the Discussion Boards required less time and effort. This extra emphasis on preparation led several students to admit that they learned more from VoiceThread assignments than from Discussion Boards.

We found that the use of VoiceThread created an increased sense of community while Discussion Board did not. This was evident in students' responses. They felt that hearing their peers' voices, seeing their faces, and sometimes seeing their surroundings helped them to get to know their classmates. The nature of speaking rather than writing also led to this conclusion, as several students commented that being able to hear inflection and tone aided in understanding students' responses and thus, their fellow students as individuals. This sense of community through the use of VoiceThread was stronger in the online graduate course than in the face-to-face undergraduate course, probably due to the fact that the online class only had VoiceThread to aid them. The use of VoiceThread did not enhance a sense of community in the face-to-face class, as they were able to create that in the classroom. In addition, the online course used the tool 12 times while the face-to-face class only used it three times. Perhaps it is necessary to build a familiarity with any tool used to foster discussion before it can promote a sense of community.

Based on the findings of this study, the use of VoiceThread in online coursework did, in fact, further learning and did not, as Mandernach (2006) warns, impede instruction. The tool did foster a sense of community in the online graduate course in which students used the tool many times and where it served as the main tool for interaction between classmates. It did not boost a sense of community in the undergraduate class that met in person for three possible reasons: 1) students had opportunities to build community in other

ways, 2) students used the tool a limited number of times, limiting its effectiveness, or 3) undergraduate students may not react to such tools in a learning environment in the same way as graduate students.

Implications

This research adds to the current knowledge base regarding online engagement and community building. The use of VoiceThread enhances students' sense of rigor and community because it enables them to choose the mode of delivery and allows them to see and hear their classmates. Since this study was conducted, other tools have been created that can add to online teachers' toolboxes for infusing rigor and community into the online classroom. Such tools include a video sharing feature that has been added to Discussion Boards, Zoom.us, WebEx.com, and Gotomeeting.com.

One additional challenge to the online educator is the need to stay current with evolving technology. Such technological advances should be treated as tools to engage, create a sense of community, and increase rigor in the classroom. Online educators should ask, "Why do I want to use this technology?" "What will it add to my students' experience in this online course?"

"It could well be that faculty members of the twenty-first century college or university will find it necessary to set aside their roles as teachers and instead become designers of learning experiences, process, and environments" (Duderstadt, 1999, p. 7). As New Literacies make new social practices possible (Leu, et al., 2014a), educators have the opportunity to selectively use new literacies tools to promote learning, engagement, and community. This study demonstrated how the use of one such tool, VoiceThread, can boost a sense of community within the online classroom environment.

Future research should continue to investigate the nuances of using such tools with students in different contexts.

Appendix

Appendix A. Questionnaire

1. What do you like about using VT for class assignments?
2. What were your challenges in using VT for class assignments?
3. What do you like about using Discussion Board for assignments?
4. What are your challenges in using Discussion Board for class assignments?
5. What mode of communication requires more preparations and effort?
6. How was your preparation for creating VoiceThreads different from your preparation for creating Discussion Boards?
7. In which format are you more inclined to participate beyond the required amount?
8. How would you like instructors to use Discussion Board/VoiceThread in future classes?
9. Do you feel the VoiceThread increased your engagement and interest in the course content?
10. Does VoiceThread make your class experience feel more personal than a Discussion Board?

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Use of Screencasting for Instructional Purposes: Ingredients for Success

Jerry Hoepner[1], Abby Hemmerich[2], and Angie Sterling-Orth[3]

Abstract: Screencasting, the recording of video with content from a computer screen and instructor narration, is an essential element of online and flipped pedagogies. This Quick-Hit provides a detailed description of methods for designing and implementing screencasted productions. Considerations for hardware, software, storage, and accessory specifications are identified. Specific pedagogical considerations, such as concept-based lesson design and a short running time, which are critical to ensuring repeated viewings, are also discussed. Numerous potential applications are reviewed, including merging video, screencasted narrations, and other modalities through basic editing techniques.

