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Student Attitudes to Traditional and Online Methods of Delivery

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Abstract

Rapid developments in education technology have provided educators and students new options in a constantly changing, competitive teaching and learning environment. As the number of online teaching resources continue to increase, research into student attitudes toward traditional and online methods of delivery is important in order to determine whether the increased usage of technology in the curriculum has been beneficial to their learning. This paper investigates the student perceptions of these two methods of delivery in a first-year introductory accounting unit in a number of key areas. These include their perceptions of learning effectiveness, motivation and impact on assessment outcomes. The importance of social interaction and their preference for online learning is also covered. This preliminary analysis of student attitudes will determine whether there are statistically significant differences between face-to-face and online learning options and preference for online learning technology between gender groups. In addition, this paper investigates whether there are statistically significant relationships between face-to-face or online learning options and preference for online learning technology in gender groups.

Keywords: student attitudes**,** online learning, technology, face-to-face, effectiveness, e-learning

Introduction

To remain globally competitive, universities are incorporating greater use of information and communications technologies (ICT) into their curriculum to provide students with more online learning options via the university's Learning Management System (LMS). Many have adopted a 'blended learning' approach to deliver course content which combines traditional face-to-face teaching augmented with online teaching resources. This has been a popular approach as it provides students greater flexibility and increased accessibility to a diverse range of teaching materials to support their learning. With the increasing pressure to provide more e-learning options to students, it is important to consider student attitudes towards this shift away from the traditional face-to-face to online delivery. According to Ong and Lai (2006), gaining insight into the learners motivation and attitudes to using technology may influence the level of e-learning utilisation. The fact that student perceptions of the Learning Management System and its online materials may influence their level of engagement has been acknowledged by Basioudis, De Lange, Suwardy, and Wells (2012). These factors may impact upon student learning outcomes and their overall learning experience. In recent reviews

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of research in accounting education by Apostolou, Hassell, Rebele, and Watson (2011) and Apostolou, Dorminey, Hassell, and Watson (2013), the need for more empirical studies into the effectiveness of using technology in accounting education was highlighted.

This paper aims to contribute to this area of research by providing an insight into how students in a first-year introductory accounting unit perceive these changes based on their gender and whether it has an impact on learning effectiveness, motivation, and assessment outcomes.

Literature Review

In a study conducted by Ginns and Ellis (2007) the increasing pressure for greater integration of new technology into the student learning experience was acknowledged. Wells, de Lange, and Fieger (2008) found that the use of technology in educational settings assists in the achievement of learning outcomes. Buzzetto-More (2008) and Sanders and Morrison-Shetlar (2002) reported that student attitudes toward technology are influential in determining the educational benefits of online learning resources and experiences. Results from an investigation of WebCT Course Management Statistical Tools in this first-year introductory accounting unit revealed a positive relationship between the level of student engagement with online resources and their overall academic result. Across the key online activities measured, the time spent on each activity was considerably longer for higher achieving students in comparison to failed students (L. Wong, 2013).

The notion that blended learning can positively impact upon assessment outcomes has been found in a number of studies. Dowling, Godfrey, and Gyles (2003) analysed whether a hybrid, flexible teaching method, in comparison to traditional face-to-face lectures, improved learning outcomes. Their results suggested a positive change in student grades when the traditional approach was used in combination with extensive use of multi-media resources. Dunbar (2004) described and analysed the transformation of a face-to face course to an online course using an online learning platform, WebCT. The survey asked students about their preference to have a live instructor or to take the class online. The majority of students responded that they would rather take the online class. Aisbitt and Sangster (2005) described the implementation and effectiveness of a new online assessment system designed to encourage and reinforce the learning of basic principles in an introductory accounting course. A positive correlation was found between student performance in the online assessments and in their final examination. Mcdowall and Jackling (2006) analysed student perceptions of the usefulness of a Computer-Assisted Learning (CAL) package in learning accounting concepts and its influence on students' academic performance. Their results showed that positive perceptions of the usefulness of CAL significantly influenced performance. The change in the method of instruction enabled a more effective use of the technology, potentially increased teaching effectiveness and improved academic performance. Potter and Johnston (2006) investigated the association between student use of a unique, interactive, online learning system, MarlinaLS, and their learning outcomes. The results showed that students' use of the new system was positively associated with both their examination performance and the internal assessment result.

In their research on the use of ICT by undergraduate students and their views regarding Internet use in accounting programs, Marriott, Marriott, and Selwyn (2004) raised some concerns relating to online learning. Students expressed their preference for a face-to-face form of educational experience and indicated that they would endorse only Internet usage that supported the traditional delivery of courses, as they valued the social interaction and the communication skills they acquired from the classroom environment. Decreased social contact and the potential isolation of learning on their own was a primary concern identified in this study. Student preference for a more traditional style of teaching was also reported in a more recent study by Osgerby (2013), which investigated students' perception of the introduction of a blended learning environment and concluded that whilst students appeared to have a positive attitude to the adoption of an organised

and well-resourced ICT based learning process, they preferred face-to-face lectures and step-by-step instruction. Smith and Greene (2013) examined the use of e-learning technologies to enhance learning. While the benefits of e-learning were recognized by the participants, these were somewhat compromised by the technological difficulties experienced. This study acknowledged that, overall, the current literature supports the view that e-learning in higher education enhances the teaching and learning experiences.

Research conducted by Naaj, Nachouki, and Ankit (2012) considered student satisfaction an important factor in measuring the quality of blended learning. Their study proposed that students' satisfaction is influenced by a combination of factors that include the instructor, the technology, class management, interaction, and instruction. In their study analysing student patterns of access to instructional resources provided in an online course environment, Murray, Pérez, Geist, and Hedrick (2012) point out that as the number of students learning online increases, the greater the importance of understanding how students engage and interact with course content becomes.

Previous studies on gender imbalance in attitudes towards using technology for learning remained inconclusive. Vale and Leder (2004), Kaino (2008) and Yau and Cheng (2012) found that male students are more willing to embrace learning technology compared to female students and they attributed this imbalance to the lack of a gender inclusive curriculum in online learning technology. These researchers emphasised the importance of a technology training course for female students in preparing them for using this mode of learning. S. L. Wong and Hanafi (2007) found that female participants possessed a higher level of confidence and improved attitude after undergoing a technology training course. Arbaugh (2000), on the other hand, found that male students encountered more difficulty in using learning technology for class participation compared to their female counterparts. However, a study by Shaw and Marlow (1999) did not reveal any gender imbalance in attitudes towards using technology for learning.

Students in their first year of university have distinct learning needs arising from the social and academic transition they are experiencing. From multiple starting points, all students are on a journey to becoming self-managing and self-directed learners and the first-year curriculum should help get them there (Nelson, Kift, Humphreys, & Harper, 2006). The student cohort for this introductory accounting unit is typically from a lower socio-economic background. For most of these students, it is a necessity to combine work commitments with their study. A large proportion of the students sampled in this study are from a non-accounting accounting majors with little or no prior studies in accounting. The introduction of e-learning to augment traditional face-to-face delivery provides a greater degree of flexibility in providing support for the diverse demands of these students.

Methodology

The aim of this paper is to investigate students' attitudes toward traditional and online methods of delivery in a first-year introductory accounting unit. The findings reported are based on a case study conducted over four consecutive semesters commencing Semester 1/2010 through to Semester 2/2011. In Semester 1/2010, students were introduced to three new online learning options to complement traditional face-to-face lectures and tutorials.

The first of these options was the viewing of recorded lectures via Lectopia, an automated lecture recording and web publishing tool. Students had immediate access to an audio-visual recording of a lecture, which generally comprised lecture slides, commentary and illustrations using links to websites where relevant. Whilst this could be downloaded and viewed at their convenience, it did not however provide for any student interaction via a discussion board or any other online chat facilities.

The second option enabled students the opportunity to enrol and actively participate in online tutorials via Elluminate Live which is an online collaborative session. To join the online tutorial they were required to login to the Elluminate Live website each week at a regular designated time. These sessions were conducted by the unit coordinator. The transfer of knowledge and review of tutorial content was facilitated through shared files or a shared whiteboard where students could also take control of the screen for direct input. Interaction between the online tutor and students was through an onscreen dialogue sidebar or speaking directly via microphone or headset. Each of the Elluminate Live tutorials were recorded and posted on WebCT by the end of each week.

The third option allowed students to download and review the audio-visual content from the Elluminate Live tutorials. As with the first option of the recorded lectures, this was a passive viewing option. Access to all these additional online resources was via the unit website on WebCT.

There are many other supplementary resources available to students accessible from WebCT that include instructional videos and modules covering content which students perceive to be more difficult to understand; however, this is beyond the scope of this particular paper.

This preliminary analysis of student attitudes will determine whether there are statistically significant differences between face-to-face and online learning options and preference for online learning technology between gender groups. In addition, this paper examines whether there are statistically significant correlations between face-to-face or online learning options and preference for online learning technology in gender groups.

The Survey

A survey questionnaire was designed to gauge student perceptions of learning effectiveness, motivation, and impact on assessment outcomes for face-to-face or online learning options. The importance of social interaction and student preference for online learning was also assessed. The survey instrument comprised three sections. The first section provided a profile of the socio-economic and educational background of the sample. This paper focuses on the second section, which rated the students' study preferences toward the traditional face-to-face lectures and tutorials, as well as new online teaching options. Each of the options were listed and students were asked to rate the effectiveness of each in assisting their learning in this subject by using a four point rating scale. The survey questionnaire was distributed to students in the last lecture at the end of each semester and student participation was voluntary. Almost all students attending these sessions participated in the survey. The total number of surveys completed was 515, of which 323 were usable for this paper.

The students surveyed were from various lecture streams and tutorial groups. Both day-time and evening students were represented in this sample. The vast majority of students in this study have no interest in majoring in accounting and have little or no previous accounting knowledge.

Survey data was collated and entered into IBM SPSS Statistics 21 software for statistical analysis. Student responses were collected over four consecutive semesters commencing from Semester 1/2010 through to Semester 2/2011. The data was accumulated over this period and the 323 usable surveys form the basis of the statistical analysis which follows. Table 1 provides a demographic profile of the survey participants.

Table 1 - Demographic Profile of Survey Participants

Number of Survey Participants	
Sample Size	n=323
Gender	**%**
Male	47
Female	53
Mode of Study	**%**
Full-Time	88
Which year of study are you in?	**%**
1st	65
Are your major studies in Accounting?	**%**
No	79
Studied Accounting Previously	**%**
No	68
Work and Study	**%**
Not working	30
Working and studying	70
Age	**%**
Less than 20 years	38
20 to 29 years	55
30 years or older	7

Profile of Participants

In this sample, female students represented a slightly higher proportion than male students. The vast majority of students, 88%, were studying in full-time mode, and for a significant proportion of these participants, 65% are in their first year of study at university. A minority of students enrolled in this compulsory accounting unit, 21% are accounting majors and a large proportion of these students, 68%, have no prior studies in accounting. A significant majority of these students, 70%, are working and studying. The dominant age group are those students less than 20 and those between 20 to 29 years old. These two younger groups combined represent 93% of surveyed students in comparison to mature students aged 30 years or older who account for only 7% of this group.

Statistical Analysis

This paper utilises mean comparisons and nonparametric Wilcoxon Rank Sum test to determine whether there are significant differences between the male and female students studying in first-year accounting. In addition, Pearson's r Correlation method, which measures the strength of the linear relationship between two variables (Bereson, Levine, Krehbiel, Timothy, & Stephan, 2013) was used to identify the relationships between face-to-face or online learning options and preference for online learning technology in gender groups. This correlation measure is important for providing insights into the profile of the male and female students studying the first-year accounting unit in relation to face-to-face and online learning options, and preference for online learning technology.

For investigating the relationships between face-to-face or online learning strategies and preference for online learning technology in gender groups, responses collected from the survey were computed into equally weighted summated scores for each relevant construct/attribute. In other words, the score for each construct/attribute constitutes an average of all the relevant item scores (obtained through responses to the questions in the survey). Because each item bears equal

weight and importance in a construct, this summation method is an appropriate estimator of the attribute. This method has been found to be as effective as other weighted combination by McDonald (1997).

Table 2 shows the items that were transformed into relevant constructs in this research paper:

Table 2: Items Relevant To Each Construct

ITEMS (QUESTIONS):	CONSTRUCTS:
1. EFFECTIVENESS OF LEARNING MODE:	
1a. Lectures – face to face 1c. Tutorials – face to face	Face to face learning mode effectiveness
1b. Lectopia - recorded lectures 1d. Elluminate – recorded tutorials 1e. Elluminate Live – participating in online tutorials	Online learning mode effectiveness
2. MOTIVATED BY LEARNING MODE:	
2a. Lectures – face to face 2c. Tutorials – face to face	Motivated by Face to face learning mode
2b. Lectopia - recorded lectures 2d. Elluminate – recorded tutorials 2e. Elluminate Live – participating in online tutorials	Motivated by online learning mode
3. IMPACT OF LEARNING MODE ON ASSESSMENT OUTCOME:	
3a. Lectures – face to face 3c. Tutorials – face to face	Impact of Face to face learning mode on assessment outcome
3b. Lectopia - recorded lectures 3d. Elluminate – recorded tutorials 3e. Elluminate Live – participating in online tutorials	Impact of online learning mode on assessment outcome.
4. IMPORTANCE OF INTERACTION:	
4a. social interaction in tutorials and lectures 4b. active participation in discussions in tutorials and lectures 4c. having a time and place for your tutorials and lectures on campus	Importance of interaction
5. PREFERENCE FOR ONLINE LEARNING TECHNOLOGY	
5a. do online tutorials instead of face-to-face tutorials 5b. view Lectopia instead of face-to-face lectures 5c. learn this unit entirely online 5f. have more technology used in this unit	Prefer to use online learning technology
5d. have no technology in this unit 5e. less technology used in this unit	Do not prefer to use online learning technology

Results and Discussion

Means Comparison and Wilcoxon Rank Sum Test

Table 3 shows the means comparison of each construct (that is, face-to-face and online learning options, and online learning technology preference) between the male and female students studying first-year accounting. The sample size for each construct is denoted by 'n' in Table 3. The last column in this table shows the results of the nonparametric independent test using Wilcoxon Rank Sum Test to determine whether there is a significant difference between male and female for each of these constructs. To gauge the students' perception of each of these constructs, a four point rating scale was used with 1 = lowest rating and 4= highest rating. Sample sizes of all constructs do not include responses from respondents who do not find the question (or item) applicable to their situation and answered 'not applicable' in the questionnaire. This response would be the option available to respondents if they did not use any of the online resources available, namely the viewing of recorded lectures, the viewing of recorded tutorials or actively participating in the online tutorials.

The mean scores calculated for each of these options are shown in Table 3 below.

Table 3: Means Comparison and Wilcoxon Rank Sum Test

Constructs:	**Male** **Mean Scores (Mean $_{Male}$)**	**Female** **Mean Scores (Mean $_{Female}$)**	**Wilcoxon Rank Sum Test**
Face to face learning mode effectiveness	3.35 (n = 150)	3.34 (n = 164)	No significant differences between male & female
Online learning mode effectiveness	2.45 (n = 74)	2.49 (n = 62)	No significant differences between male & female
Motivated by face to face learning mode	3.15 (n = 150)	3.14 (n = 165)	No significant differences between male & female
Motivated by online learning mode	2.35 (n = 73)	2.30 (n = 67)	No significant differences between male & female
Impact of face to face learning mode on assessment outcome	3.23 (n = 147)	3.29 (n = 162)	No significant differences between male & female
Impact of online learning mode on assessment outcome.	1.57 (n = 75)	1.28 (n = 60)	No significant differences between male & female
Importance of social interaction in tutorials and lectures	3.19 (n = 149)	3.18 (n = 165)	No significant differences between male & female
Prefer to use online learning technology	1.97 (n = 139)	1.99 (n = 159)	No significant differences between male & female
Do not prefer to use online learning technology	1.76 (n =150)	1.68 (n = 167)	No significant differences between male & female

The results from Wilcoxon Rank Sum tests show that there were no significant differences between face-to-face or online learning options and preference for online learning technology between male and female students studying first-year accounting. Both these groups on average found the face-to-face learning mode effective ($Mean_{Male}$ = 3.35 and $Mean_{Female}$ = 3.34) and were quite motivated by this traditional mode of delivery ($Mean_{Male}$ = 3.15 and $Mean_{Female}$ = 3.14). In addition, each group found the face-to-face learning mode effective in influencing their assessment outcome ($Mean_{Male}$ = 3.23 and $Mean_{Female}$ = 3.29). Compared to the face-to-face learning mode, the mean scores for the online learning mode were lower in learning effectiveness ($Mean_{Male}$ = 2.45 and $Mean_{Female}$ = 2.49), motivation ($Mean_{Male}$ = 2.35 and $Mean_{Female}$ = 2.3) and assessment outcome ($Mean_{Male}$ = 1.59 and $Mean_{Female}$ = 1.28). Both male and female students attached high importance to opportunities for social interaction in their learning ($Mean_{Male}$ = 3.19 and $Mean_{Female}$ =3.18).

The average scores of students who prefer to use more online learning technology were quite low ($Mean_{Male}$ = 1.97 and $Mean_{Female}$ = 1.99). With the rating scale using 1 for Strongly Agree and 2 for Disagree, these results indicate disagreement towards more reliance or total reliance on online learning for this unit. Simultaneously, the average score of students who do not prefer to use online learning technology ($Mean_{Male}$ = 1.76 and $Mean_{Female}$ = 1.68) using the aforementioned rating scale indicate disagreement towards reduction or total elimination of online learning technology in the teaching of this first-year accounting unit.

These responses are consistent with the results from the final question on the survey, "O*verall, I am happy with the level of technology used"*- which revealed an overwhelming majority of these students (cumulative of 92.4% as per Table 4) agreed or strongly agreed that they were happy with the current level of technology used. In other words, these students disagree to having more or lesser technology implemented in this unit. Table 4 shows the frequency distribution of responses to this question.

Table 4: Frequency Distribution
Student Responses to Question - "Overall, I am happy with the level of technology used"

Responses	Frequency	Percentage	Cumulative
Strongly disagree	3	0.95%	7.6%
Disagree	21	6.67%	
Agree	180	57.14%	92.4%
Strongly agree	111	35.24%	
Total	**315**	**100%**	**100%**

Pearson's r Correlation

Table 5 shows the results from Pearson's r Correlation test.

Table 5: Pearson's r Correlation Test Results

Constructs:	Preference for online learning technology	Male Correlation coefficient (r_{Male})	Female Correlation coefficient(r_{Female})
1.Face to face learning mode effectiveness	Prefer to use online learning technology	-0.14*	-0.142*
	Do not prefer to use online learning technology	Not significant	Not significant
2.Online learning mode effectiveness	Prefer to use online learning technology	0.297**	0.295**
	Do not prefer to use online learning technology	0.194*	Not significant
3.Motivated by face to face learning mode	Prefer to use online learning technology	Not significant	Not significant
	Do not prefer to use online learning technology	Not significant	Not significant
4.Motivated by online learning mode	Prefer to use online learning technology	Not significant	0.291**
	Do not prefer to use online learning technology	Not significant	Not significant
5.Impact of face to face learning mode on assessment outcome	Prefer to use online learning technology	Not significant	Not significant
	Do not prefer to use online learning technology	Not significant	Not significant
6.Impact of online learning mode on assessment outcome.	Prefer to use online learning technology	0.247**	0.294**
	Do not prefer to use online learning technology	Not significant	Not significant
7.Importance of interaction	Prefer to use online learning technology	-0.266***	-0.173**
	Do not prefer to use online learning technology	Not significant	Not significant

Note: * p<0.1, ** p<0.05, *** p<0.01

Several of the correlation test results in Table 5 showed no significant differences. Except for the relationship between importance of interaction and preferring to use online learning technology which was significant at 1%, other relationships were significant at 5% or 10% indicating weak or moderate relationship between the variables. For example, face-to-face learning mode has an inverse relationship with preferring to use online learning technology and this suggests that students who prefer to use online learning technology tend to find face-to-face learning mode less effective. However, the correlation coefficient (r_{Male} = -0.14 and r_{Female} = -0.142, both at p<0.10)

suggests this relationship is weak with low degree of correlation between these variables. For online learning mode, it has a moderate degree of association with preferring to use online learning technology ($r_{Male} = 0.297$ and $r_{Female} = 0.295$, both at $p<0.05$) regardless of gender. The test on the relationship between online learning mode effectiveness and preferring not to use online learning technology shows a weak positive relationship for male students studying first-year accounting ($r_{Male} = 0.194$ at $p<0.10$), this relationship was not significant for the female students. Motivated by online learning mode has a moderate positive relationship with preferring to use online learning technology for female students studying in this first-year accounting unit ($r_{Female} = 0.291$ at $p<0.05$) but this relationship was not significant for the male students. Impact of online learning mode on assessment outcome has a moderate positive association with preferring to use online learning technology ($r_{Male} = 0.247$ and $r_{Female} = 0.294$, both at $p<0.05$) regardless of gender.

The relationship between the importance of interaction and preferring to use online learning technology was found to be statistically significant particularly for the male students ($r_{Male} = -0.266$ at $p<0.01$) as compared to the female ($r_{Female} = -0.173$ at $p<0.05$). These inverse relationships indicate that those who prefer to use online learning technology tend to place less importance on opportunities for social interaction. In this study, male students preferring online learning technology tend to place comparatively less importance on opportunities for interaction than female students.

The results in Table 3 are consistent with studies by Marriott et al. (2004) and Osgerby (2013) who found that whilst students embraced a blended learning environment, they indicated a stronger preference for retaining the traditional method of delivery. This table suggests that there is no significant gender imbalance in attitudes towards using face-to-face and online learning options and supports the finding from Shaw and Marlow (1999) on the absence of gender imbalance. When these attitudes were further analysed based on preference for online learning technology, the Pearson's r Correlation test (results in Table 5) revealed both gender groups preferring to use online learning technology emphasised the importance of interaction in this mode.

Conclusion

The aim of this preliminary analysis of student attitudes was to determine whether there were statistically significant differences between face-to-face and online learning options and preference for online learning technology between gender groups. The results from Wilcoxon Rank Sum tests show that there were no significant differences between face-to-face or online learning options and preference for online learning technology between male and female students studying first-year accounting. Both these groups on average found the face-to-face learning mode effective and were quite motivated by this traditional mode of delivery. In addition, each group found the face-to-face learning mode effective in influencing their assessment outcome. Compared to the face-to-face learning mode, the mean scores for the online learning mode were lower in learning effectiveness, motivation, and assessment outcome. Both male and female students attached high importance to opportunities for social interaction in their learning.

The average scores of students who prefer to use more online learning technology were quite low which indicates disagreement towards more reliance or total reliance on online learning for this unit. Simultaneously, the average score of students who do not prefer to use online learning technology indicates disagreement towards reduction or total elimination of online learning technology in the teaching of this first-year accounting unit. An overwhelming majority of these students agreed or strongly agreed that they were happy with the current level of technology used.

Pearson's r Correlation Test was conducted to determine whether there are statistically significant relationships between face-to-face or online learning options and preference for online learning technology in gender groups.

The key findings show that the effect of the face-to-face learning mode has an inverse relationship with preferring to use online learning technology and this suggests that students who prefer to use online learning technology tend to find face-to-face learning mode less effective. The effect of the online learning mode has a moderate degree of association with preferring to use online learning technology.

It was also found that those motivated by the online learning mode have a moderate positive relationship with preferring to use online learning technology for female students studying in this first-year accounting unit but this relationship was not significant for the male students.

The results showed that the impact of the online learning mode on assessment outcome had a moderate positive association with preferring to use online learning technology regardless of gender. However, there is no relationship between impact of online learning mode on assessment outcome and do not prefer to use online learning technology for both the gender groups.

Finally, the analysis revealed that there are significant inverse relationships between the importance of social interaction and the preference to use online learning technology, particularly for the male students. These inverse relationships indicate that those prefer to use online learning technology tend to place less importance on opportunities for social interaction. In this study, male students preferring online learning technology tend to place comparatively less importance on opportunities for interaction than female students.

With the rapidly changing nature of accounting education, Rebele (2002) highlighted the importance of research specific to the effective use of technology in accounting education. In a review of more recent literature by Apostolou et al. (2011) and Apostolou et al. (2013), the call for more empirical studies into the effectiveness of using technology in accounting education was reiterated. By addressing some of the issues relating to student attitudes toward traditional and online methods of delivery, these findings aim to contribute to this current gap in research.

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Using Research Case Studies in eCommerce Marketing Courses: Customer Satisfaction at Point-of-Purchase and Post-Purchase

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Abstract

This paper describes a research case study of Internet apparel marketing by small businesses in Malaysia which can beneficially be included in postgraduate business courses for understanding the importance of measuring customer satisfaction at point-of-purchase and post-purchase in online purchases. The sample size in this research is 154 respondents in Malaysia who purchased apparel online and provided their satisfaction level at point-of-purchase and post-purchase stages. Seven-point Likert scale was used to measure the attitude of these respondents in regard to their customer satisfaction. Of the 154 respondents, 64 answered the surveys in Bahasa Melayu (the national language in Malaysia) while the remaining 90 answered in the English language. The case study shows that there are significant differences in all customer satisfaction items between point-of-purchase and post-purchase stages. The results are also different in these items when respondents were differentiated based on the language they used in answering the surveys. Hence, it is important to show students the need to take account of online post-purchase satisfaction as part of the cumulative experience of the online purchaser. Focusing primarily on point-of-purchase satisfaction could mislead an online retailer particularly if dissatisfaction arose in the aftermath of the purchase experience. In addition, examining customer satisfaction in terms of groups (such as language in this case study) could provide further insight into the significant differences between point-of-purchase and post-purchase in online purchase.

Keywords: Case study, customer satisfaction, point-of-purchase, post-purchase, online purchase.

Introduction

Many university masters-level business courses contain some component of Information and Communications Technologies (ICT), and often this comes in the form of an Electronic Commerce (e-Commerce) elective or even an e-Commerce specialisation. Perhaps the most important area for introducing eCommerce concepts is in courses relating to Marketing, as Web Marketing has become extremely important. One of the

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challenges of developing an e-Commerce unit in a postgraduate degree course is to effectively relate the topics covered with those covered in the generic business part of the degree (Tatnall, Groom, & Burgess 2002). Since the late 1990s the rapidly growth of eCommerce applications on the Web has been apparent to all, and business and management education has taken note of this in their courses, but often such courses are rather theoretical in nature. Successful use of eCommerce requires many changes to business practices and relationships in both business-to-business and business-to-consumer environments and the use of research case studies can facilitate student understanding of this.

This paper describes a research case study of Internet apparel marketing by small businesses in Malaysia which can beneficially be included in postgraduate business courses for understanding the importance of measuring customer satisfaction at point-of-purchase and post-purchase.

Case Study – Customer Satisfaction

The rapid growth of e-retailing may reflect convincing advantages of shopping through the Internet versus at brick and mortar stores. Consumers may sometimes become frustrated with aspects of e- shopping such as in online purchase of apparel items, and this is important to highlight to students.

Customers take a risk when purchasing apparel online because they cannot try on the garment to check fit, texture, or colour, and this may affect their level of satisfaction (Kim, Kim, & Lennon, 2006). Customer satisfaction has been extensively studied and constitutes an important concept in the field of marketing (Eshghi, Roy, & Ganguli, 2008; Helgesen, 2006; Liu, Zeng, Xu, & Koehl, 2008; Sun & Kim, 2013). Gaining high levels of customer satisfaction is very important to a business because satisfied customers are most likely to be loyal and to make repeat orders (Anderson & Fornell, 1994; Anderson & Srinivasan, 2003; Audrain-Pontevai, Goala & Poncin, 2013; Freed & Anderson, 2012; Kuo & Wu, 2012; Lin, Wu, & Chang, 2011; Oliver, 1999; Pont & McQuilken, 2005). In addition, studies have found there is a significant relationship between customer satisfaction and financial performance (Anderson, Fornell & Rust, 1997; Reichheld & Sasser, 1990; Rust & Zahorik, 1993; Sun & Kim, 2013). Furthermore, understanding consumer satisfaction and behaviour is not only important for companies in ensuring repeat purchase but also for sustaining market share (Garver & Gagnon, 2002; Kim & Stoel, 2004; Subramanian, Gunasekaran, Yu, Cheng, & Ning, 2014; Yuksel & Yuksel, 2002).

The authors are of the view that it is imperative to consider customer satisfaction at point-of- purchase and post-purchase in an online purchase process in order to better understand consumer purchase behaviour. Customers assess their satisfaction based on their perceived performance (or outcomes) of a product or service in relation to their expectations (Oliver, 1980; Tse & Wilton, 1988). Customer satisfaction at point-of-purchase refers to customer level of approval towards an object (of evaluation) at the point when the customer makes an online payment for the purchase. Post-purchase, on the other hand, refers to the level of approval at the point when the customer has already received the product and experienced the services that follow the purchase. It is important that customers are satisfied with the online post-purchase service, otherwise the business will lose repeat patronage from customers. Many of the prior service quality measures considered online purchase as a single process, even with after-purchase experience embedded and becoming somewhat obscure in this process (Kim et al. 2006; Muyllea, Moenaert, & Despontin, 2004; Parasuraman, Zeithaml, & Malhotra, 2005; Suh & Han 2003). There have been studies that considered customer satisfaction in post-purchase phase but none in point-of-purchase and post-purchase for a purchase process. This paper attempts to demonstrate the importance of measuring customer satisfaction at both the point-of-purchase and post-purchase in online purchase.

Literature on Customer Satisfaction

Studies have shown that higher customer satisfaction can lead to a higher tendency to engage in purchase behaviour (Bai, Law, & Wen, 2008; Freed & Anderson, 2012; Lin et al., 2011) and it is important to include this in postgraduate marketing courses. The study undertaken by Bai et al. (2008) found that online satisfaction has a direct and positive effect on purchase intentions. This is supported by another study by Freed and Anderson (2012) who found that highly satisfied online holiday shoppers are 71% more likely to make an online purchase. Highly satisfied customers are also potential loyal customers who are likely to generate repeat purchases for their suppliers (Anderson & Fornell, 1994; Anderson & Srinivasan, 2003; Audrain-Pontevai, et al., 2013; Freed & Anderson, 2012; Finn, Wang, & Frank, 2009; Kuo & Wu, 2012; Lin et al., 2011; Oliver, 1999; Pont & McQuilken, 2005). Freed and Anderson (2012) found that highly satisfied holiday shoppers are 67% more likely to make a repeat purchase and 65% more committed to the brand that generates high level of satisfaction. The reward from nurturing loyal customers lies in the economic returns from repeat purchase behaviour. It has been emphasised by Raphel and Raphel (1995) that the cost of retaining a regular customer is 5 times less than the cost involved in recruiting a new customer. Hence, customer satisfaction could influence the profitability and cost of a company.

Furthermore, highly satisfied customers could be an important source of positive word-of-mouth recommendations and endorsement to friends, family members, or colleagues (Chevalier & Mayzlin, 2006; Collier, 1995; Duan, Gu, & Whinston, 2008; Endo, Yang, & Park, 2012; Finn et al., 2009; Freed & Anderson, 2012; Jones & Sasser, 1995; Maxham, 2001; Senecal & Nantel, 2004). Positive word of mouth from satisfied customers constitutes a powerful input into the decision making process of a potential customer. Freed and Anderson (2012) found that highly satisfied shoppers are 69% more likely to provide positive influence through word-of-mouth as compared to dissatisfied shoppers. Kuo, Hu, and Yang (2013) highlighted that customers tend to value word-of-mouth from other consumers as more trustworthy and reliable information than promotion information from advertisers or marketers.

While customer satisfaction is not a new concept, few studies focused on the level of customer satisfaction at post-purchase stage. Keeping track of customer satisfaction at post-purchase stage is important because the level of satisfaction may fall to a lower level than at pre-purchase or point-of-purchase stage. If this drop in satisfaction is unchecked, it may result in loss of repeat purchase and future purchase as a result of dissatisfied customers and bad word-of-mouth. It has been highlighted that the awareness of dissatisfied customers at the post-purchase stage allows firms to adopt timely recovery strategies to avert detrimental consequences to the future prospect of the company and, perhaps, also adopt appropriate strategies that may effectively increase customer retention rate and nurture loyal customers (Fagerstrøm & Ghinea, 2011; Goodwin & Ross, 1992; Hart, Heskett, & Sasser, 1990; Kelley, Hoffman, & Davis, 1993; Kuo & Wu, 2012). Therefore, it is important for firms not to neglect post-purchase evaluation by online customers, particularly their level of post-purchase satisfaction, when using customer satisfaction as a predictor of future sales (Bai et al., 2008; Endo et al., 2012). Post-purchase satisfaction may make a difference in the marketing strategy employed to enhance economic returns or profitability. For example, Cao and Gruca (2004) found that online retailers were able to charge a premium price in situations where there was high post-purchase satisfaction. Homburg, Koschate, and Hoyer (2005) also found that companies could potentially charge a premium price in situations where customers' cumulative satisfaction is high.

This paper shows that it is important to show students the need to take into account online post-purchase satisfaction as part of the cumulative experience of the online purchaser. Focusing primarily on point-of-purchase satisfaction could mislead an online retailer particularly if dissatisfaction arose in the aftermath of the purchase experience. This paper also investigates the cus-

tomer satisfaction between point-of-purchase and post-purchase based on language group. According to Haque and Khatibi (2006), language has an impact on online shopping in Malaysia where Malaysian people mostly prefer to surf websites written in Bahasa Melayu. The same argument was shared by Chai, Zadrozny, and Ye (2001) who stated that people less experienced with e-commerce preferred to browse an e-commerce website which used their natural language dialog.

Methodology

The question that this research sought to address was whether there were differences in customer satisfaction between the pre and post-purchase phases of online shopping. This question is further expanded in the hypotheses below. The sample size in this research is 154 respondents in Malaysia who purchased apparel online and provided their satisfaction level at point-of-purchase and post-purchase stages. The attitudinal statements used to obtain their responses in surveys conducted at both these stages are as follows:

Table 1: Attitudinal statements on customer satisfaction at point-of-purchase and post-purchase

Attitudinal statements on customer satisfaction (point-of-purchase and post-purchase stages)	7-point Likert scale: Strongly Disagree	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree
Item 1: *I enjoyed purchasing using the website.*							
Item 2: *Overall, I am satisfied using the website to purchase apparel.*							
Item 3: *In general, I was pleased with the quality of the service that the website provided.*							

A seven-point Likert scale was used to measure the attitude of respondents toward each of the above statements. Of the 154 respondents, 64 answered the surveys in Bahasa Melayu (the national language in Malaysia) while the remaining 90 answered in the English language. This study employs Wilcoxon Ranked Sum Test for its non-parametric statistical analyses for investigating whether there are statistically significant differences in customer satisfaction items. The Wilcoxon Ranked Sum test is a distribution-free test because it does not require the assumption that the population is normally distributed. It is designed to match data pairs and used in this study to determine whether there are statistically significant differences in customer satisfaction items between point-of-purchase and post-purchase for all respondents, and within a group (respondents who answered the surveys in English or Bahasa Melayu). The hypothesis statements are as follows:

H1: There is a significant difference in customer satisfaction items between point-of-purchase and post-purchase for all respondents.

H2: There is a significant difference in customer satisfaction items between point-of-purchase and post-purchase for respondents who answered the survey in Bahasa Melayu.

H3: There is a significant difference in customer satisfaction items between point-of-purchase and post-purchase for respondents who answered the survey in English.

Results and Discussion

H1: There is a significant difference in customer satisfaction items between point-of-purchase and post-purchase for all respondents.

Tables 2 and 3 show the results for the hypothesis test for H1. H1.1 refers to item 1 attitudinal statement on customer service in H1 (refer to Table 1), H1.2 refers to item 2 and H1.3 refers to item 3.

Table 2: Results obtained from Wilcoxon Ranked Sum Test on customer satisfaction for all respondents between point-of-purchase and post-purchase.

Rank		N	Mean Rank	Sum of Ranks
H1.1. (post-purchase) – (point-of-purchase)	Negative Ranks	76[a]	61.80	4696.50
	Positive Ranks	39[b]	50.60	1973.50
	Ties	39[c]		
	Total	154		
H1.2. (post-purchase) – (point-of-purchase)	Negative Ranks	73[d]	61.77	4509.00
	Positive Ranks	40[e]	48.30	1932.00
	Ties	41[f]		
	Total	154		
H1.3. (post-purchase) – (point-of-purchase)	Negative Ranks	76[g]	60.88	4627.00
	Positive Ranks	40[h]	53.98	2159.00
	Ties	38[i]		
	Total	154		

a. H1.1 (post-purchase)< (point-of-purchase)

b. H1.1 (post-purchase)> (point-of-purchase)

c. H1.1 (post-purchase)= (point-of-purchase)

d. H1.2 (post-purchase)< (point-of-purchase)

e. H1.2 (post-purchase)> (point-of-purchase)

f. H1.2 (post-purchase)= (point-of-purchase)

g. H1.3 (post-purchase)< (point-of-purchase)

h. H1.3 (post-purchase)> (point-of-purchase)

i. H1.3 (post-purchase)= (point-of-purchase)

Table 3: Test statistics for customer satisfaction (two-tailed test) between point-of-purchase and post-purchase for all respondents

Test Statistics[a]

	H1.1. (post-purchase)-(point-of-purchase)	H1.2. (post-purchase)-(point-of-purchase)	H1.3. (post-purchase)-(point-of-purchase)
Z	-3.880[b]	-3.783[b]	-3.474[b]
Asymp. Sig. (2-tailed)	.000	.000	.001

a. Wilcoxon Signed Ranks Test

b. Based on positive ranks.

Wilcoxon Signed Ranks Test results in Table 3 show there are statistically significant differences in customer satisfaction items between point-of-purchase and post-purchase at 1% level of sig-

nificance. Table 2 also reveals that customers were less satisfied at post-purchase for all these items as compared to point-of-purchase, which is indicated by the higher number of negative ranks as compared to positive ranks and rank ties.

H2: There is a significant difference in customer satisfaction items between point-of-purchase and post-purchase for respondents who answered the survey in Bahasa Melayu.

Tables 4 and 5 show the results for the hypothesis test for H2. H2.1 refers to item 1 attitudinal statement on customer service in H2 (refer to Table 1), H2.2 refers to item 2 and H2.3 refers to item 3.

Table 4: Results obtained from Wilcoxon Ranked Sum Test on customer satisfaction for Bahasa Melayu respondents between point-of-purchase and post-purchase.

Ranks		N	Mean Rank	Sum of Ranks
H2.1(post-purchase) –(point-of-purchase)	Negative Ranks	37[a]	24.76	916.00
	Positive Ranks	10[b]	21.20	212.00
	Ties	17[c]		
	Total	64		
H2.2(post-purchase) –(point-of-purchase)	Negative Ranks	34[d]	22.68	771.00
	Positive Ranks	9[e]	19.44	175.00
	Ties	21[f]		
	Total	64		
H2.3(post-purchase) –(point-of-purchase)	Negative Ranks	37[g]	21.99	813.50
	Positive Ranks	7[h]	25.21	176.50
	Ties	20[i]		
	Total	64		

a. H2.1(post-purchase)< (point-of-purchase)
b. H2.1(post-purchase)> (point-of-purchase)
c. H2.1(post-purchase)= 1(point-of-purchase)
d. H2.2(post-purchase)< (point-of-purchase)
e. H2.2(post-purchase)> (point-of-purchase)
f. H2.2(post-purchase)= (point-of-purchase)
g. H2.3(post-purchase)< (point-of-purchase)
h. H2.3(post-purchase)> (point-of-purchase)
i. H2.3(post-purchase)= (point-of-purchase)

Table 5: Test statistics for Bahasa Melayu respondents in customer satisfaction (two-tailed test) between point-of-purchase and post-purchase.

Test Statistics[a]

	H2.1(post-purchase)-(point-of-purchase)	H2.2(post-purchase)-(point-of-purchase)	H2.3(post-purchase)-(point-of-purchase)
Z	-3.798[b]	-3.671[b]	-3.795[b]
Asymp. Sig. (2-tailed)	.000	.000	.000

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.

Wilcoxon Signed Ranks Test results in Table 5 show there are statistically significant differences in customer satisfaction items between point-of-purchase and post-purchase for respondents who answered the surveys in Bahasa Melayu at significance level of 1%. Table 4 also reveals that customers were less satisfied at post-purchase for all these items as compared to point-of-purchase, which is indicated by the higher number of negative ranks as compared to positive ranks and rank ties.

H3: There is a significant difference in customer satisfaction items between point-of-purchase and post-purchase for respondents who answered the survey in English.

Tables 6 and 7 show the results for the hypothesis test for H3. H3.1 refers to item 1 attitudinal statement on customer service in H3 (refer to Table 1), H3.2 refers to item 2 and H3.3 refers to item 3.

Table 6: Results obtained from Wilcoxon Ranked Sum Test on Customer Satisfaction for English respondents between point-of-purchase and post-purchase.

Ranks		N	Mean Rank	Sum of Ranks
H3.1(post-purchase) – (point-of-purchase)	Negative Ranks	39[a]	37.46	1461.00
	Positive Ranks	29[b]	30.52	885.00
	Ties	22[c]		
	Total	90		
H.3.2(post-purchase) – (point-of-purchase)	Negative Ranks	39[d]	39.33	1534.00
	Positive Ranks	31[e]	30.68	951.00
	Ties	20[f]		
	Total	90		
H.3.3(post-purchase) – (point-of-purchase)	Negative Ranks	39[g]	40.13	1565.00
	Positive Ranks	33[h]	32.21	1063.00
	Ties	18[i]		
	Total	90		

a. H.3.1(post-purchase)< (point-of-purchase)
b. H.3.1(post-purchase)> (point-of-purchase)
c. H.3.1(post-purchase)= (point-of-purchase)
d. H.3.2(post-purchase)< (point-of-purchase)
e. H.3.2(post-purchase)> (point-of-purchase)
f. H.3.2 (post-purchase)= (point-of-purchase)
g. H.3.3(post-purchase)< (point-of-purchase)
h. H.3.3(post-purchase)> (point-of-purchase)
i. H.3.3(post-purchase)= (point-of-purchase)

Table 7: Test statistics for English respondents in Customer Satisfaction (two-tailed test) between point-of-purchase and post-purchase

Test Statistics[a]

	H3.1(post-purchase)-(point-of-purchase)	H3.2(post-purchase)-(point-of-purchase)	H3.3(post-purchase)-(point-of-purchase)
Z	-1.799[b]	-1.754[b]	-1.439[b]
Asymp. Sig. (2-tailed)	.072	.079	.150

a. Wilcoxon Signed Ranks Test

b. Based on positive ranks.

Table 7 shows there is no statistically significant difference in overall satisfaction between point-of-purchase and post-purchase for respondents who answered the surveys in English at significance level of 1%.

Inclusion of this Material in Postgraduate Business Courses

If included in a postgraduate business course material of this sort, involving a real case rather than just a textbook example can be very useful in making the student experience much more relevant to them and of much more practical value. This is particularly the case for students from countries other than the USA as many textbook examples are US-based and not immediately relevant to non-US students. In this case, students are shown of the need to take into account both pre- and post-purchase issues when examining the online purchase experience and shown a manner in which this can be done. Here, the case of Malaysia, where many customers do not have English as their first language, adds a different perspective to understanding this topic. As most Internet sites make use of English, how does a non-English speaker get on?

It would be quite easy to adapt this approach for use with another example in another country, particularly if some of your students came from this country and were able to obtain local details of the case. As well as providing useful material for discussion in class, this has the added benefit of involving these overseas students in a quite different way.

Conclusion and Future Research Directions

In summary (as per Tables 2 and 3), there are significant differences in all customer satisfaction items between point-of-purchase and post-purchase stages for all 154 respondents. However, the results are different in those items where respondents were differentiated based on the language they used in answering the surveys. The levels of customer satisfaction (as measured by [H2.1 point-of-purchase - post-purchase]; [H2.2 point-of-purchase -post-purchase]; [H2.3 point-of-purchase - post-purchase] in Tables 4 and 5) decreased at post-purchase for those 64 respondents who answered the surveys in Bahasa Melayu. On the other hand, there were no significant differences in the levels of customer satisfaction between point-of-purchase and post-purchase for 90 respondents who answered the surveys in English (as per Tables 6 and 7). The findings demonstrate the importance of measuring customer satisfaction at both point-of-purchase and post-purchase, as well as comparing customer satisfaction between groups based on language. Further investigation is needed to investigate the factors or causes of lower levels of satisfaction when responses differ according to the language used. It is important to determine the causes or factors behind this significant drop in overall satisfaction in this group as the Malay race (who tends to speak Bahasa Melayu) constitutes 55% of the population in Malaysia and represents a huge potential market to owners of apparel BlogSpots and websites.

With the aid of this up-to-date research in a country where the advent of the Internet, of Web technology, and of eCommerce has only recently begun to make a huge difference, postgraduate students can be introduced to a real case, different to most textbook cases based in countries like the USA. The use of a case from a country like Malaysia adds a different perspective to their understanding of this important topic.

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Healthcare Students' Perceptions of Electronic Feedback through GradeMark®

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Executive Summary

This paper reports on the findings from a study undertaken to explore students' perceptions of the timeliness, accessibility, consistency, and quality of feedback and grading received electronically. The system used was GradeMark®, an electronic tool available through the plagiarism software provider, Turnitin®. 296 students from the Schools of Nursing and Midwifery, Medicine, and Dentistry at Cardiff University were included in the study. Data collection included an online survey and a focus group for each discipline. Findings revealed that the use of GradeMark® improved the timeliness and accessibility of feedback due to its immediate availability via any personal computer with internet access. The use of annotation was proven to be valuable; however consistency and quality of feedback were affected by markers' individual comments, issues which GradeMark® may not necessarily address. Findings provide insight into what quality feedback could look like from the students' perspective, which can help improve academic practice. Overall the study outcomes suggest there are benefits to using innovative technology such as GradeMark® to enhance learning. The paper provides valuable lessons that could assist others in adopting a pragmatic and planned approach to the introduction of electronic feedback using a system such as GradeMark®.

Keywords: GradeMark®, electronic feedback, quality feedback, student perceptions.

Editor: Louise Spiteri

Introduction

High quality feedback is viewed as a crucial component in student development. Joughin (2008) states it supports the learning process, acts to evaluate current achievement, and helps maintain professional standards. Effective feedback is constructive, timely, consistent, specific, non-judgmental, and non-personal (Agius & Wilkinson, in press; Ball, 2010; Ball, Franks, Jenkins, McGrath, & Leigh, 2009; Carless, 2006; Weaver, 2006). McKimm (2009) reports how effective feedback helps motivate and develop learners' knowledge, skills, and behaviour. It also promotes student growth by providing direction, increasing confidence and self-esteem, encouraging reflection, and clarifying understanding (Clynes & Raftery, 2008). When feedback is informative, supportive, constructive, specific, and of a positive nature, explaining where and why students have made errors and how to make improvements, significant increases in student learning are said to occur (Boud & Associates, 2010; Fotheringam, 2011).

Despite its value, student dissatisfaction with feedback is evident when considering current literature in the UK higher education sector and National Student Survey results (Higher Education Funding Council for England (HEFCU), (2012). Complicated jargon and vague and generalist comments can contribute to students dismissing and devaluing feedback as a learning opportunity (Nicol 2010; Sadler 2010; Weaver, 2006). The timeliness of feedback also has an impact on its effectiveness and influences whether students access feedback available to them (Knight & York, 2003). Ball et al. (2009) suggest the provision of rich and student-friendly feedback, accessible on-line, may address these well-publicised concerns. This is supported by the HEFCU (2010), which states technology has the potential to improve student experience of feedback by making it richer and more personal.

Against this backdrop the School of Nursing and Midwifery Studies, the School of Medicine and the School of Dentistry in Cardiff University undertook a research study which examined student perceptions of electronic feedback and marking of students' summative essay-type assignments through Turnitin's GradeMark® tool.

Cardiff University subscribes to Turnitin® and its suite of tools, which are fully integrated within the organisation's virtual learning environment. Stevens and Jamieson (2002) consider technology such as GradeMark® offers support in the management of student assignments and provides features conducive to high quality marking and feedback. As stated, the study explores student perceptions of electronic feedback and grading of summative work through GradeMark®, specifically, if the use of GradeMark® enhances the consistency and quality of feedback and marking, and if GradeMark® improves the accessibility and timeliness of feedback received by students.

As well as providing a plagiarism detection facility, Turnitin® provides a digital mark-up tool called GradeMark®, which offers a range of online options. GradeMark® provides markers with a flexible commentary system allowing detailed feedback to be placed at any point within a student's paper through electronic annotation. When students access their feedback on-line they are able to view assessors' annotations throughout the work in 'comment boxes' placed alongside text. A bank of personalised comments can be developed and used throughout a student's work saving the time it takes markers to repeat commonly-used feedback phrases. Students' written work can be electronically highlighted and markers can provide general comments. Grading of student work results from the use of a marking rubric embedded within the software, which can be customised according to academic requirements.

Rubrics provide criteria against which student work is assessed. Rubrics used in this study were developed in accordance with Quality Assurance Agency for Higher Education (2006) guidelines and according to each School's needs. It is suggested that electronic rubrics liberate markers from administrative tasks and enhance student learning through creating environments which facilitate quality feedback (Blayney & Freeman, 2004). The Turnitin® UK website at

http://submit.ac.uk/en_gb/features/grademark suggests students receive an enhanced service from opportunities to compare their grade, annotated and general comments, with the allocated weighting and criteria descriptors of a marking rubric.

Although some of the functions provided by GradeMark® are not unique, such as the provision of in-text annotations, according to Henderson (2008) they are easier to use and view that other popular packages such as Microsoft Word, which can disrupt the visual appearance of text (Beals, 2012). What is perhaps unique about GradeMark® is its facility to provide personalised electronic feedback directly to students together with grades generated from a marking rubric. Together, these are considered by Burrows and Shortis (2011) and Hatziapostolou and Paraskakis (2010) to be the systems strongest features.

Literature Review

Feedback to students is an important dimension of academic work. The Quality Assurance Agency for Higher Education (2006, p. 20) states "institutions must provide appropriate and timely feedback to students on assessed work that promotes learning and facilitates improvement." In addition, Archer (2010) reports feedback to health care students has the added dimension of ensuring professional standards and patient safety.

Key themes arising from existing research relate to the effectiveness of feedback from a student's perspective. Accuracy, clarity, and constructive comments assist students to progress (Archer, 2010). The timeliness, accessibility, consistency, and quality of feedback add to its utility (Sadler, 2010). Feedback not provided in time for students to act upon may be contrary to their needs, particularly if submission of further summative written work has occurred. Carless (2006) states for feedback to be of optimum use it should be delivered within a timeframe that allows students to use the information to positively influence their performance in future assessments. Consistency and quality in written feedback should be the cornerstone of good academic practice, yet students report dissatisfaction with these key attributes. Difficulties in understanding the language used by assessors, general, vague, and negative comments, and feedback lacking guidance and unrelated to assessment criteria are some of the issues raised (Weaver, 2006). Feedback should provide students with information on how to improve academic performance (Boud & Molloy, 2013). In reality, Li and Barnard (2011) consider that assessors may use feedback to justify the grade awarded rather than enable students to improve.

While considerable research informs on constituents of quality feedback, a focus on traditional paper-based systems is evident. Ball (2010) suggests annotation provides more meaningful feedback to students through augmentation of their written work with additional text. In the case of GradeMark® this is done electronically rather than directly onto paper copies. The impact of emerging technologies such as GradeMark® on the quality and experience of receiving feedback remains under researched. What research does exist has mostly focused on the functionality and assessor perceptions of software packages, such as the detailed review of online marking and feedback systems by Burrows and Shortis (2011). They identified GradeMark® as one of the most popular software packages on the market due to its ability to provide direct feedback and grading of work to students. It was these features which contributed to the endorsement of GradeMark® by the New Zealand 'Innovations in Assignment Marking' project team (Heinrich, Milne, & Moore, 2009). What perhaps is missing from research in this field is the students' perspectives on GradeMark®.

Bridge and Appleyard (2008) explored students' perception of online assignment submission and marking through a Virtual Learning Environment and reported the majority of students preferred this mechanism. Their findings provided a snapshot of students' enthusiasm for technology-assisted assessment practices. Chang, Watson, Bakerson, Williams, McGoron, & Spitzer, (2012)

also reported how 70% of students in their study preferred electronic feedback for its accessibility, timeliness, and legibility, and Upson-Saia and Scott (2013) illustrated how iAnnotate, a software system similar to GradeMark®, mitigated a number of issues undermining quality feedback, such as the time required to write detailed comments and illegibility of instructors comments. Hanna and Yearwood (2012) caution, however, against a blanket belief in students' preference for electronic feedback, stating that further research is urgently needed to explore this important aspect of pedagogical practice. Our study contributes to and complements the corpus of research available on GradeMark®, through illuminating students' perceptions of receiving electronic feedback and grading of work through GradeMark®.

The Research Study

The aim of our study was to explore student perceptions of the value of electronic feedback and marking on written work accessed through Turnitin®'s GradeMark® tool, particularly in relation to timeliness, accessibility, consistency, and quality.

Methodology

A review of the literature influenced the decision to use both qualitative and quantitative research approaches to allow for corroboration of research data and overcome what Denzin (1989, p. 307) calls "the intrinsic bias that comes from single-method studies". The study involved an online survey and focus group discussions.

Sample

The choice of assessment determined the sample population to be included in the study. GradeMark® is not compatible with all assessment types, thus it was important to determine those that were suitable to be included within the project. Essay-type assessments were chosen, as these constitute an appropriate pedagogical design to use in combination with on-line marking and feedback (Freeman & Mckenzie, 2002). All 296 students asked to participate in the study had received feedback through GradeMark®. Students approached to participate included:

- 133 second year Bachelor of Nursing (Hons) students comprising the total cohort;
- 100 third year Bachelor of Medicine, Bachelor of Surgery, medical students comprising one third of the total cohort;
- 63 third year Bachelor of Dental Surgery (Hons) students comprising the total cohort.

Ethics Issues

Ethics approval was granted by each of the Schools' Research Ethics Committees and permission gained from Deans of Schools. Participants were given free choice to engage in focus groups and the online survey. All students were seen beforehand by an academic member of staff and informed of the study aims. Students were reassured their contribution would not be discussed with members of academic staff and their personal academic progress would not be influenced by participation. All data was kept confidential and anonymised, accessed only by members of the research team.

Pilot Study

Consideration was given to the quality of the data collection tools in relation to the comprehensibility of questions posed to interviewees and if these captured the type of information they were intended to. A pilot study involving seven students, who shared the same characteristics as those in the study but who were outside of the sample population, was used to test the flow, salience, and clarity of the survey instrument and focus group schedule. This helped ensure 'content valid-

ity' through identifying problems such as ambiguity, poor wording, inappropriate response options, and unclear instructions (Burns, Duffet, Kho, Meade, Adhikari, Sinuff, & Cook, 2008). The standard aimed for was for each student to relay his or her understanding of survey and schedule questions to be that intended by the research team. Pilot testing also enabled assessment of whether the questions facilitated an adequate range of responses and that replies could be interpreted in terms of the information required as well as identifying redundant, irrelevant, or poorly worded questions. Pilot testing resulted in minor amendments to question construction in both survey and focus group schedules.

Data Collection: Online Survey

A survey was deemed the most appropriate method to reach the diverse student population as it is recognised to be quick, efficient, and effective (Sue & Ritter 2012). Surveys and focus groups were conducted sequentially over a six month period so that each method helped inform the other.

Closed and open questions formed the survey instrument (see Table 1). Closed questions were associated with a Likert-type scale offering the options of 'strongly agree, agree, not sure, disagree, and strongly disagree'. There are both benefits and disadvantages to allowing the 'not sure' option; if it is removed, this forces a response one way or another. There may be genuine occasions where respondents are not able to choose, and if forced to pick an option other than 'not sure', results can be skewed. Leaving this in allows respondents to make a choice based on legitimate reasons. This can sometimes result in higher 'not sure' responses, an issue that may have particularly affected the results of questions 'I found the rubric helped to improve my work' and 'I prefer the marking criteria used previously'. Both showed notably high levels of 'not sure' responses.

Table 1: Survey schedule

1. Accessing annotated feedback through GradeMark® was easy
2. I prefer paper-based feedback to electronic annotated feedback through GradeMark®
3. Annotated feedback has helped me clarify things I did not understand
4. I have NOT received detailed annotated feedback on my work
5. The annotated feedback I have received has been constructive and helped me see how I can improve
7. Overall, I am satisfied with the quality of annotated feedback provided
8. The feedback provided previously was more useful to me than annotated feedback through GradeMark®
9. Annotated feedback through GradeMark® should be used more widely across the University
10. The assessment and marking of my work with GradeMark® has been fair
11. The marking rubric used to grade my work is NOT easy to understand
12. The rubric clearly defined the requirements needed within each criteria and percentage banding
13. I could clearly match comments on my work (annotations and general comments) to the banding criteria definitions in the rubric
14. I found the rubric helped to improve my work
15. I prefer the marking criteria used previously
16. The GradeMark® tool is effective for the retrieval of assignment feedback
Open text questions Q1 Looking back at the experience, are there any positive aspects you would like to highlight? Q2 Looking back at the experience, are there any areas for improvement you would like to highlight?

The construction of survey questions took consideration of key factors said to influence survey success, with each question focusing on a single construct, containing fewer than twenty words, being comprehensible, non-judgmental, and unbiased with care taken to avoid the use of absolute terms such as always, none, or never (Burns et al., 2008). The format of the survey was designed to provide clear and specific directions, ensure appropriate grouping and sequencing of questions, and ensure a vertical rather than horizontal flow of items

All students who received feedback through GradeMark® were invited to complete an on-line survey and the following response rates were achieved:

- School of Dentistry (SD) – 47 of 63 (75%)
- School of Medicine (SM) – 57 of 100 (57%)
- School of Nursing and Midwifery Studies (SNMS) – 73 of 133 (55%)

An important consideration of any quantitative survey is the achievement of response rates at a level where generalisations can be made. A combined 'across school' score of 62% was achieved which meant that of the 296 students eligible to participate in the study 177 completed the online survey. Although a response rate above 80% is usually vital to ensure the generality of survey results, Wyatt (2000) states this is not always necessary. Where survey communities are homogeneous to a key variable, as in all students using GradeMark®, a lower response rate is considered less of a problem. When considering reported response rates to online surveys average around 30% (Nulty, 2008), the 62% rate achieved in our study was impressive and was influenced by the following strategies,

- Surveys were run soon after release of results in each of the three Schools;
- Announcements placed within virtual learning environments informed about the survey and how to complete it, including a web link to ensure quick and easy access;
- Where survey dates coincided with students attending University, timetabling opportunities were made available to enable completion of the survey;
- Each survey was kept 'live' for a two-week period to capture as many responses as possible;
- Using a 'text' reminder system of survey commencement dates for those students on clinical placements;
- Requesting module leaders and programme managers opportunistically remind students about the survey;
- Asking student representatives from each cohort to disseminate information on the survey prior to and during their conduction;
- Ensuring GradeMark® was a timetabled item at student/staff panels and using these to prompt reminders of when surveys were conducted; and
- Using electronic reminders throughout each survey's 'live period'.

Data Collection: Focus Groups

Students were informed through the online survey that random selection and invitation to participate in a focus group discussion would occur. A simple random selection table was used to select 20 students from each school and these students were invited to participate in one discipline-specific focus group discussion. In total, 27 students participated: 18 dentistry, six nursing and three medical students. Those selected were sent an information sheet, contact details to discuss queries, and consent forms.

The use of focus groups is not without challenges. Miles and Huberman (1994) remind how data may be affected by participants not wishing to share their perceptions or who 'gloss over' experiences that the researcher is unaware of. It is also difficult to assess how the effects of social desirability and conformity influence expression of views and how the researcher may influence and

introduce bias into discussions. Being conscious of the influence on data collection from a moderator's perceived power and position in focus group discussions, project sponsors acted in the moderator role during the conduction of the focus groups with students, but not with students from their own faculty. This was done to reduce bias and subjectivity in data collection and to encourage student discussion. Therefore facilitation of each group was planned as follows:

- The focus group composed of nursing students was facilitated by the project lead sponsor from the School of Medicine
- The focus group composed of medical students was facilitated by the project lead sponsor from the School of Dentistry
- The focus group composed of dentistry students was facilitated by the project lead sponsor and principle investigator from the School of Nursing and Midwifery

A discussion guide consisting of semi-structured questions and probes was used during the conduction of the focus groups to provide a framework with which each moderator could ask questions and probe where required (Table 2). This helped ensure consistency and comprehensiveness of data collected as discussed by Burns et al. (2008). The guide was designed to proceed logically from one topic to another and to flow from the general to the specific where questions were constructed to be open-ended, simple, unbiased and non-threatening.

Table 2: Focus group schedule

1. What have been your experiences of using GradeMark® in relation to? - Its technical aspects e.g. usability, reliability - Its use as a grading tool - Its use as a feedback tool
2. What have been your experiences of annotation (written comments on the text of your work) used as part of the feedback through GradeMark®?
3. The marking criteria was turned into a 'rubric' for use with GradeMark®, have you had an opportunity to see this?
4. What are your views on the rubric used to grade your work?
5. What were your views about the feedback comments you received through GradeMark®?
6. What does feedback mean to you and what value do you place upon it?
7. Has GradeMark® influenced your views about feedback?
8. How do you think feedback on summative assessment could be improved?