Keywords: screencasting, scholarship of teaching and learning, instructional design, video productions, pedagogy

The growing presence of online courses and an evolving understanding of high-impact pedagogies for face-to-face instruction have converged, obligating an increased use of video productions for course materials. Using screencasting technology to create video productions involves capturing images and/or audio from a computer screen and adding guided instruction to produce customized, independently-reviewable video content. Guided instruction may include narration or on-screen call-outs. Screencasted productions can include website tutorials, lessons captured during face-to-face class time, onscreen demonstrations, written edits of student work with accompanying instructor audio commentary, and multidimensional productions that contain audio, video, website demo, and other digital content.

Specifically, video productions created with screencasting allow for a myriad of instructional support to learners including hand-over-hand teaching, mediated learning through instructor think-alouds, distributed or mass practice material, and just-in-time instruction for troubleshooting (Vondracek, 2011; Pinder-Grover, Millunchick, & Green, 2013; Betty, 2008; Gorissen, van Bruggen, & Jochems, 2012). These video productions can foster student engagement through multimodal presentations of content and opportunities for deeper learning, increase learning and self-efficacy, improve teaching efficiency, and contribute to teaching effectiveness (Marriott & Teoh, 2012; Lloyd and Robertson, 2011; & Green, Pinder-Grover, and Millunchick, 2012). The focus of this paper is to address potential applications and implementation of the technologies; the effect of these supports on student learning is not examined.

Recipe for Getting Started with Screencasting

Various forms of technology including hardware and software formats exist for producing and distributing screencasts. Instructors select topics or outcomes that may benefit from or require

[1]Department of Communication Sciences and Disorders, University of Wisconsin-Eau Claire, PO Box 4004, Eau Claire, WI 54702, hoepnejk@uwec.edu.
[2]Department of Communication Sciences and Disorders, University of Wisconsin-Eau Claire, PO Box 4004, Eau Claire, WI 54702, hemmeral@uwec.edu.
[3]Department of Communication Sciences and Disorders, University of Wisconsin-Eau Claire, PO Box 4004, Eau Claire, WI 54702, sterliaj@uwec.edu.

screencasts. Next, they must understand the technology options for screencasting and make a plan for the production. This includes operational competence, procedural competence, and knowledge of advantages and limitations of potential tools. Operational competence can be defined as the skills needed to use a tool or application accurately and efficiently. It relies on motor, cognitive, visual and auditory skills (Beukelman & Mirenda, 2013). Procedural competence encompasses the skills needed to implement a given technology accurately and efficiently. In order to evaluate advantages and limitations of screencasting tools, it is necessary to understand the potential implementation. Implementation is related to the pedagogical approach being used. Pedagogical factors are critical to consider as an instructor determines the ideal duration, content, and delivery platform for content. This is a time-consuming process, but critical to remaining responsive to innovations and meeting the demands of today's learners and evolving teaching-learning contexts. The following procedures are suggested to foster implementation and refinement of screencasted productions:

Isolate a Concept

Constrain the lesson to a single concept that can be taught in three to ten minutes (some exceptions may apply). It is important to make a pedagogical distinction between recording an entire 50-minute lecture and screencasting specific concepts. Concept-based lessons are intentionally brief and reviewable. By generating concept-based lessons, students and instructors can identify the specific points of breakdown or understanding.

Locate Resources or Materials

Choose the items that will be needed to show and tell. This may include electronic documents, images, website URLs, video files, or other content. Digital content may need to be captured, created, or simply gathered from existing resources. For some screencasting, it will be helpful to open each item and then minimize them on the screen so that they can be accessed efficiently during the screen capture process.

Select the Appropriate Hardware/Software Combination for the Lesson

This "tech-match" is a critical step and may occur at this stage (i.e., after the target lesson and materials have been identified). Note that decisions about technology should be based upon pedagogical purpose, but may be imposed based on available technology. Ideally, choose the best hardware and software for the type of lesson being screencasted. Some options will include:

- Hardware—A computer, tablet/mobile device, web cam, lecture capture unit, digital video camera, tripod, backdrop image (if capturing oneself onscreen), scanner, external microphone, headset with boom mic, animation tools (such as a stylus), or document camera may be used.