Data Analysis

All collected data was included for analysis. In relation to the survey data, the Likert-style item responses were converted to percentage scores (Table 3) and the survey open text question responses were subjected to a content analysis (Tables 4 and 5).

Table 3: Online survey results

	Strongly Agree	Agree	Not sure	Disagree	Strongly Disagree	Left Blank
1. Accessing annotated feedback through GradeMark® was easy	57 (32%)	85 (48%)	11 (6%)	20 (11%)	4 (2%)	0
2. I prefer paper-based feedback to GradeMark® electronic annotated feedback	11 (6%)	17 (10%)	51 (29%)	75 (43%)	22 (13%)	1
3. Annotated feedback has helped me clarify things I did not understand	29 (16%)	82 (46%)	30 (17%)	26 (15%)	10 (5%)	0
4. I have NOT received detailed annotated feedback on my work	18 (10%)	33 (19%)	24 (13%	60 (34%)	42 (24%)	0
5. Annotated feedback I have received has been constructive and helped me see how I can improve	19 (11%)	81 (46%)	31 (18%)	31 (18%)	14 (8%)	1
6. Overall, I am satisfied with the quality of annotated feedback provided	21 (12%)	74 (42%)	35 (20%)	31 (17%)	16 (9%)	0
7. Feedback provided previously was more useful than annotated feedback through GradeMark®	11 (6%)	27 (15%)	51 (29%)	62 (35%)	25 (14%)	1
8. Annotated feedback through GradeMark® should be used more widely across the University	44 (25%)	86 (49%)	39 (22%)	5 (3%)	3 (2%)	0
9. The assessment and marking of my work with GradeMark® has been fair	19 (11%)	93 (53%)	38 (31%)	18 (10%)	7 (4%)	2
10. The marking rubric used to grade my work is NOT easy to understand	5 (3%)	24 (14%)	42 (24%)	92 (53%)	12 (7%)	2
11. The rubric clearly defined the requirements needed within each criteria and percentage banding	12 (7%)	91 (52%)	42 (24%)	27 (16%)	2 (1%)	3
12. I could clearly match comments on my work to the banding criteria definitions in the rubric	8 (4%)	69 (39%)	54 (31%)	36 (20%)	9 (5%)	1
13. I found the rubric helped to improve my work	7 (4%	56 (32%)	79 (45%)	27 (15%)	8 (4%)	0
14. I prefer the marking criteria used previously	4 (2%)	19 (11%)	83 (47%)	54 (31%)	16 (9%)	1
15. The GradeMark® tool is effective for the retrieval of assignment feedback	48 (28%)	101 (58%)	16 (9%)	7 (4%)	2 (1%)	3

Table 4: Survey free-text themes on positives aspects about GradeMark®

Theme	Question: Looking back at the experience, are there any particularly positive aspects you would like to highlight?	
a) Improved accessibility	Dental student response:	'*it's easy to access results and feedback'*
	Nursing student response:	'*it is much better to access your grades through GradeMark'*
	Medical student response:	'*much easier to retrieve work than travelling to collect the copy'*
b) Improved timeliness	Dental student response:	'*quick and easy'*
	Nursing student response:	'*getting your mark on the day makes a huge difference'*
	Medical student response:	'*much quicker way to receive feedback as we don't have to collect the work'*
c) Improved understanding from specific comments	Dental student response:	'*feedback exactly where it should be so it is completely clear'*
	Nursing student response:	*'it was really useful to have the comments posted next to your work so you could understand which area they were talking about'*
	Medical student response:	'*after being marked by GradeMark, I know which areas in particular I could have changed and feel confident I could implement them in future assignments'*
d) Improved legibility	Dental student response:	'*easy to read*
	Nursing student response:	'*feedback was clear'*
	Medical student response:	'*digital feedback prevents difficulty in reading'*

Table 5: Survey free-text themes on ways to further improve GradeMark®

Theme	Question: Looking back at the experience, are there any areas for improvement you would like to highlight?	
a) Preparation in the use of GradeMark®	Dental student response:	'*that we have clear instructions on how to use GradeMark'*
	Nursing student response:	'*there was slight confusion as to how to get assignment details up initially'*
	Medical student response:	'*difficult to find instructions on how to use the tool'*
b) Ways to improve	Dental student response:	'*more detailed comments on things to improve'*
	Nursing student response:	'*it would have been nice to have explained what could have improved the essay further'*
	Medical student response:	'*comment on how to get extra marks'*
c) More detail	Dental student response:	'*more feedback on specific areas from the markers'*
	Nursing student response:	'*perhaps slightly more detail*
	Medical student response:	'*more detailed feedback'*

Focus group recordings were transcribed by one of the researchers. This data was analysed using an adapted framework approach described by Pope, Zieblend, and Mays (2000). This involved familiarisation with the data from each student focus group discussion through repeated listening to recorded tapes and repeated reading of subsequent transcriptions. The aim was to enable any unique patterns from each student focus group to emerge. Cross group analysis followed where medical, dental, and nursing student group data were merged according to questions posed; this provided an opportunity to examine similarities, differences, and minority opinions between groups. Comparisons between preliminary focus group and survey data findings also occurred, looking for emerging concordant or conflicting patterns from both data sources in order to strengthen or question findings. It was from this process that themes began to emerge from the data. The audio recordings were transcribed into a format that allowed the writing of memos alongside the recorded text in the form of ideas, concepts, and categories, and this process enabled the development of a thematic framework, against which all focus group data was examined. Data was indexed by annotating transcripts with numerical codes, supported with representative quotations which further enabled comparisons to be made within and between the medical, dental, and nursing student discussions. Charting then occurred, which involved removing some data from its original source and coding and merging it into units of meaning with other similar units. This reduced the data into 'sets' of meaning and helped illustrate inconsistencies and minority opinions. From the sets identified, twenty five sub-themes were mapped which were collapsed into the following four major themes:

- Accessibility of feedback
- Timeliness of feedback
- Quality and consistency of feedback
- Suggestions for improvement

Findings

Findings from the online survey, including free text comments, and findings from the focus group discussions are presented according to the four major themes identified from the focus group analysis.

Accessibility of Feedback through GradeMark®

The majority of students appeared to find the GradeMark® software easily accessible, especially when clear and sufficient information in its use had been provided. Ease of use was a common theme in over a third, or 23 of the 63 dental, nursing, and medical students free text survey responses. Ease of access was also reported by the majority of survey respondents, where 32% strongly agreed and 48% agreed (80% in total) that accessing annotated feedback through GradeMark® was easy; and 28% strongly agreed and 58% agreed (86% in total) that GradeMark® was an effective tool for the retrieval of assignment feedback. Only 1% of respondents strongly disagreed that retrieval of feedback was effective through GradeMark®. Students' views are represented in the following extracts from the focus group discussions and free text comments:

> I didn't have any problems with it really. There was stuff up on Learning Central…
> (Focus group, par 2, Medical student)

> There was an online guide to submitting the project, but no, not how to use it
> (Focus group, par 9, Dental student)

> It was a bit daunting initially because err it was a completely different system. I was thinking, 'oh, this is going to ... I'm going to fail or ... if it was not submitted properly. But it was so easy to use'
> (Focus group, par 3, Medical student)

> It is much better to access your grades through GradeMark
> (Nursing student free text response)

> Much easier to retrieve work than travelling to collect the copy
> (Medical student free text response)

> And because it's online you can access it wherever you are as well…it's easily found
> (Focus group, par 1, Dental student)

> Yeah. And obviously if you're away… , like if you're writing an essay up there, it would be good to refer back to, so if someone says you need to be clearer on x and y, and you could read that where you were and do it there
> (Focus group, par 1, Medical student)

While most students found GradeMark® easily accessible, 11% did not, and focus group findings revealed that some students reported insufficient guidance on the use of the system, difficulty accessing the GradeMark® software, slow or non-system response, and perceptions that the software re-formatted work. Of 84 dental, nursing and medical student free text open survey responses 15 identified a desire for more instructions and technical improvements to GradeMark®.

> Maybe just, make it easier to follow, like just, yeah just tell us how to use it
> (Focus group, par 1, Dental student)

> There was slight confusion as to how to get assignment details
> (Nursing student free text response)

> Difficult to find instructions on how to use the tool
> (Medical student free text response)

> I spent about half an hour trying to get onto it because I hadn't realised you had to use Firefox
> (Focus group, par 5, Dental student)

> It sometimes changes the format of your work
> (Focus group, par 2, Medical student)

> Yeah, and sometimes the images get skewed and jump pages and things
> (Focus group, par 4, Nursing student)

Timeliness of Receiving Feedback through GradeMark®

Another prevailing theme from the focus group research related to improved timeliness, which was also a common theme for seven of the 21 nursing student respondents to the free text open survey. Students appeared to perceive the system as quick, fair, and convenient and appreciated the facility to access their feedback and grading of their work from locations other than that of the University.

> Getting your mark on the day makes a huge difference
> (Nursing student free text response)

> Much quicker way to receive feedback as we don't have to collect the work
> (Medical student free text response)

> We got the marks a lot quicker than we expected
> (Focus group, par 2, Nursing student)

> And I think er, we got the marks a lot quicker than we expected we would
> (Focus group, par 2, Dental student)

> Yeah, that's what I found really much better, you got to receive your mark and see the feedback straight away as opposed to receiving the mark on Blackboard and then waiting to get your feedback
> (Focus group, par 3, Medical student)

> I thought it was good that everybody gets their feedback on the same day
> (Focus group, par 1, Nursing student)

Quality and Consistency of Feedback Received through GradeMark®

When asked on their view on the feedback comments received through GradeMark® 11% and 46% of respondents respectively strongly agreed and agreed that the feedback received was constructive and helped them see how they could improve. Similarly, 12% strongly agreed and 42% agreed that they were satisfied with the quality of the annotated feedback received. Focus group findings revealed that feedback through GradeMark® was more highly valued by students when it provided direction on how to improve existing and future work and prevented the repeating of mistakes. Students in this study perceived quality feedback as that which was constructive and easily understood, of use to future learning, and of sufficient quantity to be meaningful.

> But with this it was better because, you know, you were able to say, 'well, this sentence worked. This perhaps ... this sentence could be better... and because like it was just very sort of critical on certain specific points, which obviously ... you know, it's sort of constructive feedback, really
> (Focus group, par 3, Medical student)

The survey free text open questions revealed that of 63 responses, 19 students reported the specific feedback they received was highly valued. This facility appeared to be one of the most popular aspects of the GradeMark® software.

> The little highlighted bits in the text where you could drop down and it gave you a comment if they didn't think it was what, like any good, you know the little text box. They were really good as well
> (Focus group, par 4, Dental student)

> The speech bubble's I think was the best thing about the whole thing
> (Focus group, par 5, Dental student)

> I thought it was a lot better, because normally, obviously for you guys to actually write around the text, you can't do it without ruining the work, so normally you just get the sort of simple sort of paragraph at the end
> (Focus group, par 1, Medical student)

> Feedback exactly where it should be so it is completely clear
> (Dental student free text response)

> It was really useful to have the comments posted next to your work so you could understand which area they were talking about
> (Nursing student free text response)

> After being marked by GradeMark, I know which areas in particular I could have changed and feel confident I could implement them in future assignments
> (Medical student free text response)

Conversely, 17% of students were not satisfied with the quality of the annotated feedback received, 15% thought that previous feedback was more useful that that received through GradeMark® and 10% would have preferred paper-based rather than electronic feedback.

The survey revealed that 34% of students disagreed and 24% strongly disagreed that they had not received detailed annotated feedback on their work, and 16% of students strongly agreed and 46% agreed that annotated feedback helped clarify things not understood. However, findings from the focus groups and open survey free text comments illustrated some students' desire for more detailed feedback. Overall 29% of survey respondents strongly agreed or agreed that they had not received detailed annotated feedback and over 25% of students who responded to the survey free text open responses, namely, 23 out of 84, reported a desire for more detailed feedback.

> Basically, 'good's' and like 'bad's' or 'wrong's' - it just doesn't mean anything
> (Focus group, par 3, Dental student)

> It needs to have 'next time you need to set it out into headings or', you know. If it's kind of constructive, then we can go away, learn from it and get a better mark
> (Focus group, par 1, Medical student)

> More detailed comments on things to improve
> (Dental student free text response)

> It would have been nice to have explained what could have improved the essay further
> (Nursing student free text response)

When asked about their views on feedback and what value they placed on it, the focus group discussions revealed feedback was perceived as important, helpful for future work, prevented the repetition of mistakes, informed on where to focus attention, and acted as a resource.

> It's just helpful to know where you need to ... focus on what you've done wrong
> (Focus group, par 1, Medical student)

> Well it guides us on the next assignment really
> (Focus group, par 5, Nursing student)

> If they've just said, 'You've not structured it well', no good to anyone because ...how can I learn from that ...
> (Focus group, par 1, Medical student)

> We take on board their comments ... for example, if you've done something and the comment is this isn't done very well, so you'll try and obviously do it a lot better. So obviously next time, I've learnt from that and I won't do that again
> (Focus group, par 1, Dental student)

> I think it tells you what areas you need to focus on more as well. And with the comments, helps you know what you need to focus on for the next ones
> (Focus group, par 4, Dental student)

In relation to the marking rubrics, the majority of survey respondents found the rubric easy to understand, with 53% and 7% respectively strongly disagreeing and disagreeing that the rubric was not easy to understand. A combined 59% strongly agreed and agreed that the rubric clearly defined the requirements needed within each criterion and percentage banding. Only 13% of students strongly agreed or agreed a preference for previous marking criteria to the one provided through GradeMark®, although 47% of students were unsure about this. Overall 11% of students

strongly agreed and 53% agreed that marking had been fair within GradeMark®. However, only 39% of students agreed they could match comments received to the banding criteria in the rubric and only 32% agreed that the rubric helped improve their work, (45% were unsure) with 15% of students disagreeing that the rubric helped improve their work. Focus group data possibly reveals reasons for these mixed results. Those students provided with the opportunity to view the rubric prior to submission considered it a helpful learning aid. Those not exposed to the rubric beforehand evaluated it less positively, perhaps due to its unfamiliarity.

> If you've got the rubric it shows you what you're missing out on…, then you just have to look at it to see what you need to put in
> (Focus group, par 3, Nursing student)

> It guides us on the next assignment really…by having the rubric you can make an adjustment
> (Focus group, par 5, Nursing student)

> I thought that was quite good because it was pretty clear
> (Focus group, par 4, Dental student)

> It's simple. It was very easy to just look at, to pick out exactly where you were. You didn't have to go and scroll ...
> (Focus group, par 3, Medical student)

Some students reported difficulty in using the rubric online, which may also be a contributory factor to negative views.

> Yeah, and if you try to move the mouse, you lose that text, you couldn't just click on it and have it up while you're scrolling through your script. You'd have to hover the mouse over again, it was just slightly time consuming having to scroll through the script
> (Focus group, par 6, Dental student)

Suggestions for Improvement

In relation to the influence of GradeMark® on views about feedback, nearly three quarters (74%) of survey respondents strongly agreed or agreed that GradeMark® should be used more widely across the University. Twelve out of 21 nursing students and 6 out of 19 medical students responding to the free text survey questions reported GradeMark® to be an improvement on previous marking systems. The following ways to improve feedback through GradeMark® were suggested by students:

1. Provide preparation and training in the use of GradeMark®;
2. Ensure GradeMark® is available on compatible browsers;
3. Ensure students have access to rubrics prior to submission;
4. Prompt markers to provide detailed annotated comments and avoid single word feedback;
5. Prompt markers to provide positive as well as constructive feedback; and
6. Prompt markers to inform on how to enhance future work.

The following statements reflect students' views from all three focus groups.

> I think there's a lot more potential to GradeMark… obviously they can just click and give you an annotation wherever they want to. Whereas if someone's marking it by hand, they have a limited space to write and it's a lot more cramped
> (Focus group, par 3, Medical student)

> Yeah, it has a lot of potential; you can actually read what they say
> (Focus group, par 2, Medical student)

> It makes you feel a bit more positive about it I think. Because it makes you know where you can improve and that they said some things were good
> (Focus group, par 6, Dental student)

> I think just to stress that it was really good
> (Focus group, par 1, Medical student)

Discussion

This research set out to explore students' perceptions of the timeliness, accessibility, consistency, and quality of feedback received through GradeMark®. The survey, focus group, and open question responses of this study suggest that timeliness and accessibility of feedback were enhanced. Whether an improvement in the consistency and quality of feedback delivered through GradeMark® was achieved is difficult to ascertain, due to the complexities and interpretations of what constitutes 'consistent and quality' feedback from the students' perspective.

The survey findings revealed how the majority of students in this study perceived GradeMark® as easy to use and a useful learning tool through which to retrieve assignment feedback. The fact that 74% of students either strongly agreed or agreed that GradeMark® should be used more widely across the University is testimony to this.

It should be noted that favourable comments generally depended on students having had adequate preparation in the use of GradeMark® prior to assessment submission. Clear information on how to use the tool including instructions on submission, information on rubrics, and properties available within GradeMark® such as annotation, and on how to access feedback would be essential to GradeMark®'s success. The need for institutional commitment to ensure availability of appropriate technical infrastructure cannot be underestimated when considering the use of technology-enhanced initiatives such as GradeMark®.

The role of technology in facilitating effective feedback is an emerging concept in higher educational institutions. Heinrich et al. (2009) discuss how traditional routes to the provision of written feedback may be administratively burdensome and contribute to its delay and accessibility to students. These authors suggest that tools such as GradeMark® offer a potential solution through provision of more timely written feedback to students, easily accessible from any personal computer. Nursing students in particular appeared to find that the timeliness of feedback was improved through use of GradeMark®. Where this is the case it has the potential to positively impact on students learning. The optimum use of and engagement with feedback by students is dependent upon when it is made available to them (Carless, 2006; Heinrich et al., 2009); it is of greater value if provided when it still matters, in time for improvements to be made to future work (Gibbs & Simpson, 2004). Student feedback in our study was available electronically from any computer as soon as marks were released, eliminating any waiting time. This potentially advantaged students through the delivery of timely feedback, enabling them to influence future academic performance.

Bridge and Appleyard (2008) question whether students have the required level of IT skills to meet the challenges required for online electronic submission and retrieval of work. Students in their study reported lack of confidence, skills, and technological problems. Byrnes and Ellis (2006) found similar issues where students were positive about the use of paperless marking but reported concerns relating to assignment uploading problems and slow internet connections. Eleven per cent of students' in our study disagreed that accessing feedback through GradeMark® was easy and focus group themes revealed students from all three disciplines experienced techni-

cal problems relating to access difficulties, slow response, and formatting changes. Technical issues may interfere with the success of any online feedback system as the findings of our study demonstrated. Solutions that may help to reduce technical problems, minimise corruption of work, and speed up electronic working could be achieved from accessing GradeMark® through browsers such as Firefox, Chrome, or Safari.

Rubrics can offer a useful framework against which students can develop work to the required academic level. Students in our study who were introduced to rubrics in the development stage of their assessment found them helpful. Those with little awareness of the rubrics questioned their value. This raises the importance of providing students with assessment criteria whether or not a computer system is used to provide feedback. Suggestions for improvement highlighted by students centred on the importance of preparation in using the GradeMark® software and stability of the system. Detailed, elaborative feedback, as previously discussed, which focuses on feeding forward to improve future work dominated the students' perspective.

Quality of feedback is considered a key factor in the enhancement of future learning (Beaumont, O'Doherty, & Shannon 2011; Parboteeah & Anwar 2009), and students want and should expect detailed and constructive feedback. Whether this is always experienced is debateable (Price, Handley, & Millar, 2011). Perceptions of what constitutes quality feedback are dependent upon its interpretation. Students in this study perceived quality feedback as that which was constructive and easily understood, of use to future learning, and of sufficient quantity to be meaningful.

Constructive feedback should help bridge gaps between desired and current performance by explaining where and why students have made errors as well as suggesting ways to make improvements (Boud & Associates, 2010; Sadler, 2010). Thus, students benefit from what Shute (2008) describes as directive and facilitative feedback. Directive feedback verifies the accuracy of existing work while facilitative feedback informs on ways to elaborate further (Archer, 2010). Feedback through GradeMark® was more highly valued by students when it provided direction on how to improve existing and future work and prevent the repeating of mistakes.

Students find over-generalised or vague feedback unhelpful; it is more readily accepted and likely to result in improved practice when presented clearly (Weaver, 2006). One of the commonest problems experienced by students relates to difficulty in interpreting which aspect of their work feedback relates to, that is, its specificity (Adcroft, 2010). Students in this study reported feedback received through GradeMark® enhanced its specificity due to assessors' ability to deliver feedback as annotated comments placed alongside text. Students appeared to like this feature, commenting that it increased the meaningfulness of feedback. Such findings tentatively suggest that improvement to the quality of feedback may be facilitated by GradeMark®, although it is open to the same limitations as other types of feedback. Unless feedback is detailed, understandable, jargon-free, and clearly applied, it is of little use. The influence of the marking rubric may have also influenced students' positive view on their feedback

A range of factors negatively affected student perceptions of GradeMark® that were unrelated to the online software and focused on feedback practice. Dissatisfaction with feedback arose when it was deemed ambiguous, which is a well-recognised criticism (Archer, 2010; Hanna & Yearwood, 2012; Price, Handley, Millar, & O'Donovan, 2010). GradeMark® does not appear to change academics' marking practice. It is important to remember that provision of online feedback, either as annotated comments alongside text or as general comments, does not necessarily translate into the provision of what could be deemed quality feedback.

Strengths and Study Limitations

The 62% response to the on-line survey may be regarded as noteworthy when considering response rates to such surveys often fall below 30%. It is acknowledged this figure was reached

through combining response rates from each respective school's survey, which may be a limitation due to sampling bias (Nulty, 2008).

Relying on students' perceptions to evaluate the GradeMark® tool has its limitations as learning what students like is legitimate; equating what students like and what is in fact best for them is quite another. Other limitations include the low numbers in the nursing and medical student focus groups and the high number of participants in the dentistry focus group. However, an amalgamation of the focus group and survey data serves to strengthen the findings of the study.

Conclusion

The introduction of GradeMark® was a mostly positive experience for students. It enhanced their learning and teaching experience, which may yield secondary rewards for Higher Education Institutes (HEI) in elevating National Student Survey scores in the domain of assessment and feedback. Our findings suggest that GradeMark® improved the timeliness and accessibility of feedback for students, provided they are given clear instruction on the use of the software, and technical support is made available in the early stages of adopting the system. This does not differ from any new technology students are requested to engage with as part of their learning and teaching experience in HEIs. The provision of information and mock sessions to allow students to practise using Grademark® prior to electronic submission and retrieval of feedback will reduce anxiety, increase confidence, and positively enhance skills required to access feedback in a timely manner.

GradeMark® acted as a catalyst for reviewing the quality of academic practice in relation to feedback and to gain student opinion as to what could be improved, a distinct advantage not previously considered. Our findings indicate that such rubrics should be available to students, as well as the development of written assessments to enable performance to be enhanced through self-evaluation against the criteria. It is recognised that these issues constitute excellence in academic practice, not confined to the use of electronic methods of feedback.

Our findings are inconclusive as to whether GradeMark® improved the quality of feedback. Annotation was greatly valued by students and, although not confined to GradeMark®, offers a method of standardisation for review and audit of academic feedback across schools and institutions. This hidden advantage is not widely publicised and, if adopted as standard practice, may do much to improve students' learning experience.

The positive outcomes from this research have led to the integration of GradeMark® into the working practice of Schools involved in the study. Our experiences should help inform future academic practice in planning a pragmatic approach to the delivery of quality electronic feedback, using a system such as GradeMark®. The findings add to the body of knowledge regarding what may help to constitute excellence in written academic feedback on theoretical essay type assessments, based on students' aspirations. However, further research is required to evaluate whether GradeMark® can indeed improve the quality of feedback, and once embedded, whether students' favour such a system over and above others which may be in place. Students' learning and teaching experience and views of academic practice will influence the future success and viability of programmes offered by HEIs.

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Biographies

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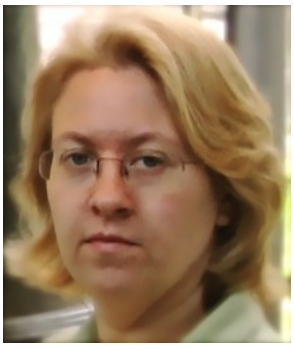

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Mike Johnson has designed and delivered information technology-related learning opportunities across the School since July 2001. He plays a vital role in exploring, leading and supporting the use of technologies for learning and academic work. In 2006 he completed a Masters in Advanced Learning Technology with Lancaster University which introduced him to the fields of networked learning and cultural-historical activity theory: his operating frameworks for teaching and research in and with learning technology. Mike has presented at the last three International Networked Learning Conferences and review books and articles for the British Journal of Educational Technology. He also blogs formative thoughts at http://networkedlearning.blogspot.com

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Generative Learning Strategy Use and Self-Regulatory Prompting in Digital Text

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Abstract

The digital revolution is shifting print-based textbooks to digital text, and it has afforded the opportunity to incorporate meaningful learning strategies and otherwise separate metacognitive activities directly into these texts as embedded support. A sample of 89 undergraduates read a digital, expository text on the basics of photography. The treatment prompted the reader with self-regulatory questions and embedded a generative strategy, paraphrasing, and confirmed previous research on the relationships between prior knowledge and level of self-regulation on reading comprehension.

A one-way between subjects ANOVA revealed significance for the level of self-regulation on comprehension-level items and for the level of prior knowledge on recall-level items. ANOVA also indicated that the quality of paraphrasing has a significant impact on recall-level and overall performance on the posttest. Further, participants were generally positive towards the instructional materials, which suggests willingness, and in some cases, preference, to reading in a digital format while experiencing embedded, metacognitive instructional interventions. It is recommended that comprehension may be enhanced by providing deeper training on the use of the generative strategy and by increasing motivation prior to interacting with the text in order to capitalize on the unique advantages of digital materials.

Keywords: digital text, generative strategy, self-regulation, calibration, prompts.

Introduction

In 2010, 48% of graduating high school seniors who took the American College Testing (ACT) examination did not meet the college readiness benchmark for Reading (ACT, 2010). Consequently, college students arrive on campuses with a deficiency in basic literacy skills; as a result, these students are often set up to fail when asked to perform a task such as processing and comprehending a narrative or expository text when they lack the fundamental skill to do so. In addition to deficient reading skills, many readers lack calibration, or the ability to assess their understanding and comprehension of material accurately, which can have devastating effects on their study habits, test preparedness and learning performance (Glenberg, Sanocki, Epstein, & Morris, 1987). Often, college students are expected to read both narrative and expository material, but many do not read actively for

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comprehension. In fact, many students use shortcut tactics such as skimming, memorizing, re-reading, or simply looking over the text expecting to derive meaning and understanding (Simpson & Nist, 1990). In addition, readers are very likely to become distracted or disengaged from the material, and in fact, the most egregious errors in reading can be attributed to the reader's "self-generated distractions" (Rigney, 1978). Accordingly, reading becomes ineffective when meaningful strategies are not employed during the act. Inaccurate calibration of understanding also may give a false sense of comprehension. To promote literary understanding and to save time, the learner should become an active reader by interacting with the text through the use of generative learning strategies and by increasing metacognitive awareness through self-regulatory intervention (Wittrock, 1985; Zimmerman, 1990). When computer-based learning environments are used to enhance instruction through the implementation of embedded prompting and generative learning strategies, that computer becomes a "metacognitive tool" (Azevedo, 2005) that aids in participatory reading and results in metacognitive awareness.

The electronic book, or e-Book, is any electronic version of a book that is viewable on electronic devices, such as a computer screen or hand-held personal digital assistants (PDA's), smart phones, or tablet PC's (DeSouza, Hon, Kim, Lee, & Leong, 2004). Devices specifically designed for reading digital text (referred to as e-Readers) include the Amazon Kindle, and Barnes & Noble Nook; more sophisticated devices such as tablet computers (Apple's iPad, Samsung's Galaxy, and Amazon's Kindle Fire), handheld mobile devices such as smart phones, and personal computers have the capability to read electronic text in addition to higher computing powers. The 2011 Horizon Report indicates that electronic books have an adoption timeframe of one year or less and that they "have the potential to truly transform educational practice" (Johnson, Smith, Willis, Levine, & Haywood, 2011). The e-book has been touted as the next big revolutionary force in education, and its usage has been predicted to shift from "occasional oddity to a mainstream technology in less than five years" (Nelson, 2008). Nationwide e-book sales, in general, have increased by 164% from 2009 ($166.9M) to 2010 ($441.3M), and in 2010, the number of e-books available in iTunes surpassed the number of games (Association of American Publishers [AAP], 2011; Ingram, 2010). A study by Springer (2008) indicated that most e-book users utilize the technology for research-oriented tasks, followed by studying, teaching, and leisure, respectively. Moreover, preferences for e-book usage seem to correspond with age; younger readers are more open to the prospect of digital text than older generations (Rowlands, Nicholas, Jamali, & Huntington, 2007). Although there have been limited studies that suggest readers prefer paper-based documents to digital text (Dillon, 1994; Schilit, Price, Golovchinsky, Tanaka, & Marshall, 1999), digital text can provide unique advantages such as searching and locating key words and phrases, hyperlinking sections of the text, high portability, affordable price, and easy accessibility and storage of documents (Johnson et al., 2011; Waycott & Kukulska-Hulme, 2003). In addition to these basic functions of digital text, possibly the greatest advantage for electronic textbooks is the potential for embedding learning strategies coupled with self-regulatory prompting that has been studied in a computer-based learning environment (Johnsey, Morrison, & Ross, 1992).

In academia, where students encounter a high volume of text, devices with digital text such as e-Readers and tablet PC's provide an economical advantage over print-based books. And from an instructional perspective, digital text lends itself to manipulative, customized, and adaptive tutoring through the use of embedded learning strategies and direct, personalized learning intervention. Technological advancements have afforded the ability to embed learning strategy tools directly in the material. Customization of instruction in conjunction with reactive embedded strategies and self-regulatory prompting can increase comprehension, understanding, and ultimately, learning achievement (Azevedo & Cromley, 2004; Lee, Lim, & Grabowski, 2010; Sitzmann & Ely, 2010). Therefore, instructional designers and instructors alike should focus efforts on developing computer-based learning environments with respect to metacognitive tools in order to facilitate learning processes.

In computer-based learning environments where there is a continuum spanning from complete program control to complete learner control, the learner may be faced with varying degrees of control of the instruction. Embedding generative learning strategies in this environment enables personalization of the material through direct prompting of the use of self-regulatory, metacognitive activities. Inserting embedded generative strategies in digital text is highly conducive to an online environment since many instructional programs and applications offer the ability to assimilate customized features into the material (Johnsey et al., 1992). These attributes can include the prompting of the use of generative learning strategies and increase metacognitive awareness through reflective questioning of the success of the learning strategy.

The focus of this study is to investigate the effects of embedded generative learning strategies and self-regulatory prompting as metacognitive tools on calibration of comprehension, reading performance, and subsequent learning achievement. The confluence of existing research in generative learning, self-regulated learning, and calibration provide a basis for this study.

Literature Review

Generative Learning

Learning is generative in nature; that is, the model of generative learning explains the relationships between the learner and the information being comprehended and describes the process by which one relates new information to existing knowledge (Wittrock, 1985). This model promotes instructional activities as being learner-centered, and asserts the learner as an active, not passive, participant in the learning process (Lee, Lim, & Grabowski, 2008). Generative learning strategies for processing a text include a variety of methods. Prior research has supported the notion that generative learning techniques such as underlining, note taking, paraphrasing, summarizing key ideas, generating questions, and making inferences and predictions from the text improve reading comprehension and understanding (Barab, Young, & Wang, 1999; Bobrow & Bower, 1969; Doctorow, Wittrock, & Marks, 1978; Hirshman & Bjork, 1988; Johnsey et al., 1992). These strategies range from simple mnemonic tasks for recall to more elaborate strategies that result in deeper cognitive processing, which in turn leads to more meaningful learning (Cermak & Craik, 1979; Craik & Lockhart, 1972).

Wittrock's (1974) generative model of learning supposes that reading comprehension is enabled when learners assign prior knowledge and personal memories and experiences to the material in order to construct a new meaning for the text. This model emphasizes a learner-centered approach rather than a didactic style of information processing. Two models specific to text design and reading comprehension reside within this framework: (1) The generative model for designing text, and (2) the generative model for the teaching of comprehension.

Generative model for designing text

Jonassen (1985) classifies techniques for generative text design into three categories: (a) Producing distinctive memories, (b) accessing and relating prior knowledge, and (c) organizing information. Ultimately, a text should be designed so that the reader's generative strategy use is stimulated. Digital text can initiate the learner's generative processes by prompting the reader to interact with the text. Rigney (1978) uses an orienting task such as instructions and inserted questions to prompt the learner to apply cognitive strategies to the narrative information, or content blocks. Strategies are either embedded (within the content) or detached (separate from the content) (Rigney, 1978). Computer-based instruction (CBI) easily becomes customizable and individualized through the use of embedded prompts and features in instructional programs(Johnsey et al., 1992). Digital text can facilitate generative text design through the use of embedded and detached strategies.

Generative model for the teaching of comprehension

Wittrock's (1991) model for the teaching of reading comprehension relies on four factors: (a) Students' preconceptions, knowledge, and perceptions, (b) motivation, (c) attention, and (d) generation. Metacognitive processes can be included under the fourth category, generation. Wittrock (1992) compares this generative learning model to neural systems in the human body: "Neural systems do not transform inputs into outputs, as, for example, digestion does…this cognitive model [is] a theory of generative brain functioning, rather than an information processing model of memory" (p. 535). The generative model likens the process of learning to the human brain, as opposed to the digestion system, in that the brain does not simply intake knowledge and stores it; knowledge is built or constructed by the learner using thoughtfully designed strategies. Once the learner has developed the awareness to recognize his or her own cognitive strengths and weaknesses, he or she begins to self-regulate learning and select the most appropriate and effective strategy for each learning situation.

Types of generative strategies

Jonassen (1988) identifies four categories of generative strategies: Recall, integration, organizational, and elaboration. Grabowski (2004) further classifies all strategies as either organizational or integration, with the latter category requiring more effort on the learner's part. If a learner is simply relating different ideas contained in the text, it is organizational, but if he or she is actively connecting these ideas to prior knowledge and experience, then the process is classified as integration. Reading comprehension, with which this research is ultimately concerned, "occurs from formulating connections, rather than solely by the function of 'placing' information of 'transferring' information in memory. The subtle difference lies in the *creation of new* understanding of the information by the learner, rather than *changing* of the presented information" (Grabowski, 2004, p. 720). Generative learning through the lens of reading comprehension demands an integration of information in the text with individual ideas, experiences, and prior knowledge.

Organizational strategies require a lower level of cognitive processing because the learner is organizing the external information presented to him or her, but he or she is not taking the additional step of associating this information with prior knowledge and experiences that is creating or refining schema. Some examples of organizational strategies include creating questions, headings, concept maps, summaries, outlines, diagrams, and taking notes (Grabowski, 2004). To an extent, underlining and highlighting serve as organizational strategies since they are merely selecting information, though some argue that these techniques may also be generative in nature (Bell & Limber, 2010; Harris, 1990; Nist & Hogrebe, 1985; Rickards & August, 1975). Although results are mixed, some studies have confirmed the use of organizational strategies as contributing to higher course performance. In particular, Barnett, DiVesta, and Rogonzenski (1981) and Peper and Mayer (1986) found that learners who participated in notetaking performed better than those who did not. Rickards and August (1975) found that underlining was also an effective strategy, when the learners selected the most relevant information. Selecting irrelevant information does not promote generative learning, necessarily, nor does it advance the learner towards accomplishing the learning goal. While using these types of strategies may be an effective method of organizing information to some degree, strong self-regulation skills are required to augment the acquisition of knowledge by ensuring the information being selected is pertinent and corresponds with the learning goal.

In order to promote deeper processing of the material, integration strategies should be favored over organizational strategies. These techniques include paraphrasing, demonstrations, mnemonics, prediction making, inferences, analogies, and metaphors, among others, which lead to modifying or creating new schema. While digital text is conducive to both organizational and integration generative strategies, deeper, more complex learning strategies benefit the learner in terms of

comprehension and retention of the material. Some studies have shown the benefit of implementing integration strategies; summary-writing and sentence elaborations have been identified as effective tools for improving reading comprehension (Doctorow et al., 1978; Hooper, Sales, & Rysavy, 1994; Wittrock & Alesandrini, 1990). However, results from studies focusing on both organizational and integration learning strategies are mixed. Since findings and results vary, it is assumed that there is no single superior generative learning strategy. Instructional designers must identify the objectives of the course or lesson first, before assigning a specific type of strategy to execute that objective. In fact, there is no magical strategy that works in all learning environments (Nist, Simpson, Olejnik, & Mealey, 1991). Moreover, learning strategies are ineffectual when the learner is unfamiliar with the strategy or how to apply the strategy to the learning situation (Weinstein, Rood, Roper, Underwood, & Wicker, 1980). Rather than focusing on one strategy in particular, educators should concentrate on developing students' self-regulation and metacognitive skills so that the learner can diagnose each situation with the appropriate generative technique.

Self-Regulated Learning

Self-regulated learning, or SRL, is a critical aspect of learning. Gardner (1963) asserts that emphasis should be placed on the learner's pursuit of knowledge. Instruction that encourages an awareness of metacognitive learning strategies and decisions through prompting and self-questioning strengthens the ability to self-regulate one's own cognitive abilities. Further, research suggests that learners who use self-regulatory processes perform better in terms of reading comprehension (Lee, Lim, & Grabowski, 2009) and overall academic achievement (Puzziferro, 2008; Zimmerman & Martinez Pons, 1988).

Self-regulated learning contains three core components: Metacognitive awareness, strategy use, and motivational control (Zimmerman, 2000). Self-regulated learning strategies are "actions and processes directed at acquiring information or skill that involve agency, purpose, and instrumentality perceptions by learners" (Zimmerman, 1989). Metacognitive awareness, or metacognition, is the knowledge that learners have about their own cognitive processes. Brown (1980) identifies two areas of metacognition: knowledge of cognition (what we know about our thought processes, and what we know about ourselves as a learner), and regulation of cognition (how we regulate our cognitive processes, such as goal-setting, planning, implementing strategies, monitoring, and self-evaluation). By improving metacognitive awareness, readers can ultimately improve the regulation of their own cognition, which is a primary goal of an educator. One method for improving metacognition and self-regulation is by embedding prompts into the text that cue the reader to employ a particular learning strategy (in this study, paraphrasing), and then cue that reader to reflect on the level of understanding of material (in this case, through self-regulatory prompting), and last, have the reader self-evaluate his or her performance so that he or she will monitor future text comprehension.

According to Zimmerman (1990), self-regulated learners plan, set learning goals, organize, self-monitor, and finally, self-evaluate their own learning performance. A highly self-regulated learner consciously attends to the metacognitive, behavioral, and motivational components of the learning task, and he evokes the use of specific learning strategies that have been proven successful over time to accomplish learning goals and objectives. Skillful self-regulators are innately interested in the material and possess the ability to adapt to each learning situation while adhering to a specific learning goal, whereas naïve self-regulators are disinterested, non-adaptive, and operate without an organized plan (Zimmerman, 1998). When a reader is prompted with generative learning strategies in addition to providing metacognitive awareness, there is an increase in recall, text comprehension, and self-regulation (Bouffard-Bouchard, 1994; Lee et al., 2010).

Self-regulatory prompts function as interventions within the instructional material that cue the reader to engage in self-regulatory consciousness. This consciousness can be achieved through the use of two types of self-regulatory prompts based on prior research: self-monitoring and self-evaluating (Kauffman, 2004; Sitzmann, Bell, Kraiger, & Kanar, 2009). Self-monitoring prompts question the reader about setting and achieving learning goals, external distractions from the instructional material, and mental effort. Self-evaluating prompts focus specifically on the comprehension of the instructional material (See Appendix A).

Self-regulation can be divided into three dimensions: (a) Strategy use, which differentiates between metacognitive, motivational, and behavioral strategies that learners select and use, (b) The covert or overt responsiveness to feedback from the use of the selected strategies, which is often referred to as the self-oriented feedback loop (Carver & Scheier, 1981), and (c) The self-perceptions (in this study, calibration) of his or her own academic accomplishment (Zimmerman, 1990). This study utilizes all three dimensions of self-regulation by providing the reader with a generative learning strategy (paraphrasing), by reflecting on the effectiveness of those learning strategies through self-regulatory prompting, then, if necessary, by refining the selected learning strategy in order to achieve the reader's learning goal, and finally, by increasing metacognitive awareness through calibration of comprehension by asking the reader to report his level of confidence in understanding the material.

Self-regulation is "a series of volitional episodes" (Kuhl & Goschke, 1994). High self-regulators set goals, attend to the strategies employed to reach that goal, and reflect on the decisions that worked for them in attaining the goal. In turn, low self-regulators are not as attuned to these learning processes; accordingly, high self-regulators tend to be better calibrated than lower self-regulators (Stone, 2000). Consequently, high self-regulators tend to perform better (Butler & Winne, 1995; Pintrich & DeGroot, 1990). Therefore, it is logical to conclude that a well-calibrated learner has moderately high self-regulation and will perform better in terms of academic achievement.

Metacognition

Metacognition is the process by which learners understand and are conscious about the strategies they choose to accomplish a learning task; metacognitive awareness is a dimension of self-regulation that is imperative for meaningful learning to occur (Lee et al., 2010). Metacognitive strategies require the student to actively monitor their learning processes, reflect on them during and after learning, and revise their processes in future applications (Bannert, Hildebrand, & Mengelkamp, 2009; Zimmerman, 1990). One method for encouraging learners to engage in reflective behavior is by providing self-regulatory prompts. Evidence suggests that metacognitive awareness is increased when self-regulatory prompts are provided (Hubner, Nuckles, & Renkl, 2006; Sitzmann & Ely, 2010; Walczyk & Hall, 1989) and that metacognitive activity during instruction results in better learning performance and higher self-efficacy (Schmidt & Ford, 2003).

Research indicates that student achievement is relatively equal in paper-based and computer-based learning environments in terms of cognition, though performance on metacognitive regulatory processes and prediction of performance is significantly lower on screen media (Ackerman & Goldsmith, 2011). This finding suggests the need for metacognitive support in computer-based learning environments. Evidence shows that students will not actively pursue metacognitive activities on their own (Weinstein, Husman, & Dierking, 2000; Winne, 2005), thus metacognitive instruction could be embedded directly into the material to help guide the reader and to increase metacognitive awareness and increase learning performance (Baker, 1994; Bannert et al., 2009; Lee et al., 2010; X. Lin, 2001; Sitzmann & Ely, 2010).

Learner-controlled instruction

An important factor in self-regulation is independence. The better a reader can independently self-regulate his or her own learning, the more control he or she is able to have over the instruction. In terms of generative learning, Jonassen (1985) stresses that true generative learning is initiated and controlled by the learner. In the case of multimedia learning and digital text, the reader has to select and construct a unique sequence through the instruction (Lawless & Brown, 1997). Some research on learner-controlled instruction suggests that learners benefit from a higher amount of control over the instructional pace and sequence (Gray, 1987; Hannafin & Sullivan, 1996; Kinzie, Sullivan, & Berdel, 1988; Lawless & Brown, 1997; Nist et al., 1991). In contrast, there is evidence that learner-controlled instruction does not benefit the learner academically (Morrison, Ross, & Baldwin, 1992; Pollock & Sullivan, 1990; Ross & Rakow, 1981).

Given that prior research has identified generative learning as an effective learning tool and that metacognition is critical to learner achievement, it is logical to conclude that digital text may be effectively utilized by embedding learning strategies that contain metacognitive and self-regulatory prompts. Moreover, a heightened metacognitive awareness leads to enhanced self-regulation, which, in turn, equips the reader with the knowledge to read, process, and comprehend a narrative text and gradually support his or her own learning processes (Sitzmann & Ely, 2010). The mass digitization of text and increase in number of technological devices capable of interacting with digital text has paved the way for instruction to take a more embedded, adaptive approach to learning materials.

Calibration

Calibration is the accuracy at which a person's discernment of his or her performance aligns with the actual performance (Hacker, Bol, & Keener, 2008). Typically, calibration is categorized as *prediction*, the relation between a student's confidence and performance (or between predicted and actual performance), or *postdiction*, assessing performance on an exam after it has been completed. This research is concerned with the former, prediction, which is also referred to as calibration of comprehension. Glenberg et al. (1987) defines calibration as the "correlation between ratings of confidence in comprehension and actual performance on an objective test of comprehension" (p. 120). This attribute is important for students because accuracy of the calibration of comprehension, or the ability to accurately predict understanding of a text, could potentially influence self-regulatory processes, and in turn, academic achievement. A reader who is overconfident in his or her understanding of a text could fail to activate deeper comprehension skills, while a reader who is underconfident in his or her understanding could be spending time inefficiently (Hacker, Bol, & Keener, 2008; L-M. Lin & Zabrucky, 1998). Further, when there are specific testing conditions under which time is a factor (as in with timed exams, or time spent preparing for an exam), calibration of comprehension could negatively influence a learner by predicting a false sense of readiness or preparedness for an exam, thus leading to an abbreviated study session and poor test performance (Glenberg et al., 1987). In general, readers are not well-calibrated; underconfidence is associated with higher performance and overconfidence with lower performance, and as a result, poor calibration is common (Glenberg et al., 1987; Hacker, Bol, & Keener, 2008). Calibration accuracy, in terms of prediction and postdiction, is resistant to change or improvement most likely because multiple factors influence a person's ability to make objective judgments, including a person's internal and external learning attributes (Bol & Hacker, 2005).

Improvement of calibration may be linked to motivational and attitudinal beliefs of the learner since providing extrinsic rewards have been shown to increase performance (Schraw, Potenza, & Nebelsick-Gullet, 1993). In terms of attribution, or a person's explanation for his or her success or failures (Graham & Weiner, 1996), higher-performing students tend to take more responsibility

in their calibration accuracy than lower-performing students, who often blame instruction, study efforts, or social influences (Hacker, Bol, & Bahbahani, 2008).

Calibration of comprehension is enhanced when the feedback is self-generated (Glenberg et al., 1987; Walczyk & Hall, 1989). If providing the learner with self-regulatory prompting increases self-regulation, then the learner may develop a better sense of calibration as a strong overlap exists between calibration and self-regulation (Stone, 2000). It is likely that high self-regulators will be more accurate in their calibration of comprehension.

For the purposes of this study, calibration of comprehension is important because of its inexplicable connection to metacognitive and self-regulatory processes (Stone, 2000). Calibration of comprehension is important not only for developing an understanding of the written text, but for the reader to realize this understanding has been achieved (L-M. Lin & Zabrucky, 1998). Calibration of comprehension is a self-assessment of the level of confidence in understanding the material. Calibration is considered a subset of the metacognitive component of self-regulation (Zimmerman, 1990). By implementing embedded learning strategies and self-regulatory prompts, metacognitive awareness can be increased, which may result in a more accurate calibration of comprehension and, ultimately, better learning outcomes.

Research Questions and Hypotheses

The purpose of this study was to examine the effects of embedded self-regulatory and generative learning strategy prompts in expository text on calibration of comprehension and achievement in college undergraduates. The general attitudes of learners towards this method of instructional intervention are also of interest to this study. The following research questions were addressed:

1. What are the effects of embedded generative strategy use and self-regulatory prompting in digital text on achievement?

2. Is there a relationship between generative strategy and self-regulatory prompting in digital text and calibration of comprehension?

3. How do the treatments impact attitudes towards embedded strategies in digital text?

The following hypotheses are proposed. First, individuals who receive the generative strategy + self-regulatory prompting treatment will perform significantly better on the posttest than those who receive the generative strategy only, the self-regulatory prompts only, and the control group. Adding metacognitive awareness that directs learners to revisit and revise their learning strategies has been shown to increase reading comprehension (Kauffman, 2004; Lee et al., 2010), and research suggests that prompting knowledge about appropriate learning strategies enhances comprehension monitoring and performance on comprehension tests (Bouffard-Bouchard, 1994). Second, participants receiving both the generative strategy and self-regulatory prompts will report a higher correlation for calibration of comprehension than the generative strategy use only treatment, the self-regulatory prompting only treatment, and the control group. A positive relationship exists between self-testing and calibration of comprehension (Walczyk & Hall, 1989). Third, participants who receive self-regulatory prompts will have a more favorable attitude towards the instructional materials than those who do not receive that metacognitive support. Sitzmann and Ely (2010) point to self-regulatory prompts as support devices that invoke the learner's internal locus of control, serve as encouragement for success, and increase the likelihood of completing the task.

Method

Participants

The 89 participants in this study were recruited from several higher education institutions in the southeastern United States. Participation was voluntary, and backgrounds varied. The majority of the participants (80.9%) were between the ages of 18-25. The next highest age range was 26-35 (6.74%), followed by others (36-45, 5.62%; 46-55, 1.12%; 56+, 1.12%; N/A, 4.49%). Of the 89 participants, the majority (58.43%) was females.

Research Design

Table 1 depicts the research design, which was a 2x2 randomized experimental factorial design, and the participants were randomly assigned to one of four groups: generative strategy use + self-regulatory prompting (mixed), generative strategy use only (GSP), self-regulatory prompting only (SRP), and control (control). The dependent variables were (a) achievement (measured by a post-test), (b) calibration of comprehension (measured by the correlation between confidence judgments and the actual performance on the criterion posttest), and (c) attitudes toward instructional materials. The independent variables were self-regulation and generative strategy use.

Table 1: 2x2 factorial design used in the data analysis

	Generative Strategy	No Generative Strategy
Self-Regulatory Prompts	Group 1 (Mixed) *n* = 21	Group 3 (SRP) *n* = 25
No Self-Regulatory Prompts	Group 2 (GSP) *n* = 20	Group 4 (Control) *n* = 23

Treatments and Materials

All groups completed the instructional treatment on a PC-based laptop in a computer lab setting. Participants completed the treatment in one sitting at their own pace. Multiple sessions were offered at scheduled times to maximize the number of study participants. Each participant experienced the same instructional unit, which was created using a fillable PDF form. The unit covered the basics of photography and was approximately 2,000 words in length. The text's readability had a Flesch Reading Ease of 59.4 and a Flesch-Kincaid Grade Level of 9.3.

Prior to the study, the digital text (minus the prompts) was distributed to 50 undergraduates in order to identify the areas where prompting was most desired. Participants were instructed to read through the PDF and indicate where they began to lose comprehension of the text by typing an "x" on the page. The results from this survey determined the location of the embedded strategies with self-regulatory and generative learning prompts in the unit of instruction used in the treatments.

Prior to the instructional treatment, all participants completed a pretest on general photography to detect participants with high levels of prior knowledge. The first treatment group (labeled as Mixed) completed the self-paced unit of instruction on the basics of photography. After reading passages of expository text, the participants were asked to paraphrase the information on a subsequent page. Further, self-regulatory prompts were embedded on a page directly after the page

with the generative strategy to promote the participant's self-regulation skills. Self-regulatory prompts are self-monitoring and self-evaluative questions that ask the learner to reflect on their understanding of the material and the learning (See Appendix A). The embedded prompt questions were derived from a study conducted by Sitzmann & Ely (2010), which emphasizes the importance of prompting self-regulation on learning. The second treatment group (labeled as GSP) experienced the same text and was asked to paraphrase the information on a subsequent page. No self-regulatory prompts were given. The third treatment group (labeled as SRP) covered the same text and was prompted with self-regulatory prompts but not asked to use a generative strategy as in the previous two treatment groups. Last, the control group read the same passage of text but did not encounter the generative strategy or self-regulatory prompts. All groups reported a level of calibration at the end of the unit; that is, the participant rated his confidence in understanding the material on a level of 1-7, ranging from "not very confident" to "extremely confident." In addition, a 10-question survey on attitude towards the instructional materials was distributed with Likert-type questions ranging from "Strongly Agree" to "Strongly Disagree," (See Appendix B), as derived from Johnsey et al. (1992). The participants in the Mixed and GSP treatments also received training on how to properly paraphrase prior to beginning the unit. All participants were given the same pretest and posttest. Once the posttest began, re-reading of the information was not permitted, and all participants were allotted two hours complete the unit.

The most robust treatment group (Mixed) viewed 40 total pages (totaling 1,923 words). In total, there were nine pages of instructional content that all treatments experienced. However, the Mixed treatment had 13 pages dedicated to generative strategy use and self-regulatory prompts. The GSP treatment received the same, minus the self-regulatory prompts. The SRP treatment consisted of the nine pages of instructional text plus the separate pages that prompt self-regulation. And the control group experienced the instructional text only.

Instruments

The participants completed a pretest in order to determine level of prior knowledge on the subject of photography. The pretest consisted of a 5-question criterion-referenced test covering general photography concepts. The questions were at a general level to avoid direct cueing of the content. For example, photos were provided and the participants selected the correct shutter speed and *f*-stop used to capture the image. To assess the participant's level of self-regulation, each completed a 20-question Motivated Strategies for Learning Questionnaire (MSLQ) as developed by (Pintrich, Smith, Garcia, & McKeachie, 1991). The MSLQ has been shown to have acceptable reliability and internal consistency (Pintrich, Smith, Garcia, & Mckeachie, 1993). Two items from the MSLQ were used: The Expectancy Component: Self-efficacy for Learning and Performance (Alpha: .93) and Cognitive and Metacognitive Strategies: Metacognitive Self-Regulation (Alpha: .79). The Likert-type questions range from 1-7, from "not at all true of me" to "very true of me." Not all items from the MSLQ were used in this study because of their irrelevance to the research questions. The Motivation Items omitted were Intrinsic Goal Orientation, Extrinsic Goal Orientation, Task Value, Control Beliefs about Learning, and Test Anxiety; the Learning Strategies Items omitted were Rehearsal, Organization, Elaboration, Critical Thinking, Time and Study Environment, Help Seeking, Effort Regulation, and Peer Learning.

At the end of the instruction, prior to the posttest, the participants in each treatment gauged their understanding of the material by providing a subjective rating of 1-7, ranging from "not very confident" to "extremely confident." Next, an attitude survey was administered to all groups with 10 Likert-type questions ranging from "Strongly Agree" to "Strongly Disagree," derived from Johnsey et al. (1992), to assess the participants' attitudes towards the instructional materials ($\propto$ = .8455). To measure learning achievement, a criterion posttest was administered and scored for the total number of items answered correctly. The 13-question posttest was composed of multi-

ple-choice questions that tested the learner at recall and comprehension levels of Bloom's Taxonomy (r = .4801). Items 1-11 were at the recall level, and item numbers 12 and 13 tested the learner at a higher level of learning, comprehension, and thus were weighted more heavily.

Procedure

Students were provided one of the four instructional treatments (Mixed, GSP, SRP, and control group). To ensure randomization, participants were assigned a treatment at random; participant one received the treatment from group 1, participant two received group 2, and so on. A moderator gave a brief explanation instructing the participants on how to operate the instructional program such as navigation, using the interactive tools, and what to do if there is a question. These directions were also provided in the beginning pages of the instructional text. Participants were asked to click to the next page where the informed consent form gave them a fair explanation of the study and their rights and privileges as participants. A digital signature was required of the participant in order to proceed with the study.

All treatments began by reading the informed consent form followed by a set of directions that explained the sequence of the instruction. Participants then completed the modified MSLQ survey, which consisted of 20 Likert-type questions, and a pretest, which consisted of five criterion-referenced multiple-choice questions. This information did not impact the instructional sequence but provided insight into the participant's levels of self-regulation and prior knowledge.

The participants in the Mixed and the GSP groups completed a brief tutorial on how to properly paraphrase material before beginning the instructional unit. The tutorial on paraphrasing provided a model of effective paraphrasing and asked the participant to complete an example. The participants were asked to compare their attempt with an expert's version. After completing the paraphrasing training, the two groups read the unit overview. The instructional unit provided two to three pages of content and then asked the participants to paraphrase the information on the passage. Following that, a page with self-regulatory questions prompted the participants to evaluate the effectiveness of their generative strategy and to monitor future use (See Figure 1). Metacognitive awareness was provided through the use of self-regulatory prompts, which ask the participants to review the learning strategy's effectiveness. The self-regulatory questions mimicked those used by Sitzmann & Ely (2010) such as "Am I focusing my mental effort on the material," "Are the study strategies I'm using (paraphrasing) helping me to learn the material?" "Do I have any thoughts unrelated to the material that interfere with my ability to focus on the module?" and "Do I understand all of the main points?" This treatment follows Butler & Winne's (1995) self-regulation model where the learner sets goals to accomplish a task, uses strategies to achieve his goal, and then self-evaluates his progress towards that goal (in this study, through calibration and confidence judgments).

The GSP treatment read the same instruction with the generative learning strategy prompts embedded within the text at the same location and frequency as the Mixed treatment. This treatment received the same paraphrase training as in the aforementioned treatment. No self-regulatory prompts were given.

The SRP treatment did not complete the tutorial on paraphrasing. The instruction included the same self-regulatory prompts embedded in the Mixed treatment. The control group read only the text narrative.

The participants scrolled through the content at their own pace, though there was a two-hour time limit to complete the unit. All groups viewed the same PDF, but modified according to each treatment's specifications. Upon completion of the instructional unit, the participants in all four groups provided a confidence judgment of their understanding of the material and completed a survey on their attitudes towards the instructional materials. These are Likert-type scale ques-

tions ranging from 1-7 and from "Strongly Agree" to "Strongly Disagree," respectively. After this, participants were allowed to return to previous pages for review before beginning the 13-question posttest. However, once the posttest began, the participant was instructed not to return to the content. When finished, the participant encountered a page that explained how to save the PDF file to the desktop. Last, the files were collected and stored for data analysis.

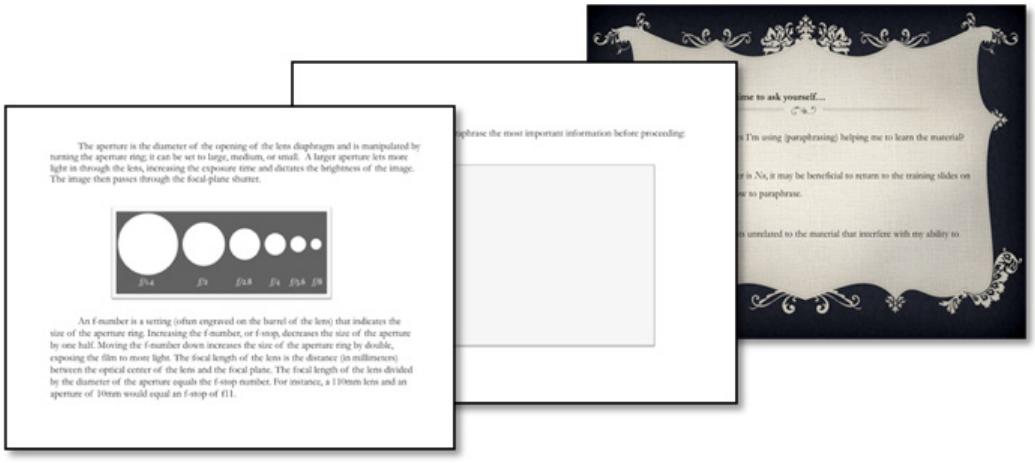

***Figure 1*. Example sequence of pages from the generative strategy use + self-regulatory prompting group**

The participant read the passage, paraphrased the information on a subsequent page, and was prompted to evaluate and monitor his learning strategies and their effectiveness on a third page. The generative strategy use only treatment experiences the first two pages, the self-regulatory prompting only treatment sees only pages one and three, and the control group encounters only the first page in this sequence.

Analysis

SPSS statistical software was used for analyzing the data. Specifically, a 2x2 factorial experimental design using an analysis of variance (ANOVA) was employed at a confidence level of .95 to determine a between subjects effect. ANOVA was used to calculate the effect of the treatment on overall performance on the posttest. The between subjects effect examined the variation in scores across each of the treatments and identified the between-group differences on multiple variables including self-regulation, calibration of comprehension, attitude, quality of generative strategy use, and prior knowledge. Last, a one-way ANOVA investigated the effects of calibration on attitudes towards the instructional materials.

Results

A post-hoc power analysis calculation, based on a two-tailed alpha value of .05, an effect size of .3 (considered a medium sized effect for this study) and a sample of 89 participants yielded a power of .847; this is a strong power rating, considering the recommended level of power is between .80 and .90 (Cohen, 1988). The power of the test was increased by achieving a large sample size.

The descriptive statistics for the dependent variables collapsed across the four treatment groups can be viewed in Table 2. The median score on the MSLQ was used as a cutoff point, where participants who scored 94 or lower were considered low self-regulators and participants with a score of 95 or higher were labeled high self-regulators. Level of self-regulation was considered

to be an extremely important variable considering its direct relationship with academic achievement and calibration. Across all treatments, the mean posttest score was only a 41.3% (*SD* = 2.48). This is a relatively low outcome for the posttest and may be explained by the quality of generative strategy use, which will be detailed later. Participants also gauged their confidence in understanding the material by providing a rating 1-7 (ranging from Not very confident – Extremely confident). The median rating was a 4, which suggests general neutrality in terms of feeling of knowing. The attitude score was calculated as a summative total of the participant's responses. A score less than the median of 25 represents general positivity towards the instructional materials, whereas 26 or greater represents a negative attitude.