- Software—*Camtasia, Educreations, Explain Everything, Microsoft PowerPoint, Front Row* (software for lecture capture with Juno), *Reflector* software (for iPad mirroring), *Screencastomatic, Screencasts Online*, etc. may be used. We do not endorse any particular software, but rather utilize a variety of options.

- Editing software and hardware—Note that not all computers have processing capacity to complete editing of multiple video files. A host of high- and low-end video editing software exists. Consult with your instructional technology department for computer specifications and software recommendations.

In addition to the tech-match process, make sure potential background distractions have been minimized. Test the audio and video quality for the selected hardware and software tools; a 10-second "practice" capture will ensure all pieces are in place and working as needed. Failure to do so can result in wasted time with an empty or lacking capture.

Capture the Lesson

This next step is to record the lesson while remaining diligent to remain on-target during the screencast**.** To do this, remember the goal or isolated concept (i.e., the purpose) of the screencast, while being aware of timing. Content need only be presented once because the learner can review as needed. This is different from what might happen in a face-to-face classroom, where the instructor might restate a concept several times to clarify or stress importance. Use the software and/or hardware "pause" function to adjust and re-orient during the capture. Doing so will require less editing of the production after completion of the initial capture.

Edit and Produce to Add Features that Emphasize Concepts

This step is sometimes critical, especially when creating a formal production that is intended to be used repeatedly. It may not be necessary when creating a "quickie" production to address a specific question or concept. Editing may include adding call-outs, overlaying additional narration, deleting sections of the production not needed, or changing other aspects of the production. Be cognizant of the concept(s) to isolate and consider adding "quiz" features (e.g., offering a question to the learners and then inserting a pause to give them time to develop an answer before the production moves forward, allowing them to check their response). Be mindful of running time to avoid being too long or too brief.

Challenges and Potential Pitfalls

While a powerful and increasingly necessary teaching tool given the ever-changing format of higher education, screencasting presents potential obstacles that can be avoided or minimized. Some include:

Time Consuming

Typically speaking, the more time invested in planning before beginning a screencast, the less time necessary for editing. Although the learning curve can be steep, productivity and efficiency increase as the amount of screencasting increases. Moreover, as a repository of screencasted productions grows, screencasting becomes a time-saving teaching tool.

Screencasting Quality Issues

Lack of hardware, software, or internet connections can hinder the process. Be sure to do a trial recording, even if just for ten seconds, before launching into your full capture. Work with instructional technology support staff to find the tools that will work best based on production needs.

Compatible File Formats for Students

Be mindful of the types of file formats provided to learners. This can become an issue when accommodating learner access through varied technologies (i.e., PC, Mac, or mobile technologies). Ideally, use streaming media on a central server to avoid complications with hardware or software specifications of the audience. If this is not possible, choose universal file formats such as MP4s.

Server/Storage Space Demands

As the collection of productions grows, server space needs will increase. Be proactive with technology support staff and administrators to secure the space needed to allow for use of this critical teaching tool.

Conclusion

As online learning continues to grow through addition of fully online, blended, and flipped classroom designs, and classroom instructional pedagogy evolves, screencasting will be an even more relevant teaching tool. Development of screencasts allows instructors to provide content outside of class and sets the stage for innovative pedagogy, which allows students to be more interactive with the content during class time. Generating a repository of productions requires time and may not be feasible in a single iteration of a course; furthermore, revisions of productions will be required as you become cognizant of your learners needs or as pedagogy evolves. Technology changes rapidly, but the rationale, principles, and method for creating screencasts will remain.

Further application of screencasting could include a variety of purposes. Students may generate productions to demonstrate knowledge and skills related to disciplinary content. Instructors may draw upon this technology to facilitate asynchronous collaborations. Instructors and students may create productions to assist in troubleshooting. Such productions may include single-use or reusable learning tools. While some learner needs may be discipline-specific, screencasting offers a platform for efficiently disseminating content for student consumption, allowing face-to-face class time to be spent on in-depth discussion and application of content. It can easily become an essential adjunct to one's instructional pedagogy.

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Contact Info for the Journal

JoTLT Editorial Office

Indiana University
Bryan Hall, Room 203 B
107 S. Indiana Avenue
Bloomington, Indiana, 47405
jotlt@iu.edu

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