Table 2: Descriptive statistics for dependent variables across all treatments

Dependent Variable	N	Min.	Max.	*M*	*SD*	Median
MSLQ	89	20	140	94.72	14.37	95
Calibration Rating	89	1	7	4.09	1.28	4
Posttest Performance	89	0	15	6.19	2.48	7
Attitude (Summative Scale)	89	10	50	25.25	5.35	25

Treatment and Achievement

A one-way between subjects ANOVA was conducted to compare the overall posttest scores, and performance on recall-level and comprehension-level questions (items 1-10 & 12-13 on the posttest, respectively). There was no significant difference detected in scores on overall performance, recall-level items, or comprehension-level items. Further, there was no significant main effect for the treatment groups on any of the dependent variables (calibration, achievement, or attitude). Table 3 outlines the descriptive statistics for all variables as broken down by treatment group. Contrary to the hypothesis, the Mixed treatment did not produce significantly higher scores on the posttest. The use of a mixed strategy approach, however, did yield a better-calibrated student.

Table 3: Descriptive statistics for all variables, broken down by treatment group

	Group 1 (Mixed) *n*=21		Group 2 (GSP) *n*=20		Group 3 (SRP) *n*=25		Group 4 (Control) *n*=23	
	M	SD	*M*	SD	*M*	SD	*M*	SD
MSLQ	93.86	15.03	95.25	16.48	95.16	11.68	94.57	15.36
Pretest	1.90	1.09	2.25	1.6	2.20	1.09	2.30	1.02
Calibration	3.95	1.40	4.30	1.13	4.00	1.26	4.13	1.60
Posttest	5.90	2.21	6.75	2.36	6.32	2.48	5.83	2.84
Attitude	25.71	5.75	24.9	5.44	24.80	6.40	25.61	4.11

A one-way between subjects ANOVA identified a significant difference in scores at the $p < .05$ level on comprehension-level items across all groups as a function of high and low self-regulators (as indicated by the MSLQ score), $F(1,87) = 4.45$, $p = .037$. Post hoc comparisons using the Tukey HSD indicated the mean score for the low self-regulator condition ($M = 1.09$, $SD = 0.68$) was significantly different than the high self-regulator condition ($M = 0.78$, $SD = 0.70$). The difference in the means of both groups was a moderate effect (eta square = .05, mean difference = .31, 95% *CI*: .019 to .601). These findings suggest that one's level of self-regulation positively impacts the level of comprehension of text.

Participants with higher levels of prior knowledge (e.g. participants who performed better on the pretest) performed significantly better on recall-level questions (questions 1-11 on the posttest), according to a one-way between subject ANOVA: $F(1,87) = 6.05$, $p = .016$. A moderate effect was detected (eta squared = .065) between the means (mean difference = -1.07, 95% *CI*: -1.93 to -.21). A post hoc comparison using Tukey HSD revealed a significant difference between levels of low prior knowledge ($M = 3.93$, $SD = 1.88$) and levels of high prior knowledge ($M = 5.0$, $SD = 2.08$) on recall-level questions. Also notable, the effect of levels of prior knowledge on scores on comprehension-level items was approaching significance: $F(1,87) = 3.59$, $p = .061$, with a small to moderate effect detected (eta squared = .04). As one would expect, preexisting knowledge of the subject matter influenced the outcome of the comprehension test.

The quality of each participant's generative strategy use was analyzed using Mayer's concept of "explanative idea units" (2001). Essentially, an idea unit is a key concept within the text, and a successful paraphrase would restate each idea unit in the participant's own words. The 2,000 word expository text contained a total of 35 explanative idea units. Of the 41 participants who experienced treatments prompting the use of a generative strategy (groups 1 and 2), the median number of explanative idea units identified in the participants' paraphrased responses was only 20% ($M = 7$). The highest performing strategy users paraphrased 20 idea units ($n = 2$), and the lowest performers failed to capture any relevant idea units ($n = 2$). Three treatments were excised from the study because they failed to implement the generative strategy altogether. The usefulness of the generative strategy did not reach its full potential due to the lack of effort in its implementation.

An independent samples *t*-Test was performed to identify the differences in achievement for those who generated a higher number of idea units and those who failed to do so. Results indicated that the participants who recorded higher numbers of idea units had significantly higher scores on recall items at the $p < .05$ level: $t(39) = -3.575$, $p = .001$, two-tailed, as well as on the overall posttest score, $t(39) = -2.224$, $p = .032$, two-tailed. The differences in the means between the quality of generative strategy use and recall scores had a relatively small effect, .25, as did the difference between the quality of generative strategy use and total posttest performance, eta square = .11. However, these findings reinforce the importance of executing the generative strategy properly. Table 4 provides an example of how the explanative idea units were identified and counted. Intuitively, a more effective use of the generative strategy resulted in better performance on the comprehension test.

Table 4: Comparison between the text and an exemplary response. Idea units are bolded.

Expository Text	Student response
First, the light passes through the optics, or the lenses, which can be simple or complex. ***A simple lens is a convex disk of ground and polished glass that refracts widening light rays*** traveling away from every point of the subject so that they converge to form coherent points. ***The point at which the lens focuses these rays is referred to as the focal plane***. ***The aperture is the diameter of the opening of the lens diaphragm*** and is manipulated by turning the aperture ring; it can be set to large, medium, or small. ***A larger aperture lets more light in through the lens, increasing the exposure time and dictates the brightness of the image***. The image then passes through the focal-plane shutter. ***An f-number is a setting (often engraved on the barrel of the lens) that indicates the size of the aperture ring. Increasing the f-number, or f-stop, decreases the size of the aperture by one half***. Moving the f-number down increases the size of the aperture ring by double, exposing the film to more light. ***The focal length of the lens is the distance (in millimeters) between the optical center of the lens and the focal plane. The focal length of the lens divided by the diameter of the aperture equals the f-stop number***. For instance, a 110mm lens and an aperture of 10mm would equal an f-stop of f11.	***The focal length of a lens is divided by the diameter of the aperture, which is the F stop number***. Snapping photos is capturing light that is already being emitted from a subject. This is reflected light. Whether we are in natural light or artificial ***light increases exposure***. If it's dark, we cannot see and if it's light we 'see.' Light rays from an original source are reflected off of a subject and transmitted through a camera to form a latent image on film or a chip. ***The simple lens is a convex ground polished glass which refracts widening light rays*** that are traveling away from every point of a subject so that ***they converge to form at coherent points. This is the 'focal plane.' The focal length of a lens is divided by the diameter of the aperture which is the F stop number.*** The aperture determines the amount of light which is allowed in and can be set to large medium or small***. The F-stop number is a setting which increases or decreases the aperture ring's manipulation of light to the opening of the lens diaphragm.***

Treatment and Calibration

A one-way ANOVA indicated that the treatment group did not produce a significant effect on the reported level of calibration though readers did report a higher level of calibration in the Mixed treatment. There was also a small positive correlation between the reader's level of self-regulation (MSLQ) and calibration, $r(89) = .285$, $p < .007$, suggesting that as level of self-regulation increases, so does the reported level of calibration of comprehension. This aligns with previous findings that high-achieving students tend to be more accurate in their calibrations given that those who precisely calibrate comprehension are also likely to calibrate performance accurately (Bol & Hacker, 2005; L-M. Lin, Moore, & Zabrucky, 2001). Further, the relationship between the pretest score and calibration revealed a small positive correlation: $r(89) = .254$, $p < .016$. This finding indicates confidence of judgment (calibration) increases with prior knowledge (pretest scores). Table 5 presents the Pearson product-moment correlations between each of the variables.

Table 5: Pearson's R correlation between variables across all treatments

	Pretest	MSLQ	Calibration	Idea Units	Posttest	Recall	Comprehension	Attitude
Pretest	1	-.079	.254*	.041	.138	.267*	-.136	-.138
MSLQ	-.079	1	.285**	.013	-.044	.021	-.120	-.033
Calibration	.254*	.285**	1	.251	.095	.184	-.094	-.658**
Idea Units	.041	.013	.251	1	.490**	.483**	.122	-.333*
Posttest	.138	-.044	.095	.490**	1	.818**	.568**	-.087
Recall	.267*	.021	.184	.483**	.818**	1	-.001	-.169
Comprehension	-.136	-.120	-.094	.122	.568**	-.001	1	.082
Attitude	-.138	-.033	-.658**	-.333*	-.087	-.169	.082	1

** Correlation is significant at the .01 level (two-tailed)
* Correlation is significant at the .05 level (two-tailed)

Treatment and Attitude

The 10-item attitude scale was coded as *Strongly Agree* = 1, *Agree* =2, *Neutral* = 3, *Disagree* =4, *Strongly Disagree* = 5. A total of fifty points was possible if the participant marked *Strongly Disagree* for each of the attitudinal questions; this was considered a highly negative attitude towards the instructional materials. Conversely, a lower score on the summative scale suggested a positive attitude towards the instructional materials. The median summative score on the attitudinal survey was a 25 ($M = 25.25$) and any participant scoring at or below this number was considered to have a positive attitude, whereas scoring a 26 or higher suggested a negative attitude towards the instructional materials.

A one-way between groups ANOVA was conducted in order to identify whether the level of self-reported calibration of comprehension would impact levels of attitude towards the instructional materials. Those who reported a higher confidence in the form of a higher calibration rating had a more positive attitude towards the text, than those who had lower levels of self-reported calibration of comprehension. Participants were divided into one of three groups, depending on their self-reported level of calibration low (1,2, or 3; $n = 21$), medium (4; $n = 38$), or high calibration (5,6, or 7; $n = 30$). There was a statistically significant difference at the $p < .05$ level in attitudes for the three levels of calibration, $F(2, 86) = 22.9$, $p = .00$. The effect size was calculated using eta squared and was a somewhat moderate effect, .04. Post-hoc comparisons using the Tukey HSD test indicated the mean score from low-calibrators ($M = 29.8$, $SD = 5.75$) was significantly different from mid-calibrators ($M = 25.84$, $SD = 5.43$), and from high-calibrators ($M = 21.3$, $SD = 3.64$). Also, mid-calibrators differed significantly from high-calibrators in terms of attitude towards the instructional materials. This suggests calibration, or confidence in understanding of the material, and attitude towards the instructional materials are closely aligned.

Discussion

This study sought to pinpoint specific strategies readers could implement during the act of reading digital text in order to enhance comprehension skills. Previous studies underscore the importance of generative strategy use, metacognitive, and self-regulated activities on the improvement of comprehension, but the aim of this research was to identify successful interventions that can be implemented while reading through the use of embedded prompts so as to observe an immediate effect on achievement rather than over the course of days, weeks, or semesters. The findings

suggested that poor generative strategy use impeded the intended successfulness of these prompts. In other words, if the strategy was not utilized properly, it did not result in increased performance.

The first research question posited whether generative strategy use coupled with self-regulatory prompting would produce a statistically significant effect on overall achievement, but the results of this study suggest this is mostly not the case. Rather, the intervention of a generative strategy and self-regulatory prompting only found a significant effect on higher-level but not lower-level questions, which is consistent with previous research (Bannert et al., 2009; Lee et al., 2009; Lee et al., 2010). It was hypothesized that the generative strategy, paraphrasing, would directly impact the participant's comprehension of the material and subsequent performance on the posttest. Though, statistical analysis of the number of explanative idea units each treatment file contained indicates a subpar quality of the use of the generative strategy; paraphrasing was a major contributor to the strategy's overall ineffectiveness on lower-level questions. Other studies have shown that it is all too common for learners to fail to implement self-regulated learning activities, and these types of prompted-for interventions require a substantial amount of in-depth explanation, modeling, and training (Bannert & Reimann, 2011; Clarebout, Horz, Schnotz, & Elen, 2010). Additionally, past studies advise fading the frequency of prompts, so that the reader gradually takes on more control of the instruction and autonomy (Johnsey et al., 1992; Winters, Greene, & Costich, 2008). Although, this method will only be successful if the reader is implementing the strategies correctly.

The second research question sought to determine whether generative strategy and self-regulatory interventions in digital text would yield a significantly better-calibrated reader. A well-calibrated, well-regulated reader has been shown to perform better overall in educational contexts than those with less calibration and self-regulation, and this is an important asset. Being well-calibrated in terms of reading comprehension can be a useful skill, though prediction of performance in screen media is less accurate compared to print-based materials (Ackerman & Goldsmith, 2011). The results did not indicate that the treatments with embedded interventions had a significant effect on the level of calibration as reported by the readers in comparison to the other treatments, though calibration was more accurate for participants in the Mixed treatment. Also, there was a positive relationship between a reader's calibration level and his or her level of self-regulation as well as between calibration level and prior knowledge.

The third research question addressed how the type of treatment would influence the readers' attitudes towards the text. The attitudes towards the instructional materials were fairly consistent across all treatments, and although it was hypothesized that readers who received metacognitive support would have a more favorable attitude than the other treatments, the results did not produce a statistical significance on overall attitude between the groups. This non-statistically significant finding is beneficial because it did not indicate dissatisfaction from readers experiencing multiple interventions throughout the text. Previous studies not only encourage providing metacognitive support, but also show that lower self-regulators stand to benefit more from this type of intervention (Bannert & Reimann, 2011; Clarebout et al., 2010). Notably, high-calibrated readers had a significantly more favorable attitude towards the instructional materials compared to the lowest-calibrated readers.

Limitations

A major barrier in this study was the poor quality of generative strategy use. While prompting self-regulation skills and the use of generative learning strategies have been shown to improve performance, they are only effective when implemented properly. In the cases where the participant did not fully utilize the generative strategy by composing a valuable paraphrase of the text, the intended effect of the generative strategy was not observed. Other research suggests that ex-

posure to this type of metacognitive and generative strategy intervention over a longer period of time may produce significant differences in the data, but the aim of this study was to identify strategies that enhance the reading experience concomitantly. This research did not find the 'magic bullet' for enhancing reading comprehension, though the instructional treatment did observe increases in calibration and comprehension for certain groups of readers, particularly lower self-regulated learners. Also, there is a possibility that the combination of both the generative strategy and the self-regulatory prompting could have been disadvantageous if the reader experienced cognitive overload. Cognitive load was not measured, so it was not determined whether or not cognitive strain did, in fact, burden the intended effect.

Conclusion

The shifting from print-based materials to digital text affords the opportunity for instructors and designers to embed learning-oriented activities within text more easily. The use of self-regulatory and generative learning strategies is critical to understanding and comprehending text, so it is reasonable to propose that they should be incorporated directly into digital text. The purpose of this study was to identify successful interventions, specifically through the use of embedded prompting, in order for readers to become more aware of what they are reading and ultimately, improve reading comprehension. The findings of this study did suggest a positive outcome for embedding both a generative strategy and self-regulatory prompts in digital text; though not significant, the mixed strategy approach yielded a better-calibrated reader. Likewise, when the generative strategy was implemented properly, it resulted in significantly higher scores on the overall comprehension posttests as well as on the recall-level items. These findings, along with readers' consistent attitudes towards the instructional materials regardless of the treatment, suggest the risk to reward ratio for implementing a mixed strategy approach is low. Accordingly, there should be more focus on enhancing metacognitive and strategy use in digital text (Ackerman & Goldsmith, 2011; Lee et al., 2010). The widespread adoption of digital text is sluggish, but gaining speed, and the marrying of metacognitive and generative strategy use with digital text is a relatively novel approach. Future research is needed to explore the possibilities for embedding metacognitive, motivational, and generative strategies within text.

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Appendix A

Self-Monitoring Questions

1. Did I set a learning goal to ensure I have a thorough understanding of the material?
2. Did I set a learning goal to help me perform better on the posttest?
3. Am I distracted during learning the material?
4. Am I focusing my mental effort on the material?
5. Do I have any thoughts unrelated to the material that interfere with my ability to focus on the module?
6. Are the study strategies I'm using (paraphrasing) helping me to learn the material?
7. Do I understand all of the main points?
8. Am I focusing my mental effort on the material?

Self-Evaluation Questions

1. Do I know more about the material than when the module began?
2. Do I know enough about the material to answer at least 80% of the questions correctly on the posttest?
3. Do I understand all of the key points and concepts of the material?

Appendix B
Attitude Survey

1. The instructional materials were clear and easy to understand.
2. The instructional materials were at an appropriate level of difficulty.
3. The instructional materials facilitated learning.
4. My overall understanding of the content was enhanced.
5. Overall, the instructional module effectively facilitated learning.
6. I will be able to confidently perform the comprehension test.
7. I felt comfortable with the way the material was presented in the module.
8. It was easy to retain my attention on learning the material in the module.
9. I was distracted during the module.
10. I would prefer this method of instruction in future modules.

Biographies

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Drawing Analogies between Logic Programming and Natural Language Argumentation Texts to Scaffold Learners' Understanding

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Abstract

The paper presents a theoretical investigational study of the potential advantages that secondary school learners may gain from learning two different subjects, namely, logic programming within computer science studies and argumentation texts within linguistics studies. The study suggests drawing an analogy between the two subjects since they both require similar abstraction skills manifested in the analysis of texts and in capturing their logic structure and inference. We propose that drawing analogies between two representations of argumentation texts can advance students' understanding, and, furthermore, using computerized systems may enable students to interact with linguistics texts and thus enhance their understanding. The paper explores the connections between the two disciplines, emphasizing the similar structures used to express the knowledge, and presents the similar abstract thinking processes that learners must carry out. Further implications for curricula are discussed.

Keywords: Logic Programming education, Linguistics education, Argumentation texts, Analogies, Abstraction

Introduction

The learning of argumentation texts is included in all educational levels from kindergarten, throughout schools, till academic degrees. Even pre-school children use arguments when trying to justify their claims (Stien & Miller, 1993). Studies show that young students find it difficult to formulate a good argument (Orsolini, 1993). For example, researchers addressed the difficulties of young students aged 9-11 and found that they encounter problems in finding justification for their claims (Berkowitz, Oser, & Althoff, 1987). Studies conducted on older students and adults also found that they experience difficulties presenting eligible justifications and arguing with counterclaims (Kuhn, 1991). Kuhn (1991) also found that students tend to base their claims on explanations more than on evidence. Understanding an argumentation text requires exposure to its structure or, in other words, the ability

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to identify the presented argument and to distinguish between the argument and the argument justifications. Argumentation texts can take on different constructions that may make them more difficult to understand. In some structures the inference is concealed in the text, and so it is more complicated for readers to recognize and understand.

Logic programming, a field in computer science, is also based on inference. Inference is based on the way people believe that human inferential thinking is performed, i.e., it is based on basic rules of mathematical logics. For example, if condition *cond1* exists (its logical value is *true*) and condition *cond2* does not exist (its logical value is *false*), then the following composite conditions can be inferred: (*cond1 and cond2*) is *false*, (*cond1 or cond2*) is *true*, (*not cond2*) is *true*. This nature of inference can be observed in the framework of logic programming, both in the inference engines of the logic programming languages and in the way programs are written as knowledge bases, described by facts and logic rules.

We claim that the abstract abilities required to understand argumentation texts are similar to those required to formalize problems in logic programming language. Since logic programming is based on elementary structures that capture the formation of argumentation texts, mastering it may enable students to advance their understanding of such texts. Such enhanced understanding may be gained based on learning from different representations of the texts and from the opportunity students have to use computerized systems that enable them to interact with the texts. Students can also formalize their interpretation of the inference presented in an argumentation text as a logic program. Furthermore, by using logic programming as a knowledge base, students can present queries and get answers that validate or disprove their assumptions, and thus enable them to check their preceding interpretation.

The broad intention of our study is to investigate the possibility of scaffolding students' understanding of texts and knowledge that involves inferring comprehension by presenting explicit analogies between the two disciplines. We believe that providing learners with tools from the two different disciplines, and displaying the similar connections between the knowledge entities as presented in both disciplines, can improve learners' understanding and ability to cope with knowledge that involves inference.

In this paper we conduct a theoretical investigation comparing the structures of a natural language argumentation text with the structure of a program written in logic programming language (Prolog). Although the study is based on comprehensive experience and research involving learning processes of the Hebrew language, we believe our conclusions characterize any natural language since the study refers to logic thinking processes that are based on discovering the abstract structure of texts. The logic programming Prolog has several different versions based on natural languages such as Russian, Japanese, and Hebrew. This reinforces the assertion that the discussion is language independent. In our research we focus on texts that are used regularly in the teaching of natural languages and show the potential gain to students from transferring the acquired knowledge between learning logic programming within the framework of computer science studies and argumentation texts within the discipline of language studies.

Literature Review

Linguistics and Computer Science

The two disciplines of linguistics and computer science have many converging points. Regarding the computer as an implementation tool and as a research tool in linguistics revealed the following three main mutual influences: (1) Theories and research methodologies that are grounded in computer science have been adopted by linguistics research, for example, the description of formal languages using automata, a model used in computer science; (2) Theoretical assertions about

the similarities between computer computational methods and the way humans learn and use natural language, have led to the use of various computer science tools, specifically artificial intelligence tools. An example of such theoretical work is Rahwan and Simari's book entitled "Argumentation in Artificial Intelligence" (2009), which presents different ideas and specifically relates to the subject of argumentation; and (3) Computerized systems that simulate human linguistic behavior, such as translation or the understanding of natural language questions that can be used with any search system, have been developed and are referred to as natural language processing. An example is research which concerns fuzzy logic and offers computational tools that conclude in non-objective or fuzzy conditions or that allocate a suitable sense to sentences that include fuzzy prepositions like "few" or "often" (Freksa, 1994; Zadeh, 1997).

In 1957, Chomsky introduced the theory of formal languages and expanded it in later works (Chomsky, 1965, 1975). Chomsky theory enables the definition of a set of rules that facilitates the building of all valid sentences in the language. This theory, which came from the linguistics research on natural languages, came to be a central tool in mathematics theory and in computer science theory with respect to programming languages. Research that combines the two disciplines was established and called 'computational linguistics,' and academic institutes began to offer formal degrees in this discipline. Computational linguistics deals with the development of computerized tools to cope with natural language. The theoretical basis for these developments rests on the attempts to identify formal structures in natural languages and to further investigate how such structures serve as a basis for computational inference as executed by a computer program. The objective is to find algorithms that address issues involving natural languages, such as automated translation between different natural languages, computer dialogs in natural language, analysis of documents, and the understanding of natural language.

In the 1950s and 1960s, in parallel with the development of the formal languages theories another field, artificial intelligence (AI), also developed (Bratko, 1990; McCarthy, 1958; Sterling & Shapiro, 1994) and influenced the field of computational linguistics. AI research focused on logics and deductions, which led to the identification of models that capture natural language semantics and to the development of the first computer implementations that captured the meaning of natural language, such as Prolog (PROgramming in LOGic). Up until that time, the vast majority of computer programs were written using formal computer languages rather than natural languages. Prolog is exceptional in its use of natural language words as part of the program code and in its syntax, which is very similar to that of natural language conditional sentences. The language operations are very minimalist and are based on human logical inference (if <conditions> - then <operations>), hence the language is referred to as a logic programming language. Prolog's suitability for analyzing natural language structures led to the development of various CALL (computer-assisted language learning) software systems. One project, for example, used C-Prolog to evaluate the correctness of simple English sentences that were based on some of the main Prolog characteristics, such as being a non-numeric programming language, offering the advantages of user-friendliness and being, above all, descriptive (relational) rather than procedural (Butcher, Galletly, & Wong, 1990). Dung (1995) asserted that logic programming is an ideal environment for implementing data bases and presented an in-depth exploration of logic formalization as a computational mechanism that enables investigation of human natural inference when constructing and understanding an argument. Prolog was used in the development of an intelligent computer-assisted language learning (ICALL) system for learning Arabic, designed to be used by students at primary schools or by learners of Arabic as a second or foreign language (Shaalan, 2005). Prolog was chosen as the implementation language since the language's grammatical rules can be specified using Horn clauses and because the Prolog interpreter uses the strategy of depth-first top-down parsing algorithm, which fits language structures. This strategy is best also for presenting argumentation texts, as in our analyses.

Based on the above interpretations, we further present correspondence between the structure of argumentation texts taught in linguistic educational settings and the structure that enables presentation of argumentation texts in Prolog, in computer science educational settings, and offer analogies between the two disciplines to enhance learners' understandings of such texts. Our interpretation is different from the uses of CALL systems. We claim that using the Prolog language as-is, is most suitable for the interpretation of argumentation texts. We wish to take advantage of the fact that Prolog is accessible and easy to learn, and in some countries is taught within the CS curriculum.

Logic Programming in Education

Computational thinking is nowadays appreciated, as a tool for thinking and inferring, in many other disciplines other than computer science, and many countries strive to integrate it into curricula at all levels (e.g., Wing, 2006). Scientists cope with the challenge and need to integrated disciplines and, particularly, to meet the need to adopt computational representations and algorithms used in computer science to other domains. A reflection of this can be seen, for example, in a multinational research work conducted by leading scientists from different countries (Microsoft Research, 2006) and in a collection of research papers that includes the two said disciplines (Martín-Vide & Mitrana, 2001).

Work has been done in educational frameworks on knowledge representation and logic representation in logic programming. One heterogeneous study, for example, presented both theoretical and empirically based findings using the framework of logic programming (Habiballa & Kmet', 2008). This study highlighted the key role of logic in computer science, computer science education, and knowledge representation but failed to take the discussion any further, i.e., to an integration with what is considered to be a different discipline – linguistics. Another study presented a methodology for teaching logic programming using analogies (Lopez, 2001). This study suggested giving students declarative programming examples that illustrate various concepts and then asking them to write their own programs using an analogy process. The analogies used in this study were based on similar relations within different contexts rather than on two different, though similar, representations in two different disciplines.

The analogy we suggest implementing in educational settings is based on the fact that logic programming using Prolog is already used in middle and high schools worldwide (Bottino, Forcheri & Molfino, 1995; Cope, 1989). Another issue dealt with by researchers is how to cope with the pedagogy of teaching logic programming (Di Bitonto, Roselli and Rossano, 2009; Stamatis & Kefalas, 2007). Linck and Schubert (2011), for example, investigated the new German curriculum for teaching logic programming in secondary education. These researchers' aim was to improve informatics in secondary schools based on a model of logic programming competence levels. In Israel, a broad high school logic programming curriculum is already established and includes various advanced subjects such as artificial intelligence and expert systems (Haberman, Shapiro & Scherz, 2002; Haberman & Scherz, 2005; Ragonis, 1996; Ragonis, Scherz, Ben-Ari, & Shapiro, 1998; Scherz, Haberman, Ragonis, & Shapiro, 1993; Scherz, Haberman, & Ragonis, 1994).

Disciplinary Background

Argumentative Texts

The meaning of argumentative texts

An argumentative text is a text in which the addresser presents a claim and is then required to prove it in order to convince the addressee of the validity of his or her claim. In the text, the ad-

dresser makes an assumption that leads to a conclusion and supports a particular opinion using different methods of justification such as explanations, examples, and comparisons (Antaki, 1994; Brooks & Warren, 1972; Copi, 1982; van Dijk, 1980). Argumentative texts differ from expository texts, which convey information about events, facts and ideas, interpret historical events, and clarify opinions without presenting the writer's own opinion (Goelman, 1982; Sarel, 1991, Shilo, 2003).

Several researchers described the structure of argumentative texts: Toulmin (1969) presented a five-part model that included the possibility of a counter-argument, which was further investigated in modern Hebrew (Alon, Grilac, & Shilo, 2006; Livnat, 2011). Mann and Thompson (1998) introduced the Rhetorical Structure Theory (RST) that provided a method of describing the relations between clauses in a text according to whether they are grammatically or lexically signaled. The RST is a useful framework for relating the meaning of conjunctions, the grammar of clause combining, and non-signaled parataxis. Mann and Thompson (1998) revealed semantic relations that repeat themselves throughout the various texts and demonstrated how RST can be used to identify the main idea of a text. Azar (1999) described the argumentative text in the context of RST and claimed that the nucleus-satellite relation is the most important structure of such texts. According to Azar (1999), the nucleus is the writer's main purpose and the satellite adds details that supplement the nucleus in various ways, for example, by convincing. Azar refers to five subtypes of argumentative satellites: evidence, justification, motivation, antithesis, and concession. In his opinion, the purpose of the first three subtypes is to convince, while the latter two present a claim and then negate or refute it.

Learning argumentation was viewed by researchers not only as a one-off activity but as a stage-wise and collaborative process that builds on the students' concrete experience, reflective thinking, and observation over a period of time (Ho, Mei Lin, Natasha, & Chee, 2009). Ho et al. (2009) used the Second Life immersive virtual environment as a platform, and, following their work, we recommend using Prolog programming language as the environment on which to build the stage-wise reflective learning activity.

In a previous paper (Shilo & Ragonis, 2014), we presented argumentative texts formatted in a basic claim structure. In such texts, the claim usually appears in the first part of the text but can also appear at the end. In this paper, we present a structure that is based on a basic claim structure (claim and justification) but also contains a claim that opposes the view of the addressee, i.e., a counter structure. In other words, the addressee presents a claim, the opposing argument, and the justification of the claim. This structure is considered more influential and convincing than a basic claim because the addresser presents his or her claim explicitly while adding a counter-claim. Since the addresser is familiar with the subject, he or she can then proceed to refute the counter-claim.

Basic structures of argumentative texts

Argumentative structures have one of three common basic constructions: basic claim structure, counter structure, and "pros and cons" structure. We will first present the three structures and then elaborate on the counter structure, whose representation, in both natural language and logic programming language, will be interpreted in detail.

A. Basic claim structure: The aim of the basic claim structure is to convince the addressee that the addresser's claim is valid. The claim is the main idea of the text, whose structure is usually introduction, claim, justification, and summary, which reiterates the claim. A less common way of presenting the claim involves presenting it at the end of the text. In this case, the order of the text's parts will be introduction, justification, which leads to the claim at end, which in turn serves also as a summary.

B. Counter structure: The counter structure presents both a claim and a counter-claim according to the following order: introduction, counter-argument, the claim and justifications for the claim. Sometimes the addresser's claim is presented before the counter-argument and may even include explanations of the counter-argument. In any case, the counter-argument must always appear before the justification of the writer's claim, as will be elaborated on later.

C. "Pros and cons" structure: This structure, in which two opposing arguments are presented, is used mainly in debates and discussions. The paragraph opens with an introduction, in which the subject and a clue and/or an explicit statement about the dispute are presented. This is followed by the presentation of one claim after which the counter claim is presented, followed by a conclusion of one sort or another (agreement with one of the claims, a new viewpoint, a compromise, or a standoff).

The counter structure

The counter structure seems to be more convincing than the basic claim structure since a text that contains an argument opposing the writer's claim is more persuasive than an ordinary text containing only a difference of opinion. The presentation of the counter-argument indicates that the addresser is confident, has explored all possibilities, has reached his or her conclusion, and is not afraid to address the opponents' claims or even confront them. The opposing argument generally appears in the opening section, before or after the addresser's claim, but never after the supporting argument, so as not to interfere with the persuasion process. After the supporting argument is presented, no new arguments are introduced and the addresser concludes with a recap of the original argument presented at the beginning of the argument, thereby completing a cycle.

The five parts of the texts in the counter structure are:

1. Introduction
The introduction can be either a presentation of the topic and/or of a problem, background information such as a summary of theories, or an example or a story meant to attract the reader as a "teaser".

2. Addresser's claim

3. Counter-claim

4. Justification of the addresser's claim
The justification of the addresser's claim can consist of details, exemplifications, data, grounds and/or definitions.

5. End
The end paragraph of counter structure can be a summary, a conclusion, a recommendation, a prediction or any combination of them.

Logic Programming

What is logic programming?

A computer program is an implementation of an algorithm that is written in a programming language and developed in order to solve a problem. A programming language consists of data structures and control structures that enable manipulation of the data. Programming languages are attributed to programming paradigms that differ in their principles of knowledge representation and in their ways of execution (Detienne, 2001). The differences between the paradigms are first reflected in the way a given problem is analyzed. The logic programming paradigm is essentially different from other paradigms (e.g., procedural, functional, object oriented) since it uses struc-

tures and inferences that are commonly used in mathematical logics and are accepted as being similar to human logical thinking. The logic programming paradigm is based on first-order predicate calculus. This programming style emphasizes the declarative description of a problem rather than the decomposition of the problem into an algorithmic implementation. A logic program is a collection of logical declarations that describe the problem to be solved, whereby the problem description is then used by an inference engine to find a solution. Logic programming is restricted to backwards chaining in the form usually referred to as a *rule*. Rules represent logical connections between claims and are presented using logic syntax. The main structure of a rule is as follows: *G if G1 and G2... and Gn*, where *Gi* is a goal. This structure is behaves like a goal-reduction procedure, and its semantics are *to solve G, you have to solve G1 and ... and Gn*. The goal *G* is called the *rule head*, and the combined logic claim *G1 and G2 ... and Gn*, is called the *rule body*. In other words, if the rule body is valid, then the head of the rule is valid. Every goal *Gi* can either be derived from another rule or can be defined as a *fact*, which means that it exists, its logic value is true, and so it needs no further reduction. A *fact* can also represent relations between values. Thus, a logic program is a set of facts and rules that can be derived based on each other, combined with logical operators such as *and*, *or*, and *not*. Computation in logic programming is in fact a proof search, which determines whether proof can be derived for a given goal. The given goal is presented to the program as a *query* and the built-in *inference engine* of the language searches a proof to solve the query. If a proof (a chain or tree of goals) can be derived based on the specific program and the proof is deemed successful then the answer to the query is *yes*; otherwise, if the proof fails, the answer to the query is *no*. Knowledge in logic programming is presented in terms of facts and rules, referred to as a knowledge base (which is actually a program). The language, based on its built-in inference engine, can follow inferences and determine either that a goal can be derived from the knowledge base, i.e., the deduction is valid, or that it cannot be derived, i.e., the deductive is invalid. The most commonly used logic programming language is Prolog (PROgramming in LOGic). This declarative language is based on first-order logic, which is used in artificial intelligence applications. The common concept known as "running a program" does not exist in logic programming. Rather, a query is presented and the technical mechanisms *unification* and *backtracking* together serve the inference engine, which outputs an answer whether the query can or cannot be derived from the knowledge base. A simple and traditional example of logic program that relates to family relations and demonstrates how natural language serves the programming language is presented in the Appendix. The example shows how a Prolog program is similar to a text written in a natural language and how the inference executed is similar to basic human logical thinking inference.

Steps in developing a logic program

When representing information as a logic knowledge base – a logic program - the next phases are carrying out the following:

Step 1 – *Definition of targets:* The subject and the objectives of the program are defined, or in other words, what are the main objectives that will be further presented as queries, on which we want to get answers in relation to the knowledge base. All of the other knowledge structures will be defined based on those definitions.

Step 2 – *Choosing descriptors:* Since the inference is based on facts, the fact structures must first be defined. The rule definitions will rely on the fact structures. Specific data that is written in the program is not, in itself, of importance, but the structure that represent the relations between the given data components is essential.

Step 3 – *Choosing the relations:* The relations – the rules heads – are now defined based on the objectives defined in Step 1. In this stage, a logic relation is expressed for each of the rule heads.

The objective of the goal, and the relations (rules or facts) on which it is based, are of importance here.

Step 4 – *Formalization in Prolog, programming:* In this step the Prolog program is written – facts and rules. The specific data is presented using both the fact structures chosen in Step 2 and the rule heads and their logic declarations chosen in Step 3.

Step 5 – *Demonstrating queries (running the program):* After implementing all facts and rules, queries relating to the different objectives may be presented. The answers given by the inference engine can be either yes or no, according to the specific inference validation. If the logic answer is yes – some specific results may be obtained as well.

Demonstrating the Analysis of Argumentation Structure in Linguistics and in Logic Programming

In this section we will use an example of a counter-structure argumentation text to demonstrate text analysis according to the text's linguistics structure and its representation in logic program (Figure 1).

Recently the subject of conducting experiments in animals has surged again. Some people object to animal experiments and claim that they reflect abuse and that animals should be treated like humans. Others believe that these experiments are necessary in order to promote basic research, add to our understanding of physiological and pathological processes, and are crucial for the development of new drugs and therapies. Despite the claims of the opponents, no substitute has been found to conducting experiments in animals, hence research experiments must continue.

Figure 1: Example of a counter structured text

Analysis of Counter Structure in Linguistics

Table 1 presents the analysis of the text presented in Figure 1 according to the counter structure presented in the section entitled Disciplinary Background – Basic Structures of Argumentative Texts.

Table 1: Expressing the example text in counter structure form

Counter structure part	Quote from the example text
1. Introduction	*"Recently the subject of conducting experiments in animals surged again"*
2. Addresser's claim	*"Others believe that these experiments are necessary"*
3. Counter-claim	*"Some people object to animal experiments and claim that they reflect abuse and that animals should be treated like humans."*
4. Justification of the addresser's claim	*"in order to promote basic research, add to our understanding of physiological and pathological processes, and are crucial for the development of new drugs and therapies"*
5. End	*"Despite the claims of the opponents, no substitute has been found to conducting experiments in animals, hence research experiments must continue."*

Expressing the Counter Structure in Logic Programming

In this section, the text presented in the example is formalized in a Prolog program. We first present the program elements, and then display the full Prolog program and explain the way the inference is carried out.

The Prolog program

As presented in the section Disciplinary Background – Steps in Developing a Logic Program, the first step in analyzing a text in order to present it as a Prolog program is to determine the objective of the inference. In the above example text, the subject is "experiments in animals" and the objective is to conclude whether or not it is reasonable to conduct experiments in animals. Next, it is necessary to distinguish between elements that are already known to be true, which are to be presented as facts, and elements that must be inferred, and so are presented as rules. The text contains justifications for two different claims, those that support the conducting of experiments in animals and those that do not. In the counter structure presented here in detail, only justifications for the addresser's claim are presented.

To enable fluent inference and generalization, the first fact formation to use is claim. Claims can express either agreement or disagreement. This knowledge is presented in the following clauses:

claim(agree).

claim(disagree).

The main elements presented in the text are the different justifications. To present each justification we use the relation *standpoint*. This relation has two descriptors, a claim and a related justification. For example, the supportive text *"experiments are necessary in order to promote basic research,... "* is presented by the following clause :

standpoint(agree, experiments_are_necessary(to_promote_basic_research)).

Syntax remarks: (a) the underline between the words is necessary in this programming language to indicate that all of the words are a single element; (b) use of brackets (…) enables further inference that is not presented here.

And the non-supportive text *"Some people object to animal experiments and claim that they reflect abuse,... "* is presented by the following clause:

standpoint(disagree, abuse).

All of the other justifications are presented similarly, each as a separate fact.

The objective of the program is to infer from the facts and to draw a conclusion. In the chosen formalization we will use three main rules:

1) A rule that collects all justifications for a specific claim, named justifications. A list of justifications that supports the claim is, therefore calculated for each claim. The head of the rule is: *justifications(Claim, Justifications_list)*.
2) A rule that calculates the number of justifications addressed for each claim, named *justifications_count*. The number of justifications that support the claim is calculated for each claim. The head of the rule is: *justification_counts(Claim, Number)*. The rule inference is based on the previous rule (Rule 1), which calculates the list of justifications, and further calculates the number of elements within this list.
3) The main rule that drives the conclusion about the text argument is: *conducting_experiments_in_animals*. The conclusion in this demonstration is based on a simple decision about whether the number of supportive justifications is greater than the number

of non-supportive justifications. The rule inference is based on the previous rule (Rule 2), and calculates the number of justifications for each claim.

Figure 2 displays the program at a glance.

```
% claim(Claim: agree / disagree).
claim(agree).
claim(disagree).

% standpoint(Claim, Justification).
standpoint(agree, experiments_are_necessary(to_promote_basic_research)).
standpoint(agree, experiments_are_necessary(to_understand_physiological_processes)).
standpoint(agree, experiments_are_necessary(to_understand_pathological_processes)).
standpoint(agree, experiments_are_crucial(for_the_development_of_new_drugs)).
standpoint(agree, experiments_are_crucial(for_the_development_of_new_therapies)).
standpoint(disagree, abuse).
standpoint(disagree, animals_should_be_treated_like_humans).

justifications(Claim, Justifications_list):-
                claim(Claim),
                findall(Justification, standpoint(Claim, Justification), Justifications_list).

justifications_count(Claim, Count):-
                justifications(Claim, Justifications_list),
                list_count(Count, Justifications_list).

conducting_experiments_in_animals:-
                justifications_count(agree, Count1),
                justifications_count(disagree, Count2),
                Count1 > Count2.
```

Syntax remarks: (1) the notation % indicates that the line is a remark line and serves to document the structure ahead; (2) an element that starts with a lower-case letter is a constant; an element that starts with a capital letter is a variable. For example, the variable Claim can have the values *agree* or *disagree*, and the variable Count can be any number that is calculated.

Figure 2: The Prolog program formalizing the counter-structure text example

Examples of the program outputs

The developed program enables to present different kinds of queries. We will limit our presentation to three main rules. Figure 3 presents the queries, their answers, and short explanations.

Query No. 1: For each claim (agree or disagree), give the list of justifications

?- justifications(Claim, Justifications_list).

Claim = agree
Justifications_list = [experiments_are_necessary(to_promote_basic_research) ,
experiments_are_necessary(to_understand_physioloical_processes) ,
experiments_are_necessary(to_understand_pathological_processes) ,
experiments_are_crucial(for_the_development_f_new_drugs) ,
experiments_are_crucial(for_the_development_of_new_therapies)] ;

Claim = disagree
Justifications_list = [abuse , animals_should_be_treated_like_humans]

Query No. 2: For each claim (agree or disagree), give the number of justifications (i.e., the size of the list produced in Query No. 1)

?- justifications_count(Claim, Count).

Claim = agree
Count = 5 ;

Claim = disagree
Count = 2 ;

Query No. 3: Give a final conclusion whether or not animal experiments should be conducted (this is based on the number of justifications for each of the opposing claims).

?- conducting_experiments_in_animals.
Yes

Figure 3 : Queries and their answers

Explanation of the inference process

Each of the three rules is logically based on previous rules or on the facts. When a query such as *conducting_experiments_in_animals*, is presented, the language inference engine identifies this constant as a head of rule, and so in order to reach a conclusion, the rule body must be valid. This rule body determines the number of *agree* justifications and the number of *disagree* justifications, and calculates whether there are more *agree* justifications than *disagree* justification. In order to determine the number of *agree* and *disagree* justifications, a suitable rule, *justifications_count*, is in place that gives the required answer. The *justifications_count* rule uses the *justifications* rule that provides a list of justifications for each specific claim and uses a built-in descriptor that calculates the size of each such list. Thus, the *justifications* rule uses a built-in descriptor that identifies all of the facts with the structure, *standpoint(Claim, Justification)*, and collects them into a list. So, a tree of inference using the language mechanism is constructed in order to answer our main objective question – whether or not to conduct experiments on animals, to which the final answer is yes.

Reflection of the Prolog program in the linguistics counter structure

As argued earlier, there is a clear analogy between the counter structure and its formalization in Prolog. Table 2 presents this analogy.

Table 2: Expressing the logic program in the counter structure form

Counter structure part	Quote from the program
1. Introduction	Does not appear in the program but is the program's title – what the program is about.
2. Addresser's claim	Facts with the structure: *standpoint(**agree**, << justification >>).*
3. Counter-claim	Facts with the structure: *standpoint(**disagree**, << justification >>).*
4. Justification of the addresser's claim	Rules that build on each other: *justifications(Claim, Justifications_list):- ...* *justifications_count(Claim, Count):- ...* *conducting_experiments_in_animals:- ...*
5. End	The target query and its answer : *?- conducting_experiments_in_animals.* *yes*

Comparison between the Representations

A comparison between the two representations in Tables 1 and 2 reveals several immediate similarities. It can be seen that the addresser's claim and the counter-claim are "known" from the text and since they appear as facts in the Prolog program. The justification of the addressor's claim is reflected in the Prolog program by the definition of rules, which are the heart of the required logic inference, and are actually independent of the textual content. The rules formalize what is actually happening in the human mind upon reading a counter text and generating conclusions. The opportunity to display a query in the Prolog environment enables learners to check whether or not their own conclusion is valid. In fact, the display of the query corresponds fully to the "end" part of the argumentation text. In the counter-structure text, the addresser's claim is reiterated at the end in order to finalize the argument. In the Prolog environment, a query must to be presented in order to receive an answer. The query is a trigger for a sequence of inferences based on the rules which ends with the facts.

As can be seen, the structure of the text that must be uncovered in both disciplines is similar. Students must use abstract abilities when reading the text in order to cope with its meaning, the argument. They must discover what the claim is, what justifications are displayed, and what can be concluded (inferred) based on that. The process is essentially the same in both representations, though the way of formalizing the text is different. Thus, by alternating between the two forms of representation and by highlighting the analogies, the two different representations of the text may serve to mutually develop students' skills and so enhance their understanding of texts.

Summary

The paper suggests a theoretical correspondence between two ways of representing argumentation texts. The process, we believe, can support teachers by presenting analogies between two different, though similar, representations of argumentation texts in language studies and in computer science studies, particularly logic programming. Teachers in each of the two disciplines can use such analogies without being too concerned about their veracity since, as teachers of one discipline, they are not actually required to master the other discipline. The teaching-learning processes can rely on the students' knowledge, and teachers can lead discussions and use them to

formally demonstrate analogies and, thus, develop the students' skills. We believe that it makes no difference which discipline is learned first; in either case connections can be made and pointed out. The analogies demonstrated in the paper can be further applied to the discipline of mathematics and, specifically, to geometric proofs, which are studied in high school but are considered to be relatively difficult for students to understand. In geometry, for instance, the frequently used phrase "need to prove" is the claim; the partial relations between mathematical elements referred to as "the proof" are actually the justifications; and the phrase used to finalize the proof, i.e., "what was needed to be proved", is the end of the argument that must also relate to the claim.

We argue that learning argumentation texts by exposing and emphasizing their structure, alternatively in the two disciplines of computer science and linguistics, will develop the understanding of the semantics of those texts and further develop the mathematical logical thinking about which we wish to expand our investigation.

Based on the theoretical investigation presented in the paper, we intend to further examine this topic by performing field research. The research population will be middle or high school students, and the objective will be to investigate the mutual understanding of students who study both disciplines while the appropriate analogies are presented and discussed in class. The research will examine students' ability to understand and use such analogies and will determine whether or not the first discipline studied has an influence on these abilities. Such research may also examine the teachers' ability to cope with (slightly) diverse challenges in their classrooms. Since, we expect teachers to deliver the analogies between the two different subjects to their students, it is important to investigate their positions regarding this new approach.

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Appendix
An Example of a Logic Program – Family Relations

One of the traditional examples of the use of natural language in logic programming is the use of a logic program to represent the relations between family members. When relating to family members we usually distinguish between males and females, so the two basic fact structures will be *male* and *female*. The fundamental relation in family is parenthood, so one more fact structure will present this relation using the descriptor *parent*. Next we can express ever more specific relations in a family, such as *father* – a male family member who is a parent; *mother* – a female family member who is a parent; *grandfather* – a male who has a descendant who is a parent, etc. These relations are be defined as rules and it is evident that all relations defined as facts and rules are properties of any family. In this example we will use the original biblical family, but it should be apparent that in order to infer about a different family, only the values presented in the facts need be changed. All of the structures, facts, descriptors and rules do not change. (Some basic syntax remarks are presented in the footnote.)

```
% facts
male(abraham).                          meaning: abraham is a male
female(sarah).                          meaning: sarah is a female
male(isaac).
male(jacob).
parent(abraham, isaac).
parent(sarah, isaac).
parent(isaac, jacob).

% rules
father(X, Y) :- male(X), parent(X, Y).  meaning: if X is male and X is the parent
                                                 of  Y, then X is the father of Y
mother(X, Y) :- female(X), parent(X, Y).
grandfather(X, Y) :- father(X, Z), parent(Z, Y).

% query examples
?- mother(X, Y).
X = sarah
Y = isaac

?- grandfather(X, Y).
X = abraham
Y = jacob
```

Syntax remarks: In Prolog: (a) a constant must start with non-capital letter (e.g. abraham); (b) a variable that serves to identify relations within rules must start with capital letter (e.g. X); (c) the symbol :- meaning “if”; (d) the symbol ; meaning “and”; (e) a dot indicates the end of any claim – fact or rule.

Biographies

Dr. Noa Ragonis is head of the Instructional Development Center at Beit Berl College. She is a senior lecturer at the Department of Computer Science, Beit Berl Academic College, and at the Department of Education in Technology and Science, Technion. Dr. Ragonis is active in educational research, focusing on cognitive aspects of teaching and learning of Computer Science, and is also involved in pre-service and in-service teachers preparation programs. She is co-author of the *Guide to Teaching Computer Science* (2011, Springer) and has authored eight Computer Science high-school text books and teachers guides.

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Education Students' Use of Collaborative Writing Tools in Collectively Reflective Essay Papers

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Note from the Editor. The results in this paper build on earlier work: Brodahl, C., Hadjerrouit, S., &. Hansen N. K., (2011). Collaborative writing with web 2.0 technologies: Education students' perceptions. *Journal of Information Technology Education: Innovations in Practice (JITE: IIP), 10*, IIP 73-103. Portions of this material (lengthy quotations) are reprinted with permission in indented paragraphs.

Abstract

Google Docs and EtherPad are Web 2.0 tools providing opportunity for multiple users to work online on the same document consecutively or simultaneously. Over the last few years a number of research papers on the use of these collaborative tools in a teaching and learning environment have been published. This work builds on that of Brodahl, Hadjerrouit, and Hansen (2011) expanding its case study. The theoretical framework is the same as the one underlying Brodahl et al. (2011), drawing on two learning theories, the social-constructivist learning theory and the community of practice, and their relationships to collaborative tools. The literature review is extended to cover the recent research work in the field, related to Web 2.0 technologies in higher education.

The case study of Brodahl et al. (2011) involved 201 education students who had just begun their four-year initial teacher education. However, 24 students are omitted in the current work, and the result tables from Brodahl et al. (2011) accordantly updated. Disregarding particular groups of students was due to their specific local dispersion, as they conducted their entire assignment and collectively reflective essay paper at the same physical location and, with respect to this, reported the use of collaborative tools as superfluous and unwanted in their setting.

Partly based on the same survey, this work presents a case study investigating education students' perceptions of collaborative writing reflective essay papers. However, where Brodahl et al. (2011) presented a solely quantitative study derived from closed-ended questions, this work incorporates the survey's open-ended questions in a qualitative analysis. The analysis also draws on the students' written reflections on their experiences.

The qualitative analysis supports the conclusion of Brodahl et al. (2011) that technical problems were a major issue, mostly related to EtherPad. All but one complaint about technical difficulties stemmed from EtherPad users during a limited period of time. Other major negative feedback concerned group size; several groups pointed out difficulties with organizing the work, problems of

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keeping track when editing simultaneously, and failure to produce a unified document. Positive issues frequently mentioned are the ability to work asynchronously and from different places.

Furthermore, a majority of the reports on commenting on and editing each other's work were positive, mentioning that it is an advantage to be able to correct spelling errors and bad formulations, that it is educational, that one may contribute with ideas that the others do not have, and that it improves the final text. Larger issues on the negative side were fear of insulting or misunderstanding, and difficulties because of various work modes.

Also qualitative results indicate that females are more concerned with group size than males, but less preoccupied with technical difficulties. Furthermore, younger students appear more concerned about the importance of preparation and planning than older ones.

The major conclusions are that EtherPad and Google Docs facilitate new ways of approaching communication, for different collaborative writing work modes as well as in different settings. However, the setting in which the tool is used exerts an influence on the way students perceive its usefulness. Recommendations derived from students' perception of factors of success for using the collaborative writing tool include the following: group size should preferably not exceed three persons; the students ought to be prepared for technical difficulties and have a contingency plan; and they should have time in advance to discuss their work mode and agree on rules for commenting on and editing each other's work.

Keywords: Collaborative writing, collaborative tools, EtherPad, Google Docs, Google Drive, Web 2.0 technologies.

Introduction

Technological affordances of new and emerging Web 2.0 tools, their balance of functionality, ease of use and low cost make educators consider their pedagogical value (Ajjan & Hartshorne, 2008; Boulos, Maramba, & Wheeler, 2006).

> During the last few years, the use of several online collaborative writing tools, e.g., blogs and wikis, has been integrated into educational settings. The advantages of wikis for a variety of different uses and their inclusion in learning processes have been broadly studied and documented in classrooms, distance and blended learning, as have the potential pitfalls and critical issues associated with their use.
>
> In higher education settings, research has been carried out on a wide range of subjects related to wikis, including issues as didactic and organizational arrangements for learning, design of open learning environments, and knowledge production (Baltzersen, 2010; Bonk, Lee, Kim, & Ling, 2009; Hadjerrouit, 2013; Karasavvidis, 2010; Kasemvilas & Olfman, 2009; Pusey & Meiselwits, 2009; Rice, 2009; Su & Beaumont, 2010; Trentin, 2009). (Brodahl et al., 2011, p. 74)

However the use of Google Docs (2008) and EtherPad (2008), being collaborative writing tools relatively comparable to wikis, remains a gap in research literature (Benson, 2012; Chu & Kennedy, 2011), though recently a number of contributions to the body of research have been made (Brodahl et al., 2011; Burden, 2012; Caspi & Blau, 2011; Cruz, Dominguez, Maia, Pedrosa, & Grams, 2013; Dishaw, Eierman, Iversen, & Philip, 2013; Garner, 2010; Oguilve, Vindas, & Moya, 2012; Tomlinson et al., 2012).

> Google Docs (GD) and EtherPad (EP) are tools promoted by software designers to be fairly intuitive to adopt for anyone accustomed to a word processor like Microsoft Word or Open Office Writer. Yet the fact remains that it is difficult to predict how students will behave in a real educational setting. Taking the complexity of learning processes into

> consideration, the educational use of GD and EP raises a number of questions. How important is the students' digital literacy and previous knowledge in ICT in such situations? What role do parameters such as age, gender and number of collaborators play in the collaboration and learning process? Are GD and EP potentially powerful tools supporting collaborative learning and encouraging the students to collaborate? And, is introducing the tools possible without teaching them in detail? Clearly, there is a need to explore these issues experimentally. (Brodahl et al., 2011, p. 74)

This study draws on similar quantitative research done previously by Brodahl et al. (2011).

> [It] investigates beginner education students' perceptions of collaborative Web 2.0 tools to support academic work. The goal is to enrich the empirical results in this domain by evaluating the perceived effectiveness of GD and EP as online collaborative tools. The investigation is carried out in collaboration with teacher educators in a setting with groups of undergraduate education students using the tools to collectively write a reflective essay paper.
>
> The case study is structured according to three categories: subject, object and approach. The subjects of the study are education students. The object of the study is the use of collaborative writing tools in teacher education. The approach is exploratory, considering questions posed below. (Brodahl et al., 2011, p. 74-75)

The paper is structured as follows. First, the theoretical framework, including an outline of the collaborative tools GD and EP, is described. Second, a literature review is given. Third, the research questions are presented. This is followed by the methodology of the work. Then, the results are presented and analyzed, and limitations discussed. Finally, conclusions, suggestions for future work and some recommendations for introducing the collective writing tools for collectively reflective essay paper work are presented.

Theoretical Framework

The theoretical framework is established in Brodahl et al. (2011):

> The proposed theoretical framework serving as a foundation for this work is drawn from two learning theories – the social-constructivist learning theory and the community of practice – and their reciprocal relationship to collaborative tools. The framework identifies two major elements and how they might relate to each other: firstly, learning theories that help to understand the very nature of collaborative learning in terms of learner engagement, group discussion, collaboration, participation in communities of practice, language and culture, and negotiation of meaning; secondly, collaborative tools that serve as means of communication for collaborative learning activities where group members use various techniques to write collaboratively, share their knowledge, post information, and discuss issues of common interest. The framework specifies collaborative learning processes and collaborative tools in a dialectical relationship. The quality of collaboration depends both on students' prerequisite knowledge in terms of collaborative skills, on the one hand, and the potential capabilities of the tools in supporting students' collaborative learning in terms of user-friendliness and effectiveness, on the other hand. Collaboration presupposes a trouble-free interaction with the tool in order for the students to work collaboratively.
>
> The purpose of this framework is to guide the implementation and evaluation of collaborative writing with GD and EP. The framework addresses both technical and pedagogical issues of collaborative writing. It provides support to investigate the research questions, analyze and interpret the results, and draw some conclusions for collaborative writing.

The framework is an attempt to make meaningful links between the collaborative tools GD and EP and collaborative learning, based on current learning theories. The effectiveness of the framework in practice will depend on the strength of the links between the learning theories and the collaborative tools being used. (Brodahl et al., 2011, p. 75-76)

Socio-Constructivist Learning Theory

Theories of collaborative learning are based on the socio-constructivist theory that knowledge is socially produced by communities of people and that individuals can gain knowledge if they join knowledge communities (Vygotsky, 1978). From a social constructivist point of view, learning is considered an active process in which people construct their knowledge by relating it to their previous experiences in real situations through interaction with the social environment. Thus, learning occurs as learners improve their knowledge through collaboration and information sharing in authentic contexts. According to Vygotsky, language and culture play essential roles in human collaboration and communication. As a result, the socio-constructivist learning theory is essentially a collaborative learning theory. In education, collaborative learning is seen as a process of peer interaction that is mediated and structured by the teacher.

Vygostky's theory of Zone of Proximal Development (ZPD) expresses the social aspect of learning. ZPD is the "distance between the actual developmental level as determined by independent problem-solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (Vygotsky, 1978, p. 86). ZPD describes the tasks the learner can do, but only with help from a more knowledgeable person. This means that students can learn, but beyond a certain level, they cannot learn alone unless they are engaged in a level of activity that they cannot manage alone without the assistance of a more knowledgeable person. Vygostky's theory of ZDP is a useful construct to understand the tension between individual learning and collaboration with others. Students' learning development in an online collaborative environment should not be assessed by what they can learn independently with the tools alone, but rather by what they can learn in collaboration with fellow students (Buzzetto-More, 2010; Koohang, Riley, & Smith, 2009). (Brodahl et al., 2011, p. 76)

Community of Practice

Collaborative learning becomes even more important when it takes place in the context of a community of practice (Wenger, 1998). A community of practice consists of people engaged in collective learning in a shared domain, where learning becomes a collaborative process of a group. In such communities, students collaborate as they acquire a common understanding of a shared knowledge domain (Lave & Wenger, 1998). Students' participation in communities of practice is based on negotiation and renegotiation of the meaning of the shared domain. This means that understanding and experience are in constant interaction and mutually constitutive (pp. 51-52). Becoming a member of such a community includes learning how to collaborate in the community (p. 109). In this perspective, participation in online dialogue by means of collaborative tools can be seen as social practices and contextual negotiation of meaning. Collaborative writing is one example of a shared knowledge space where students come together as communities of learners to share knowledge as they generate content (Dubé, Bourhis, & Jacob, 2006; Parker & Chao, 2007). (Brodahl et al., 2011, p. 76)

Tools for Collaborative Writing

> Collaborative tools can serve as a knowledge platform for a community of practice where members of the community can share their knowledge with the group, post information, work together, and critically discuss issues (Cattafi & Metzner, 2007). The use of collaborative tools is characterized by some of the elements fundamental to a community of practice, including an online presence, a variety of interactions, communication, participation, relevant content, and relationships to a broader subject field of interest. Collaborative tools can be used to facilitate computer-supported collaborative learning, i.e., the development of collaboration by means of technology to enhance learning. In addition, collaborative tools can enhance peer interaction and group work, facilitate sharing and distributing knowledge and information among a community of learners (Lipponen, 2002). Finally, an essential element of collaborative learning is that learners should be encouraged to reflect on their knowledge. Collaborative tools allow this reflection to be done collaboratively, moving closer to a fully social constructivist mode of learning. (Brodahl et al., 2011, p. 77)

Collaborative Writing with Google Docs and EtherPad

Web 2.0 tools are second-generation software characterized by facilitating creation of content, communication, and collaboration, designed for user distribution and providing an "Architecture of Participation" (Barnatt, 2008; O'Reilly, 2005). On a conceptual level, online collaborative writing tools, allowing single users to create and share text and multiple users to edit the same document at the same time, are Web 2.0 tools, in virtue of editing software being centrally hosted (Software as a service, SaaS) and text documents stored in the "Cloud".

> Common applications are blogs and wikis. A blog is sequential, sharing content by posts and comments displayed in reverse chronological order, but a wiki allows for multiple users to edit each other's content (Bell, 2009). To modify a wiki page however, the user must enter an edit-mode and then save a new version of the page (Bell, 2009), so a wiki also has a chronological structure. …
>
> Alternative collaborative writing applications enable synchronous editing and allow users to collaborate in real time. Examples are GD and EP. GD [currently as part of a larger suite, Google Drive] … consisting of word processor, spreadsheet, presentation tool, database, survey tool and storage service [provides] most of the features found in standard word processors. … EP is less full featured, but is noted for being particularly easy to use (Hoya, 2010). Both applications are free. They differ however in that GD requires users to have an account, while EP is open to anybody. EP automatically provides each author with a unique highlight color, and updates the document being edited continuously, i.e. every half second (EtherPad, 2008). Both GD and EP provide automatic saving and also allow the author to save at any time. Each saving produces a new document revision. Such revision tracking is a strong feature also provided by wikis. All three systems also offer a means for written metacommunication, in the form of separate discussion pages in wikis and chat fields (see Figure 1) in GD and EP. (Brodahl et al., 2011, pp. 77-78)

Chat boxes offer instant messaging between authors, as well as chat history with chat conversations recorded and saved.

Both GD and EP offer a great variety of choices on where people collaborate and how close they need to be in order to collaboratively reflect and write together on a shared document. The two collaborative writing tools have opened up both different ways of interaction and different writing work modes.

- Different ways for writers to interact with other writers in a writing process and to engage in different ways with and on the content: Figure 1 conceptualizes how the tools can support collaborative writing in a process of negotiated meaning making, mediated by a mixture of the affordances inherent in the technology.
- Different degree of proximity of the writers (where the author writes) and different degree of synchronicity of writing activities (when the author writes): The tools offer place dispersion, i.e. to work at the same location or at different locations, and time dispersion, i.e. to work at the same time or at different times. Figure 2 conceptualizes that a writer can edit a shared document in real-time with a group (same time/same place or same time/different places), possibly with some co-authors collocated and some apart. From different places a writer can edit a shared document alone, as well as read and leave text in the chat box, achieving non-real-time communication and collaboration.

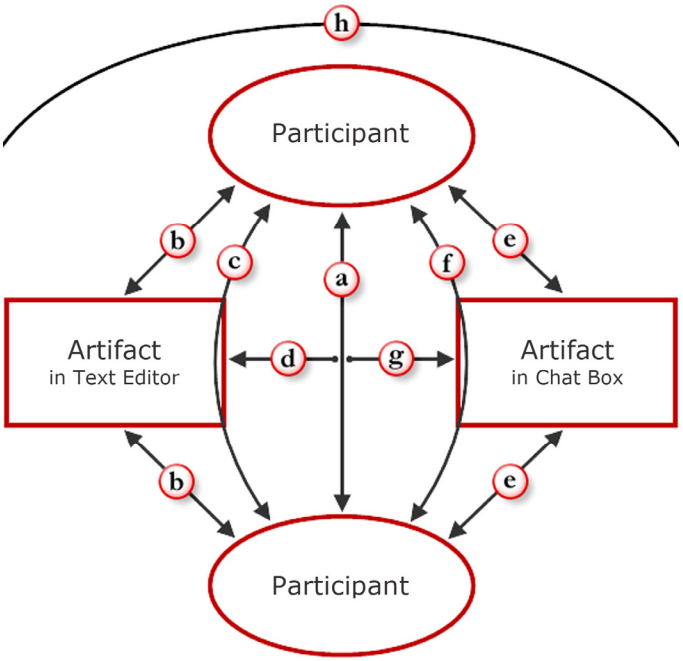

Figure 1: Extended conceptual model of collaborative writing. (Brodahl, Hadjerrouit, & Hansen, 2011, p. 78)

		SYNCHRONICITY	
		Same Time	Different Times
PROXIMITY	Same Location	Face-to-face	Asynchronous
	Different Locations	Synchronous–Distributed	Asynchronous–Distributed

Figure 2: Collaborative writing work modes on a shared online document. Based on Ellis, Gibbs, & Rein (1991), p. 41.

GD and EP are real-time collaborative editors where multiple writers can edit the same document simultaneously. They do however not support off-line editing of documents, and collaborators consequently need Internet connectivity to access the shared document. As well, the tools do not support insulated work, where blind modifications are made and occur only when the writer chooses to save. A work-around is to complete insulated writing on a separate file, in same time, while connected to the other writers working on the shared document in real-time, and to copy and paste into the collaboratively written shared document. Since text is not instantly visible for co-authors, i.e., not in real-time as it is being written, insulated writing is considered an asynchronous mode of interaction (Skaf-Molli, Ignat, Rahhal, & Molli, 2007).

Literature Review

The literature review is based on Brodahl et al. (2011), with block quotation and page number used for citations, and expanded with later publications:

> Looking at the research literature, it appears that published material related to Web 2.0 technologies in higher education is characterized by a number of issues: positive elements of use, advantages of using Web 2.0 technologies, critical issues regarding the pedagogical value of Web 2.0, and the role of the teacher in using these technologies. (Brodahl et al., 2011, p. 79)

Positive Elements of Use

> First, the research literature reports on positive elements of use of Web 2.0 technologies as teaching tools. For example, Rienzo and Han (2009) found significant benefits of using GD[’s real-time editing capabilities] in a management course with more than 400 students, and they anticipate additional benefits in the future, e.g., raising collaboration to a new level. Likewise, Tsoi (2010) reported that the outcomes of the process of integration of Web 2.0-mediated collaborative activities in terms of the richness of the contents of the blogs and wikis have been encouraging and positive. Furthermore, Rice (2009) claims collaborative writing in Web 2.0 environments not only to be a practical tool, but also a fluid, dialogical situation existing among writers, objects, and the informational contexts. (Brodahl et al., 2011, p. 79)

Garner (2010) provides a discussion of how technologies like GD can support collaboration around information and personal knowledge management. Chu, Kennedy, and Mak assessed students’ perception on the effectiveness of MediaWiki and GD in report-writing processes, and analyzed usage experience, severity of potential problems and knowledge management (Chu & Kennedy, 2011; Chu, Kennedy, & Mak, 2009). They reported on undergraduate students in the Information Management Program, who found both MediaWiki and GD to be effective and enjoyable online collaboration and management tools.

In a study with a total of 1002 students on technologies that may be suited to challenge the combination of Word and email in solving a non-face-to-face collaborative writing and editing task in three-person groups and distributed in time and space, Dishaw et al. (2013) found that GD achieved high scores, much higher than TWiki, both due to its perceived usefulness and ease, and its support for collaboration (real-time up-date editing; email, real-time chat and threaded comments available within the tool) and the clarity of the collaboration process. Brodahl et al. (2011) highlight the importance of GD and EP claiming that properties and characteristics of the tools provide opportunities for multiple users to work on the same document and afford meta-communication. Oguilve et al. (2012) found that use of GD increased motivation in writing tasks for academic purposes depending on how efficiently students used the tool.

Blau and Caspi (2009a) did research on education and psychology students sharing their written assignment for suggestions or editing via GD. "They found differences in psychological ownership, perceived quality of the document, but not in [students'] perceived learning, and believe that a collaboratively written document might have higher quality than a document written alone" (Brodahl et al., 2011, p. 79). They conclude that relation between perceived ownership and perceived learning is mediated by perceived quality of the written product (Caspi, & Blau, 2011) and improvement suggestions preferred over editing one another's writing (Blau, & Caspi, 2009a, 2009b).

Pedagogical Benefits of Using Web 2.0 Technologies

> Second, the research literature also highlights the advantages of using Web 2.0 technologies. For example, Kittle and Hicks (2009) discuss, from new perspectives on literacies, issues about how learners work together and what online tools like word processors and wikis can enable, synchronously and asynchronously. They present sample procedures for how we can teach collaborative writing using technology and how to pay attention to what is happening in the document and mentally. Similarly, Lamb and Johnson (2010) considered, from the perspective of teacher-librarians, GD as collective writing tool in inquiry-based education. They discussed ways writing tools can be used in facilitating teaching and learning in order to think, create, and share at the same time as addressing subject areas in the classroom. Also, Krebs, Schmidt, Henninger, Ludwig, and Müller (2010) think that weblogs and wikis are a promising way to improve students' learning and to impart their 21st century skills, but these assumptions are the best hypotheses. Empirical research is still necessary to confirm the potentialities of Web 2.0 for collaborative learning. (Brodahl et al., 2011, p. 79)

Burden (2012) includes both GD and EP in his doctoral study which explores how the affordances of Web 2.0 technologies support and transform teacher learning. These collaborative editing tools are argued to facilitate new forms of interaction between individuals and groups, to be potential vehicles for learning and to play a significant role in supporting the processes and contexts of teacher learning, through three major affordances. They invite collaboration, participation and practice, and knowledge construction (p. ii).

Critical Issues Regarding the Pedagogical Value of Web 2.0

> Third, apart from the advantages of using Web 2.0 technologies and the positive results achieved so far reported in the literature, there are still a number of critical issues regarding the educational value of Web 2.0 technologies in comparison to traditional ways of learning. The research literature reports on a number of studies on the use of Web 2.0 for collaboration in educational settings. Elgort, Smith, and Toland (2008) pointed out that many students still favor individual learning instead of working collaboratively, although wiki technologies require collaboration among students. According to Luckin et al. (2009), few learners reported engaging in genuine collaborative learning using Web 2.0 technologies. On the contrary, most learners reported that they did not work collaboratively. (Brodahl et al., 2011, p. 79)

Furthermore, despite the potential capabilities of Web 2.0, Witney and Smallbone (2011) reported that face-to-face meetings were the students' preferred means of facilitating group work and discussion. Kraut, Fussell, Brennan, and Siege (2002) indicated that people within limits can adopt the means of communication available, but "communication will be less social, more focused on the topic at hand, more planned, less ambiguous, and more likely to contain misunderstandings, than communication conducted in person" (p. 157).

> Dron (2007) pointed out that the structure generated through social software intended to support collaboration and group interaction may not be pedagogically useful, and there are many ways that social software can fail to address the learners' needs. Criticisms are also expressed by Grion and Varisco (2007). They explored the shared construction of professional identity and the nature of interaction in students sharing their case-work, a synthesis of real life scholastic experiences and pedagogical theoretical reasoning, by means of a collaborative writing tool. They identified the need to provide a space for supporting these novice students to reflect more. Lastly, Brush and Saye (2009) succeeded using collaborative tools (like GD) for school visit inventory and empowering inquiry-based teaching practices in social studies classrooms, having pre-service [education] students collectively gather, analyze, and interpret information. However, they indicated that "even if mentor-teachers do have expertise in technology integration and time to mentor preservice teachers, they may not have the opportunity to model diverse teaching strategies in the limited amount of time a preservice teacher is present in their classroom, or they may lack of technology resources at a given placement school" (p. 59). (Brodahl et al., 2011, p. 80)

The Teacher's Role in Using Web 2.0 Technologies

> Finally, another important subject for discussion in the literature is the teacher's role in using Web 2.0 technologies. Parker and Chao (2007) think that the role of the teacher is as important as in the traditional classroom. Teachers still need to teach Web 2.0 as a skill, by incorporating social software into classroom, and to prepare students to make innovative uses of collaborative software tools. (Brodahl et al., 2011, p. 80)

Cruz et al. (2013) found that digital competencies do not present any difficulty for the realization of GD-based activities in web-based peer assessment, while good preparation and support guidelines, and the response and support given by the teacher (versus peers) are essential for its success and students' use and appreciation of feedback.

> Likewise, Kim, Hong, Bonk, and Lim (2009) stress that effective teacher intervention is a crucial component leading to better group performance, collaboration, and reflection. In contrast, Prensky (2010) claims Web 2.0 technology to be a tool that students use for learning essential skills and "getting things done" (p. 103) and that students should be encouraged to use Web 2.0 tools as much as possible – not necessarily teach them to use technology. (Brodahl et al., 2011, p. 80)

Hadjerrouit's (2013) conclusion regarding wikis and their relationship in teacher education is that factors of success can be divided into content-related, tool-related, and group-related factors.

Research Questions

This work examines education students' perceptions of collaborative writing by means of the collaborative tools GD and EP. The investigation is situated in teacher education and an established partnership between the Faculty of Technology and the Teacher Education Unit.

The following research questions guided this work:

- What factors or practices in class assignment do students perceive to be important to make collaborative writing easy and effective?
- How do students' perceptions of collaborative writing vary depending on factors like gender, age, digital competence, interest in and opinion on the importance of digital tools?

- In what way do their experiences motivate them for future use of the tools?

A case study is used to answer the questions. To answer the second question, the paper attempts to examine qualitative data collected and search for meaning in the results from a former study (Brodahl et al., 2011) that solely focused on the quantitative results of survey questionnaires.

Methodology

Case Study

This work expands that of Brodahl et al. (2011), and though some responses have been omitted (see section Participants) and a thorough qualitative analysis has been carried out, the case study itself remains the same. It concerns students' perceptions of collaborative writing tools in a higher education setting, with focus on educational objectives, not on teaching the tools. In collecting data, both quantitative and qualitative methods are employed. The case study also draws on a theoretical framework associated with learning theories and the link to collaborative tools, and may shed light on challenges with introducing collaborative Web 2.0 writing tools.

> A case study research was chosen for three reasons. First, it provides a suitable context for the research questions … Second, it helps to find out whether the results support the theoretical framework and existing research work. Third, it uses methods to collect both quantitative and qualitative data and their triangulation to achieve an adequate understanding of the students' perceptions of GD and EP. (Brodahl et al., 2011, p. 80)

Initial teacher education today needs to consider the pedagogical use of ICT and digital competence in order to prepare student teachers for practice (Krumsvik, 2012). In Norway, related policies in teacher training are to be operationalized both by the teacher educators responsible for teaching a specific school subject and the educational science subject teachers. Educational science subject teachers at the University of Agder decided to give opportunities for students to acquire and practice ICT and to utilize Web 2.0 for collaborative learning. Together with the researchers, they designed a mandatory group task for the education students in the second month of their education, as a jump-start to utilizing Web 2.0 tools in collaborative learning.

The development of the task was based on the following premises and assumptions:

- Focus should be on the content of the assigned subject, not on technical skills and tools.
- Web 2.0 technologies should supposedly be easy to use and take little time to learn.
- An introduction of tools might be needed, but with emphasis on motivation, not details.
- Students need to be given time in class to work on or coordinate the group task.

> Beyond covering subject content, the task was to be designed with the intention of providing opportunities for students to acquire and practice ICT skills, in particular applications and technologies allowing for engaging and connecting with others, as well as experiencing implications for learning strategies. (Brodahl et al., 2011, p. 81)

The assignment was presented by the educational science subject teachers, and the use of a Web-based collaborative real-time editor was made mandatory. Each base group worked on the same task that had focus on a teacher's role and was required to collaboratively write a two- to three-page reflective essay paper using either GD or EP. The assignment consisted of writing narratives of practice, based on theory and experience from ongoing first practical training in elementary school, and working in groups of five to seven students. Students in each base group received their practical training at different schools, and planned and elaborated their experiences at a distance.

> Apart from formal writing requirement and a five-minute demonstration of each of the two writing tools, no detailed training was given, expecting the students with equal ease to find their way to explore and utilize the writing tool while working on their subject assignment. (Brodahl et al., 2011, p. 81)

Participants

The work used a convenience sample for three reasons. First, the participants were directly accessible to the researchers. Second, students were to take part in a mandatory online survey, resulting in a high response rate. Third, students had comparable conditions regarding task and local dispersion.

The sample included beginner education students (N =177) in the university Teacher Education Unit (see Table 1) at the main campus. It is a subsample of the one used in Brodahl et al. (2011) (N =201), with students from the satellite campus excluded. Disregarding these students is done because their groups received their practical training at the same school, wrote their collectively reflective essay paper at the same physical location, and reported the use of collaborative tools as superfluous and unwanted in their setting, resulting in little experience with the tool to be gained or shared.

- The participants consisted of 72.3% females and 27.7% males with a mean age of 22.1 years and a median age of 20.0.
- Ages ranged from 18.8 to 44.2 years.
- Students were enrolled in one of two courses, 41.2% and 58.8% respectively: Primary Education program for grades 1-7 in 10-year compulsory schooling and Lower Secondary Education program for grades 5-10.

Table 1: Students' age and gender distribution

	Aged 19-27			Aged 28-44			All ages		
	Female	Male	Subtotal	Female	Male	Subtotal	Female	Male	Subtotal
Total (n)	116	43	159	12	6	18	128	49	177
Total (%)	*(65.5)*	*(24.3)*	*(89.8)*	*(6.8)*	*(3.4)*	*(10.2)*	*(72.3)*	*(27.7)*	*(100.0)*

Note. Numbers of students, N = 177. Percentage is italicized and parenthesized.

The five classes were organized in 29 basic work groups with a mean age varying from 19.8 to 27.4 years. The groups consisted of 5-7 students each: two groups of five, 22 groups of six and five groups of seven students.

A show of hands, after a demonstration of GD and EP, revealed that none of the students present had used EP before. Less than 2%, three students, had used GD.

> Relying on the concept of Digital Natives as defined by Prensky (2001, p. 1), and overall characterized as possessing a core set of technology based skills (Kennedy, Judd, Churchward, Gray, & Krause, 2008, p. 117), this research work designates all students born after 1983, who were 27 or younger at the time of the study, as a part of the Net generation of Digital Natives in Europe (Jones, Ramanau, Cross, & Healing, 2010, p. 724). (Brodahl et al., 2011, p. 83)

Accordingly, 89.8% of the first-year students are considered as Digital Natives.

Data Collection Methods

The study is based on three sources. One is a priori data of group size, location, age and gender, known from class participant lists. The other two are based on data collected on a Drupal-based website: a survey and students' reflection notes. The survey was conducted using a questionnaire created with the Drupal module Webform, and the reflection notes were posted as Drupal Forum entries.

The survey consisted of three major parts:

Part one was concerned with the students' backgrounds, asking for age and gender, though known a priori, and statements on how often they performed certain tasks on a computer. This information was later used to estimate their digital competence. (See section Data Collection Methods in Brodahl et al. (2011) for details on the survey and estimation of the students' digital competence.) Finally they assessed their own digital competence.

In part two the students responded on a Likert scale to how much they agreed or disagreed with statements on the collaboration tool their group used the most, i.e., GD or EP.

Part two also contained three open-ended questions on:

1. What they liked and did not like about the collaborative tool.
2. Why they liked or did not like that their fellow students edited or commented on their contribution to the group's work.
3. Why they liked or did not like to edit or comment on their fellow students' contribution to the group's work.

Part three concerned the Drupal website itself, responses intended to ameliorate the site. However they do not concern this study, and will not be mentioned further.

In their mandatory reflection notes the students commented on what was done, experienced, and observed around their group's collaborative effort, and what was learned and found worth keeping or changing in the future. The task was given by "Write a short reflection note on your experience with a collaborative writing tool and the collaborative writing process. Share your experience along three levels: what is done, what is learned, and what is smart to consider". Students were asked to consider briefly how the tool was used in particular phases of collaboration, for instance planning, writing and preparing for submission, and what had been carried out with or without differences in time and space.

A priori data, questionnaire background data and responses to closed-ended questions were used in the quantitative study by Brodahl et al. (2011).

By contrast, this work takes the qualitative data, i.e., responses to open-ended questions and students' reflection notes, into consideration. It also, both qualitatively and quantitatively, disregards responses from the student groups working at the same placement school. This is because their reflection notes indicate that the use of a collaborative tool was superfluous, simply an unwanted issue that was imposed on them, interfering with their work. For instance:

- Smart enough if we worked separately, but not when we spend all day together.

The qualitative data management tool NVivo (version 10) was used to manage the qualitative data. For each student, attributes like age, sex, group code and group size were imported together with complete responses to the questionnaire, as well as reflection notes. Responses to open-ended questions, and also reflections on what they had done and learned, and suggestions on what would be smart to do in the future, were successively classified by coding.

Both researchers first performed data analysis individually, familiarizing themselves with the data, and refining the research questions. In an iterative process themes and cases were identified and labeled with codes. The researchers then exchanged codes and organized them in a coding structure, establishing a hierarchical set of codes with themes and subthemes. Several readings and recoding of the data set and minor modifications to the coding categories were performed before the data set was independently and completely coded, and the agreement on coding used compared. Each researcher then wrote his/her sections of the paper, which they shared with the other researcher who responded in light of her/his own coding.

Coding was mainly guided by a search for statements to highlight the research questions, including a search for information strengthening or weakening the assumptions made concerning quantitative data in Brodahl et al. (2011). Furthermore an attempt was made to identify and code the work modes of each group, i.e., face-to face, asynchronous, synchronous-distributed or asynchronous-distributed. Coding included identifying and classifying negative and positive statements concerning work mode and task, the tool itself, and the process of commenting on and editing each other's work.

In addition, apparent factors of success, as perceived by the students in their written reflection notes, when addressing their experience with a collaborative writing tool and the collaborative writing process, especially giving details on what they experienced to be smart to consider, underwent coding, with a code structure mainly along three categories: tool, content, and group. An outstanding frequency of a theme was used to identify it as a key factor and a recommendation to be drawn upon students' perceptions.

NVivo was then used to group all chunks of data associated with each code or combination of codes and attribute data in list views. These organized lists were exported to Word for further formatting, reading, and analysis.

Results

A total of 154 students (87.0% of $N = 177$) participated in the survey, and 145 (81.9% of $N = 177$) completed reflection notes.

In the following, the *quantitative* results describe the students' perceptions of the:

- Collaborative tool, including ease-of-use and effectiveness (see Table 3, statements 1-3).
- Collaborative process, supported by the tool (see Table 3, statements 4-8).

As the search concerned dissimilarities in response distribution between two groups, the quantitative results of the survey questionnaires are presented as frequency distribution tables with the groups compared in juxtaposition. The focus was not on distribution details within each group, i.e., mean and standard deviation.

The work focuses on averages on frequency of respectively positive, neutral, and negative responses. Positive responses include "Strongly agree" and "Agree", neutral responses "Neither agree nor disagree" and "Don't know", and negative responses "Disagree" and "Strongly disagree".

Students' Perceptions of Collaborative Writing, Global View

A large number of students indicated uncertainty about the value of the tool used and the collaborative writing (see Table 2 and Table 3).

Table 2: Students' perceptions of collaborative writing

Statement category	Statement n°	Response[a] Positive	Neutral	Negative
Collaborative tool	1–3	*33.5*	*33.8*	*32.7*
Collaborative process	4–8	29.4	40.1	30.5

Note. Average on frequency (%). [a]*n* = 154

Table 3: Students' perceptions of collaborative writing, global view

Statement	Response[a] Strongly agree (SA)	Agree (A)	Neither agree nor disagree	Dis-agree (D)	Strongly disagree (SA)	Don't know	Sub-total SA+A	Neutral	Sub-total D+SD
1. It was easy to use the tool in group work	**9** *(5.8)*	**52** *(33.8)*	**57** *(30.5)*	**36** *(23.4)*	**10** *(6.5)*	**0** *(0.0)*	**61** *(39.6)*	**47** *(30.5)*	**46** *(29.9)*
2. It was effective to use the tool in group work	**8** *(5.2)*	**35** *(22.7)*	**58** *(37.7)*	**37** *(24.0)*	**15** *(9.7)*	**1** *(0.6)*	**43** *(27.9)*	**59** *(38.3)*	**52** *(33.8)*
3. The tool was easier to use than traditional tools such as MS Word	**7** *(4.5)*	**44** *(28.6)*	**49** *(31.8)*	**37** *(24.0)*	**16** *(10.4)*	**1** *(0.6)*	**51** *(33.1)*	**50** *(32.5)*	**53** *(34.4)*
4. I liked to comment on and edit others' contributions to group work	**9** *(5.8)*	**40** *(26.0)*	**55** *(35.7)*	**35** *(22.7)*	**8** *(5.2)*	**7** *(4.5)*	**49** *(31.8)*	**62** *(40.3)*	**43** *(27.9)*
5. I liked that other students comment on and edit my own work in the group	**13** *(8.4)*	**63** *(40.9)*	**52** *(33.8)*	**14** *(9.1)*	**4** *(2.6)*	**8** *(5.2)*	**76** *(49.4)*	**60** *(39.0)*	**18** *(11.7)*
6. The quality of collaboration in the group increased with the use of the tool	**5** *(3.2)*	**19** *(12.3)*	**53** *(34.4)*	**40** *(26.0)*	**31** *(20.1)*	**6** *(3.9)*	**24** *(15.6)*	**59** *(38.3)*	**71** *(46.1)*
7. The tool motivated me to collaborate with the students in the group	**3** *(1.9)*	**19** *(12.3)*	**59** *(38.3)*	**45** *(29.2)*	**26** *(16.9)*	**2** *(1.3)*	**22** *(14.3)*	**61** *(39.6)*	**71** *(46.1)*
8. It was instructive to edit and comment on others' contributions to group work	**5** *(3.2)*	**50** *(32.5)*	**61** *(39.6)*	**20** *(13.0)*	**12** *(7.8)*	**6** *(3.9)*	**55** *(35.7)*	**67** *(43.5)*	**32** *(20.8)*
9. The tool did work as expected	**8** *(5.2)*	**17** *(11.0)*	**16** *(10.4)*	**46** *(29.9)*	**65** *(42.2)*	**2** *(1.3)*	**25** *(16.2)*	**18** *(11.7)*	**111** *(72.1)*

Note. Frequency of responses is in boldface, percentage is italicized and parenthesized. [a]*n* = 154

Table 3 presents, in more detail, a count of responses to the statements concerning the collaborative tool, the collaborative process and how well the collaborative tool worked.

Concerning the ease-of-use and effectiveness of the tool, 39.6% agreed or strongly agreed that the tool was easy to use. Likewise, only 27.9% of the students thought that the tool was effective to use in group work. Furthermore, 33.1% found that the tool is easier to use than traditional text processing. While only 31.8% of the students liked to comment on and edit others' work, 49.4%

strongly agreed or agreed that they liked other students to comment on and edit their own work. In addition, only 15.6% of the students found that the tool influenced the quality of collaborative work within the group. Furthermore, only 14.3% were motivated to use the tools for collaboration with their fellow students. Regarding the learning effect of collaborative work, 35.7% strongly agreed or agreed that they learned by collaborating. Finally, 16.2% of the students indicated that the tool did work as expected.

More than 30% of the students neither agreed nor disagreed with any of the statements, except for statement 9 (see Table 3). An explanation of this uncertainty may be lack of experience with the tools, but other causes may be the students' digital competence and lack of time to work with the tool. Thus it is difficult to assess the real value of collaboration by means of GD and EP. However, some provisory conclusions might be:

- An important number of students (46.1%) were not motivated to use the tools for collaboration.
- The tools did not work as expected for the overwhelming majority of the students (72.1%).
- The tools did not significantly affect the quality of collaboration between the students.

The symmetrical distribution of responses in Tables 2 and 3 is another factor that makes interpretation difficult. The difference between the number of students who agreed or strongly agreed that the tool was easy to use, effective, and more effective than traditional tools, and those who disagreed or strongly disagreed, is only 0.8% (see Table 2 and Table 3, statements 1-3). On statements related to the collaborative process, supported by the tool, the corresponding figure is 1.1% (see Table 2 and Table 3, statements 4-8). In the survey the students, however, also commented on what they liked and did not like about the collaboration tool, shedding light on the issue. Their reflection notes also deal with many of the same issues as the responses to the open-ended questions.

An overview is shown below, grouped by the essential elements of Hadjerrouit's (2013) system of relationships.

Tools: On the negative side the major consideration is technical difficulties. The students were unable to log in, were forcedly logged out or lost connection, and even lost their work. Several claim that the program is not to be trusted, and that their work needs to be backed up in another system. However, except for a single comment, they all stem from EP-users. Since about 80% of the respondents used EP, the fact that EP was periodically unavailable during the students' work period may severely have contributed to the negative ratings of the tool.

– The tool was down in the period when we were supposed to finish.
– Unstable. The tool was not to be trusted, didn't always work.
– Got very difficult when we fell out of EP all the time. It obstructed our work to such a degree that we in the end were forced to save what we could of the text and finish writing and editing in Word.

Further negative comments are that using a collaboration tool is inferior to being collocated and that it was difficult to keep track of the text in a document being edited by several people synchronously. A few complained about lack of training. Missing a spellchecker and a slow program is also mentioned on the negative side. On the positive side the system of color-coding text by user is frequently mentioned, next frequently mentioned is the chat feature.

Group: The major negative factor here is concerned with group size. The students claim that it was difficult to keep track of the text when too many edited simultaneously. Nor did cooperation work very well, as it was both difficult to get people organized and to agree on the structure of the text. There are several suggestions that two or three people is an ideal group size. Comments on group size appear in fairly equal amount in groups with five, six or seven participants.

- Difficult to keep track of the document when five others are editing.
- Is probably more suited for a group of two or three instead of six, like we were.
- It is also a bit difficult when we are many in the group. It is hard to agree on a time suited for everybody to write.
- Continuity is also important; everybody ought to be logged in regularly.

On the positive side, the advantage of being able to work from anywhere anytime and the possibility to able to work synchronously on the same document from different places is a recurring comment, as well as that everybody can contribute, improving the final result.

Content: The major issue was difficulties with producing a unified text with many contributors. The problems were caused by different writing styles, lack of consensus on how the final result should be, and problems patching together the individual contributions. Some also claimed that the assignment was unsuited for collaboration, and that the time of assignment did not fit their work schedule.

- I did not like how the text quickly got incoherent when it was written by 6 different persons not in the same room, unable to discuss and agree on how to write.

The closed-ended Questions 4 and 5 (see Table 3) had open-ended counterparts in the survey, requiring responses from the participants, respectively on what they liked or disliked on editing and commenting on other people's work, and having their own work edited or commented on.

The quantitative response to Question 4 is slightly skewed to the positive side, as 3.9% more agreed or strongly agreed that they liked to comment on and edit others' work than disagreed or strongly disagreed. However the responses to the open-ended question indicate a more positive attitude. More than 70% of the comments from those with a neutral response to Question 4 were positive. Among the others, also more than 65% of the comments were positive.

Typical positive comments are that it is an advantage to be able to correct spelling errors and bad formulations, that it is educational, that one may contribute with ideas that the others do not have and that it improves the final text.

On the negative side, a concern is that one is not familiar enough with other people's work and methods, fear of insulting somebody and worry about misunderstandings.

The quantitative response to Question 5 is strongly skewed to the positive side, since 37.7% more agreed or strongly agreed that they liked to have their own work commented on and edited by others than disagreed or strongly disagreed. An even stronger positive attitude is reflected in the responses to an open-ended question on the issue. More than 87% of the comments from those with a neutral response to Question 4 were positive. Among the others, more than 90% of the comments were positive. Even among those with a negative response to Question 4, about 70% of the comments were positive.

Recurring positive comments were that feedback improves the text, that constructive criticism is positive, that others contribute with ideas and correct errors one doesn't see oneself, improving the final text. Negative comments dealt with feeling surveyed, others spoiling the text and loss of control.

Students' Perceptions of Collaborative Writing, Detailed Views

Tables 4 to 10 show how the percentage of positive (Strongly Agree and Agree), neutral (Neither Agree Nor Disagree and Don't Know), and negative (Disagree and Strongly Disagree) responses to statements 1-3 (collaborative tool) and 4-8 (collaborative process) vary with gender, age, perceptions of digital competence, educational setting and whether they used GD or EP.

Gender

Table 4 indicates that females were more negative than males regarding the collaborative tool (35.4% / 25.6%) and process (33.3% / 23.3%).

Table 4: Students' perceptions of collaborative writing according to gender

		Male (n = 43)			Female (n = 111)		
Statement category	Statement nº	Positive	Neutral	Negative	Positive	Neutral	Negative
Collaborative tool	1–3	*36.4*	*38.0*	*25.6*	*32.4*	*32.1*	*35.4*
Collaborative process	4–8	*32.6*	*44.2*	*23.3*	*28.1*	*38.6*	*33.3*

Note. Average on frequency (%).

The qualitative data indicate that females are more concerned about group size than males, since 72 of 81 comments on the issue were from females. Correlated for group size, this corresponds to 76%. On the other hand, females account for only 41%, correlated, of the comments on technical difficulties.

Age

Table 5 shows that Digital Immigrants (age 28-44) were more positive regarding the collaborative tool (40.0% / 32.9%) than Digital Natives, that is to say, first-year students born after 1983 (Jones, Ramanau, Cross, and Healing, 2010, p. 724). They were, however, less positive regarding the collaborative process (24.0% / 29.9%), although the results should be considered with caution, as only 15 digital immigrants responded to the questionnaire.

Table 5: Students' perceptions of collaborative writing according to age

		Age 19-27 (n = 139)			Age 28-44 (n = 15)		
Statement category	Statement nº	Positive	Neutral	Negative	Positive	Neutral	Negative
Collaborative tool	1–3	*32.9*	*33.1*	*34.1*	*40.0*	*40.0*	*20.0*
Collaborative process	4–8	*29.9*	*39.1*	*30.9*	*24.0*	*49.3*	*26.7*

Note. Average on frequency (%).

The qualitative data indicate that younger students are more concerned about the importance of preparation and planning than older students, as 93 of 98 comments on the issue came from younger students. Correlated for group size, this corresponds to 67%.

Digital competence

Table 6 shows that students assessing their own digital competence as high or very high tended to be more negative regarding the collaborative tool than those with medium or lower perception (34.3% / 29.5%), but more positive regarding the collaborative process (30.8% / 26.5%).

Table 6: Students' perceptions of collaborative writing according to own perception of digital competence

		Medium, low, very low, Don't know (n = 52)			High, very high (n = 102)		
Statement category	Statement nº	Positive	Neutral	Negative	Positive	Neutral	Negative
Collaborative tool	1–3	*33.3*	*37.2*	*29.5*	*33.7*	*32.0*	*34.3*
Collaborative process	4–8	*26.5*	*42.7*	*30.8*	*30.8*	*38.8*	*30.4*

Note. Average on frequency (%).

Table 7 on the other hand shows that students with high or very high estimated digital competence were more positive regarding the collaborative tool (43.9% / 30.2%) and less negative regarding the collaborative process (24.2% / 32.6%). An explanation of this contradiction may be that the students' perception of own digital competence was too high. 68.2% of the students perceived their own digital competence as higher than estimated, 22.7% as estimated, and 9.1% as lower than estimated.

Table 7: Students' perceptions of collaborative writing according to estimated digital competence

		Medium, low, very low, Don't know (n = 116)			High, very high (n = 38)		
Statement category	Statement nº	Positive	Neutral	Negative	Positive	Neutral	Negative
Collaborative tool	1–3	*30.2*	*33.6*	*36.2*	*43.9*	*34.2*	*21.9*
Collaborative process	4–8	*27.6*	*39.8*	*32.6*	*34.7*	*41.1*	*24.2*

Note. Average on frequency (%).

Table 8 shows that students with high or very high interest in digital tools were more positive regarding the collaborative tool (37.3% / 26.4%) and the collaborative process (33.7% / 21.1%).

Table 8: Students' perceptions of collaborative writing according to interest in digital tools

		Medium, low, very low, Don't know (n = 53)			High, very high (n = 101)		
Statement category	Statement nº	Positive	Neutral	Negative	Positive	Neutral	Negative
Collaborative tool	1–3	*26.4*	*34.0*	*39.6*	*37.3*	*33.7*	*29.0*
Collaborative process	4–8	*21.1*	*37.4*	*41.5*	*33.7*	*41.6*	*24.8*

Note. Average on frequency (%).

Table 9 shows that students who thought that digital tools will be of high or very high importance in their future work as a teacher were more neutral regarding the collaborative tool (34.6% / 32.0%) and more positive regarding the collaborative process (33.3% / 20.0%).

Table 9: Students' perceptions of collaborative writing according to how important they assume digital tools to be in their future work as a teacher

Statement category	Statement nº	Medium, low, very low, Don't know (*n* = 49)			High, very high (*n* = 105)		
		Positive	Neutral	Negative	Positive	Neutral	Negative
Collaborative tool	1–3	*34.7*	*32.0*	*33.3*	*33.0*	*34.6*	*32.4*
Collaborative process	4–8	*20.8*	*43.7*	*35.5*	*33.3*	*38.5*	*28.2*

Note. Average on frequency (%).

Collaborative tools

Table 10 shows that students using GD tended to be considerably more positive regarding the collaborative tool (48.8% / 30.2%) and less negative regarding the process than those using EP (24.3% / 31.9%). The explanation could be that EP was periodically unavailable during the students' work period. This is substantiated by the fact that only 10.3% of the students using EP agreed or strongly agreed that the tool always worked as it should, in contrast to 42.9% of the students using GD. The qualitative data also give strong support to this, as 125 out of 126 comments on technical difficulties originated from EP users, and are related to a limited period of time.

Table 10: Students' perceptions of collaborative writing according to tool used

Statement category	Statement nº	EtherPad (*n* = 126)			Google Docs (*n* = 28)		
		Positive	Neutral	Negative	Positive	Neutral	Negative
Collaborative tool	1–3	*30.2*	*34.7*	*35.2*	*48.8*	*29.8*	*21.4*
Collaborative process	4–8	*29.0*	*39.0*	*31.9*	*30.7*	*45.0*	*24.3*

Note. Average on frequency (%).

However, in their reflection notes, 35.6% of the students explicitly expressed their intention regarding future use of the tool for educational or academic purposes. Table 11 shows that not more than seven students clearly express demotivation for future use of EP (5.6%) and GD (0.0%) as a result of their collective writing experience. It is surprising not only that just two of them relate their experiences of temporary unavailability of the tool, but also that the other five emphasize the importance of physical proximity to their peers, rather than shortages of the tool. Sixteen of the 21 students expressing that they are undecided about their future use of the EP and report that they have experienced periodical unavailability. However, except for two, all believe that information they collected from experiences in the writing process will in turn improve future use of the tool in collaborative processes. Nevertheless, future use will be considered depending on the particular educational situation.

Table 11: Students' intentions regarding future use of the tool

EtherPad (n = 126)				Google Docs (n = 28)			
Will Use	Undecided	Will Not Use	N/A	Will Use	Undecided	Will Not Use	N/A
21	**21**	**7**	**77**	**4**	**5**	**0**	**19**
16.7	*16.7*	*5.6*	*62.1*	*14.3*	*17.9*	*0.0*	*67.9*
(42.9)	*(42.9)*	*(14.3)*		*(44.4)*	*(55.6)*	*(0.0)*	

Note. Frequency of responses in reflection notes is in boldface, percentage is italicized. Percentage of expressed intentions among responses is italicized and parenthesized.

Collaborative process

Students' reflection notes, while not necessarily exhaustive and, even taken collectively for each group, not claiming to give 'the whole picture', reveal information about the groups' work and line of actions. Different practices certainly may cause different perceptions of collaborative writing using the respective writing tools.

As to collaborative writing work modes (see Figure 2), we find groups exclusively working face-to-face and editing their shared document from their laptops at one location. In addition, we find groups mainly working online asynchronously and in sequence, and groups largely working online apart from each other and synchronously. Other groups combined collaborative writing work modes.

In one or two periods 25 groups worked physically close to each other (same time/same place), 23 groups worked at different times and from different places, and 14 groups worked in real-time and apart from each other. Five of the 29 groups reported that they had planned to collaborate in a different way, but had to reorganize their work as the tool did not work at a particular time.

Table 12 shows that students from the groups who employed synchronous-distributed working mode in one or more sessions tended to be less positive regarding the collaborative tool (30.6% / 36.2%) and less positive regarding the collaborative process than those who did not (25.6% / 34.2%). Some explanations why groups applying synchronous-distributed working mode are more negative than average could be found in the respective students' responses to open-ended Question 1 (See Data Analysis Methods):

- "It was messy, frustrating and confusing when everyone wrote at the same time."
- "It went in all directions and it was impossible to keep track of what came up in the document itself while what was going on in the chat."
- "It was overly complex and confusing when many wrote in the same document at the same time."
- "It was hard to survey. Difficult to follow when six persons edit the same document."
- "I disliked communication in chat. It was simply too unnatural and time consuming to explain [suggestions for change] using the chat."
- "Chat was bad and is quite important when it comes to good communication."
- "It was incredibly hard to come by justifications for changing the text to other students, since we had to write everything on chat instead of talking face to face."
- "A simple «telephone line» [voice-over] through the tool would make it very useful."
- "It was rare that the collaboration tool worked [for all of us]. Some did not come into the document at all, while others could not see what had been written. Do not think the tool worked very well."
- "Poor stability. A nice thought, but not good in practice. The result was not good."
- "Everything was new and too many were negative before they tried."
- "It did not feel like a partnership when sitting alone on the task and not had the opportunity to discuss orally and see the other students."

Table 12: Students' perceptions of collaborative writing according to working modes

Statement category	Statement n°	Include synchronous–distributed (*n* = 82)			Non synchronous–distributed (*n* = 72)		
		Positive	Neutral	Negative	Positive	Neutral	Negative
Collaborative tool	1–3	*30.6*	*34.3*	*35.2*	*36.2*	*33.3*	*30.5*
Collaborative process	4–8	*25.6*	*40.3*	*34.2*	*32.7*	*40.0*	*27.3*

Note. Average on frequency (%).

As to possible ways for writers to interact with other writers on the writing task, groups tend to differ in their utilization of collaboration and participation affordances provided by the co-authoring tools (See Figure 1).

- Group A, six group members using EP: The collaborative writing process included the text editor (c), the chat box which members use to "talk" with each other whilst editing (f), and the artifacts that are produced as a result in both the text editor and the chat box. The students started adjacent, in a group meeting. They discussed the task (a), created a shared document in and tested interaction with the text box (b) and interaction with other participants in the chat box (e). The group then decided to work at different times and from different locations. They did not agree on turn taking and timing, working on the paper when it was convenient for them, occasionally synchronously, but mostly working online alone. Each participant made contributions to the document in the text editor and used the chat box to log their work and to comment on each other's contribution. Besides indirect communications between partners through the document (c) and through chat log (f), they also discussed live (a) referring to their understanding of the artifact in the text editor (d) and the artifact in the chat box (g). Taken as a whole, from interacting though shared artifacts, these processes supported developing a common understanding (h) which is the key factor of negotiated meaning making and collaboratively solving the tasks.
- Group B, six group members using EP: The group started out gathered locally, familiarized themselves with the tool and assigned writing tasks in an oral discussion (a). Their next meeting, being apart and working and interacting synchronously and collaboratively on the same artifact (b, c) while chatting (e, f), they completed a rough draft before later continuing to work virtually on their particular part of the document, mostly synchronically, at least in part, and using chat. The following collaborative online working session, where/when each member elaborated a dedicated part of the artifact, included insulated writing, as some text was prepared in separate documents before being incorporated in the shared artifact. Chat was used to keep each other updated. (There is lack of evidence in students' reflection notes on further direct conversations or mutual establishment of various means to refer to the artifacts in editor (d) and chat box (g).)

Surprisingly enough, groups appear not necessarily to recognize and utilize all the potential for collaborative writing and communication by means of chat integrated in the authoring tools (see Figure 1, e, f, g), when it comes to conversation about the writing and negotiation about changes.

As can be seen from students' reflection notes, 21 of the 29 groups used chat to support their paper work. Chat was reported to be used on collaborative processes, respectively coordinating, assignment of activities, turn-taking and time management, as well as on task-related processes, respectively planning, gathering information, suggestions, feedback and dialogue in terms of

checking, focusing, arguing, and composing the document. The chat box was also used to express feelings or mood.

Some of the education students' statements about the content in the chat box:

- "Chat was used as a brainstorm, but of course also for questions and eventually outpouring of despair."
- "[We used] chat to discuss how the task [text] should be […focused] on getting the text to be coherent and pure in the language, while it took a keen discussion in chat about what we could leave [... and how to get a good structure with] introduction, body and conclusion."
- "While we worked [in text box], everyone wrote [in chat box] what they had worked on, and commented […] the work of the others."
- "There was often a bit much chatter there [in chat box]. That made it a little cumbersome for the next guy to read what [was discussed and agreed]."

While eight groups neglected reporting on using chat related to collaborative writing, and one group reported not having been aware of the chat window available in GD, 17 groups reported using chat while working at the same time; at least four groups, while working close to each other, both directly talked to each other as well as using the chat box for written communication. At least 11 groups reported using chat when working in real-time and being apart. Three groups reported having used chat asynchronously, meaning group members kept updated on the status of their collaborative work by reading the chat log and leaving updates there for members of their group.

Some of the education students' statements about their interaction in chat box or through chat log:

- "The downside of this tool was that there was no chat function. So we wrote a note to each other at the top of the page about what each had done and what remained."
- "We found that the task should be written on the large sheet [in text editor], while opinions we wrote in column next to it [in chat box]."
- "There is a chat box, but [to write in the chat box ...] while writing the task is just stressful. To discuss over a chat is not the same as doing it while sitting next to each other."
- "[We talked] in chat and we agreed to correct the text of the one that was upon us."
- "[We used] chat to agree on things, even if it sometimes was a little chaotic. [...] You learn to communicate in a different way. One must be clear and specific, so that others will understand."
- "We discussed [orally] what we had written in the chat."
- "[When entering the document, we] read what has been talked about [in chat box], what the group did agree upon."
- "It is difficult to write a text along with other people when you cannot talk as you work on the text. Chat is not good enough communication."
- "It is hard enough with six persons being obliged to write a shared paper. There are so many different opinions, and it was not easy to reach agreement through chat."

Factors of success and failure

Implementing collaborative tools such as GD and EP for education students' collaboratively writing reflective essay papers is influenced by various factors of success or failure in teacher education. As Hadjerrouit (2013) concludes about wikis and their relationship in teacher education, these factors can be divided into content-related, tool-related, and group-related success factors, where all three have to be taken into consideration. The papers' content is a topic that is aligned with a given curriculum in teacher education. The GD and EP technologies, providing support for creating reflective essay papers, have editing and formatting features, history function, and discussion space. Group work, supported by GD and EP technology, enabling the collective creation of the paper, consists of collaboration, cooperation, and group discussion.

In their reflection notes students point out factors of success based on their experience with writing collectively reflective essay papers. They can be divided into content-related, tool-related, and group-related factors (See Table 13).

Table 13: Students' group-, tool- and content-related perceptions of collaborative writing

Factor	Frequency
Tool	
Use and agree on how to use the chat feature	*39*
Backup work and have a contingency plan	*19*
Get fairly acquainted with the tool and agree on an effective use	*9*
Content	
Prepare well for the specific topic	*7*
Agree on the academic task structure	*6*
Group	
Decide on when and where the group will do its writing, respectively in terms of same or different places and same or different times	*48*
Agree soon on equitable distribution of work	*43*
Work in small(er) groups or large(r) writing tasks (than students did)	*36*
Include communication conducted in-person (face-to-face meetings)	*19*
Preplan and plan next steps and phases	*16*
Dedicate roles and tasks	*14*
Give continuously feedback and converge on ideas	*12*
Agree on time management	*8*
Agree on rules for editing the work of others	*7*
Others (on how to communicate)	*2*

Note. Frequency of responses on factors.

Students point out factors related to tool, content and group. They address the tools' features, advantages and disadvantages, and what will support and assure future work. The way to use features and, not least, to agree on their use is seen to be important. Students' narratives call attention especially to chat and use of chat. A minor number of students address the importance of being prepared on the content of the task and to agree on its academic structure for future work. Deciding as to when and where the group will do its writing, respectively in terms of same or different places and same or different times, is a major concern and perceived to be a success factor for collaborative working, as well as early and equitable distribution of work, in a group of reasonable size.

Limitations

The limitations of the work are concerned with the same five issues as acknowledged in Brodahl et al. (2011): type of sample, validity and reliability, confidentiality, level of experiment control, and time considerations.

Type of Sample

> First, the study was conducted with a small convenience sample, with participants from one university only, and thus may not well cover the perceptions of the total population of beginner education students. While this should not invalidate the initial results, readers need to be aware of this limitation and consider the results of the study with some degree of caution. Replication studies with a larger population may confirm or question these … research results. (Brodahl et al., 2011, p. 89)

Validity and Reliability

> The second limitation is concerned with reliability and validity issues. Reliability refers to the extent to which the research results are consistent over time and an accurate representation of the population and if the results can be reproduced under similar circumstances using a similar methodology (Hardy & Bryman, 2004). To achieve a high degree of reliability, it is important to be aware of the conditions and circumstances under which the study is carried out and the factors that may influence the results of the study. Reliability is also enhanced by an accurate description of the methodology being used so that it can be reused to produce similar results. High reliability is ensured only if these conditions are fulfilled, if used again in similar circumstances.
>
> Two validity issues are concerned with the case study: measurement validity and external validity (Bryman, 2004; Hardy & Bryman, 2004). Measurement validity is associated with the extent to which the data collection methods indicate what they are intended to measure. Survey questionnaires alone cannot accurately measure the students' perceptions of Web 2.0 technologies, but a higher degree of measurement validity is ensured through the use of qualitative data collection methods and their triangulation with survey questionnaires. External validity is concerned with the question of whether the results of the case can be generalized beyond the two campuses. Clearly, the case study cannot be generalized to other campuses, because it is not known to which extent the students are representative for a larger population. (Brodahl et al., 2011, p. 89)

A validity issue concerning written qualitative data is that it never gives the full picture. The students themselves decide on what they will emphasize and how extensive the answers that they want to give are. Another validity issue is that coding is a process subjective to the researchers. Having two researchers separately code the data and suggest codes, then develop a code structure together, and finally code the data independently and compare the agreement on coding used will improve the validity of the analysis. Full credibility, however, would require the students themselves to interpret their responses.

Confidentiality

> Third, limitations may arise by respondents not being anonymous, because it is possible to link the answers to the students' name for university staff. Openness may impact the results. Not being anonymous may turn out at least two ways: Students may complete the questionnaire with diligence, or they may avoid giving purely critical answers. (Brodahl et al., 2011, p. 89)

Level of Experiment Control

> Fourth, freedom of how to use the collaborative writing tools during the group tasks caused a relatively low-level experimental control with the students' utilization of the tools. … [Conditions] under which the students worked together in their respective groups, the quality of their collaboration, their task awareness and the degree of reflection during their work [are] important details [that] may affect the results. (Brodahl et al., 2011, pp. 89-90)

Deeper qualitative research would raise the need for some elements of observation.

Time Considerations

> Fifth, reopening the surveys after the initial period, issuing reminders and making special arrangements to increase the number of respondents may have produced some less serious responses. (Brodahl et al., 2011, p. 90)

Conclusion and Future Work

The goal of this work was to examine what factors or practices in class assignment students perceived to be important to make collaborative writing easy and effective, as well as assessing to what degree their experiences motivated further use of the tool. It also tries to assess how factors like age, gender, students' digital competence, and the tool used influence their experiences.

The case study allowed investigation of the research questions by means of survey questionnaires and students' reflection notes. The quantitative results have been analyzed using a statistical analysis method based on frequency distributions. The quantitative analysis alone did not provide satisfactory evidence that collaborative tools are easy-to-use, effective, enhance motivation, and increase collaboration. However a qualitative analysis provided more insight.

The quantitative findings suggest that only 14.3% of the students were motivated to use the tools for collaboration. Additionally, only a minority of the students (15.6%) reported that the quality of collaboration in the group increased with use of the tools. Likewise, the tools did not work as expected for most students (72.1%). Regarding the collaborative writing process, no definitive conclusions could be drawn from the results. The results also reflect students' positive experiences with collaborative writing, e.g. 72.1% of the students were not negative about commenting on and editing others' contributions to group work, and 88.3% were positive or neutral about getting their own contribution commented on and edited. These results are consistent with some research work in the field of Web 2.0 technologies (Dron, 2007; Grion & Varisco, 2007; Luckin et al., 2009).

The qualitative findings confirm that technical difficulties frustrated many students. However, problems with group size, not technical problems, appear to be the most prevalent reason for discouraging future use of a collaborative writing tool. Students from groups applying synchronous-distributed writing work mode claimed that they were overwhelmed with visual complexity due to a number of people writing at the same time, and complained about stressful working conditions, as well as the chat being insufficient as the only means of communication. It is also worth mentioning that students do not show uniform opinions when expressing their intensions regarding future use.

In contrast to what the quantitative data indicate, students' responses to open-ended questions on why they liked or disliked editing and commenting on each other's work reveal a more positive attitude. Another survey, avoiding the technical difficulties and following the recommendations of this work, might therefore be expected to yield a more positive result.

Taking a detailed view, the quantitative data suggest that females are more negative than males about both the collaborative tool and the collaborative process. The qualitative data cannot be interpreted as confirming or questioning this result, but indicate that females were more concerned about group size than males, but less concerned with technical difficulties.

The quantitative data appear to indicate that digital immigrants are more positive regarding the collaborative tool than digital natives, but less positive about the collaborative process. Again, the qualitative data neither confirm nor question the results. Qualitative data on the other hand indicate that digital natives are more occupied with the importance of preparation and planning. However, the results must be interpreted cautiously as our analysis only includes 15 digital immigrants.

The quantitative data seem to indicate that students with high digital competence and a positive attitude towards digital tools are more positive than average. The qualitative data did not contribute with anything particular on this issue.

Finally, quantitative data suggest that GP users are considerably more positive regarding the collaborative tool and less negative regarding the process than those using EP. This may be explained by the fact that EP was periodically unavailable during the students' work period. This is substantiated by the qualitative data, where 125 out of 126 comments on technical difficulties originated from EP users.

Students' reflective papers confirm that groups took advantage of their freedom on how to use the collaborative writing tools and how to organize their collaboration during the group tasks. It is not surprising that students' experiences, and with that their perceptions of the tools and their group's collaboration processes, differ. Students consider future use based on the background of their experience and in the light of success factors that are to be given consideration for forming productive collaboration within writing collectively reflective essay papers.

Suggestions for future research may be case studies undertaken on real educational situations, but preferably in a more controlled environment, thus reducing the number of limitations found in this work. A suggestion is to observe a small number of groups and follow the groups more closely, for instance, by using interviews. Similar tasks may be assigned to groups that choose to work on collective essay papers in mainly synchronous-collocated, mainly synchronous-distributed or mainly asynchronous-distributed modes, rather than mixed use. The recommendations for increasing the effectiveness of collaborative tools in this work may also be considered. Finally, one may want to limit the study to a single writing tool. The availability and popularity of tools, which vary over time, availability, stability, and ease of use, could guide their selection.

Recommendations

The instructors had made four assumptions for designing the task for their classes:

- Focus should be on the content of the assigned subject, not on technical skills and tools.
- Web 2.0 technologies should supposedly be easy to use and take little time to learn.
- An introduction of tools might be needed, but with emphasis on motivation, not details.
- Students need not be given time in class to work on or coordinate the group task.

EP and GD are tools that facilitate new ways of approaching communication. Although they are easy to learn, it seems reasonable to suppose that their potential value first is recognizable when effectively used to serve the purpose. The students adapted the tool without prior hands-on training, but, beyond covering subject content, groups did not seem to take full advantage of all features and working modes that would support engaging and connecting with others, as well as have implications for learning strategies. For instance, while collaborative writing tools are particularly well-adapted to support text revision, "using them solely to support revision, is not recognizing their potential as authoring tools" (Benson, 2012, p. 198).

It is possible to limit an introduction to five-minute sessions on how best to use the tool; instructors may consider that the introduction of new collaborative writing tools such as GD and EP allows the opportunity to expand students' experiences with collaborative learning, namely in the process of negotiated meaning-making and communication, which takes place parallel to development of the text, around and through the text (Mitchell, 1996).

What do instructors need to know before introducing GD and EP to their class for quick and effective use of the tool's central capabilities? The following suggestions come from this study, are drawn on students' perceptions of factors of success, and are derived from the conclusions addressing the major challenges from a pedagogical perspective:

To increase the effectiveness of GD and EP for collaborative writing, one should keep group size small, with preferably two or three people, especially when working synchronously, and also recommend that groups get acquainted with the tool before starting their task. If possible give them time in the class for experimentation and discussion.

As most students encountered a number of technical problems that hindered them from fully performing their collaborative writing tasks, some of which was also reported by Tomlinson et al. (2012), the groups should be prepared for this and discuss a contingency plan.

As many students report problems and insecurity on commenting on and editing each other's work, issues also reported by Blau and Caspi (2009a), groups should be given time in the class to create and agree on rules for this.

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Blended Learning: How Teachers Balance the Blend of Online and Classroom Components

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Abstract

Despite teacher resistance to the use of technology in education, blended learning has increased rapidly, driven by evidence of its advantages over either online or classroom teaching alone. However, blended learning courses still fail to maximize the benefits this format offers. Much research has been conducted on various aspects of this problem, but only one other study has examined teaching practice in a blended course. Teachers using blended learning were interviewed about their use of online and classroom components and the reasons for their decisions. The online and classroom aspects of their course were analysed against a pedagogical framework of engagement strategies. Classroom components were found to be more highly valued by teachers than those online, an attitude largely driven by their perceptions that specific learning functions were best suited to particular formats. The courses themselves reflect these values. Most teachers used well-developed engagement strategies in their classroom teaching, compared to a minimal use of strategies online. Further, with one exception there was a lack of integration between online and classroom components. Blended learning will not fulfill its promise of better learning unless teachers can be encouraged to re-think and redesign courses that afford students more, and different learning experiences than those offered by either online or classroom alone. This paper adds to a small literature base examining what teachers actually do in blended learning, and signals steps that teachers and their institutions might take to build on the opportunities presented by blended learning.

Keywords: blended learning, student engagement, teaching practice, teacher resistance to technology.

Introduction

Chen, Lambert and Guidry (2010) found that widespread use of the Web and other Internet technologies in post-secondary education has exploded in the last 15 years. An increasing focus of this trend is blended learning. So popular has the uptake of blended learning been, that it has been called the "new

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normal" in higher education teaching (Norberg, Dziuban, & Moskal, 2011). Blended learning contexts that integrate physical and virtual components are seen as critical strategies for higher education institutions (Cobcroft, Towers, Smith, & Bruns, 2006). This trend has intensified since the publication of a meta-analysis of 50 studies that found that while online students performed a little better than face-to-face students, students in courses that blended online and face-to-face components did much better than a straight online course, with an effect size of +0.35, $p < .001$ (Means et al., 2010).

The case for the effectiveness of blended learning derives from the observation that such courses offer students a greater range of affordances that enhance the learning experience beyond that of either online or face-to-face modes alone. Support is offered by Ramsden, (2003) who argued that blended environments increase student choice and this can lead to improved learning. Oliver and Trigwell (2005) also suggest that a blended environment may offer experiences that are not available in non-blended environments and that the nature of these different experiences promote learning. While there is evidence to suggest the potential of blended learning, there is also considerable evidence that most blended learning courses fail to fulfill this potential (Driscoll, 2002; Hofmann, 2006).

This failure can be partially explained by the well-documented resistance of teachers to online learning, a common theme in the literature for at least 15 years (see for example, Heirdsfield, Walker, Tambyah, & Beutel, 2011), and a lack of adequate professional development (Garrison & Vaughan, 2008). The profusion of online and blended learning courses have become pervasive in the educational sector, driven by senior administrators who are more positive about the efficacy of online learning than teachers (Allen, Seaman, Lederman, & Jaschik, 2012). Faculty are often given little option about incorporating online learning components into their classes, so it's not surprising that the results are frequently disappointing.

While there is substantial blended learning literature on the student experience, course design, and even the professional development of teachers, a neglected area is teaching practice: how and why teachers balance the blend of online and classroom components (Torrisi-Steel & Drew, 2013). In a literature review of over 800 articles, Torris-Steele and Drew (2013) found only one article, by Woods, Baker and Hopper (2004), on academic practice in a blended environment. Knowing more about what teachers do in their teaching practice when they are required to introduce online components may go some way to explaining the failure of blended learning to reach its predicted potential. Only by understanding current practice can we prepare to make changes to that practice.

This study adds to the sparse literature on the practices and attitudes of teaching in blended courses in a qualitative study in which teachers were interviewed about their teaching practice and their attitudes to blended learning. In addition, the effectiveness of their online and classroom components was assessed against a pedagogical framework of student engagement strategies.

Blended Learning

Blended learning has been described as a mode of teaching that eliminates time, place, and situational barriers, whilst enabling high quality interactions between teachers and students (Kanuka, Brooks, & Saranchuck, 2009). It echoes the practice of distance education that emphasized flexibility of time, place, and pace of student learning. Research suggests that the student experience varies considerably and results in variable learning experiences (Jeffrey, Kinshuk, Atkins, Laurs, & Mann, 2006; Zepke, Leach, & Prebble, 2006), indicating a need to clarify how a blended approach can support learning.

The role of faculty in successful blended or online learning has been noted in a number of studies. Mayes and Morrison (2008) found that, in addition to a well-managed program, it was important

that teachers are both interested and competent in teaching in an online context. Bates and Sangra (2011) argued that; "There is convincing evidence that online students do just as well if not better than students in face-to-face courses, but more important, the results depend on the conditions in which students are studying. All modes of delivery will suffer from badly designed teaching or inadequate resources" (p. 147).

Technology has increased the breadth and depth of access to education. This is significant because it has been a hallmark of western education that the co-location in time and space of teachers, students, and resources is the *sine qua non* of education. Changing from a classroom-only context to include a major online component requires adjustment for both teachers and students (Swenson & Redmond, 2009). The speedy adoption of educational technologies is evidence that new forms of teaching and learning are possible. However, shifts of this magnitude need major changes in approach from faculty and administrators in education, especially in higher education, where the lectures still dominate teaching practice.

Teacher Resistance to Technology

Despite the clear demonstration of the benefits of using technology in education, there continues to be a marked reluctance by academics to engage with online learning (Anderson, 2008). Heaton-Shrestha, May, and Burke (2009) found teachers to be much less positive than their students about the learning benefits of an online learning component. Becker and Jokivirta (2007) also found that academics worldwide reported low enthusiasm for using technology in learning. More recently, a large-scale study (over 4,500 teachers) by Allen et al. (2012) found that 65% of faculty were more afraid of teaching with technology than they were excited by the prospect.

Over the past 15 years several factors have been identified as discouraging academic staff from teaching in online environments, including inadequate support and training, time for developing online materials, fears of failure, and beliefs about the value of technology in education. Mansvelt, Suddaby**,** O'Hara, and Gilbert (2009) presented findings from an online survey of 408 teachers and 40 qualitative interviews ascertaining beliefs and experiences of staff regarding e-learning professional development. They found that managerial support, individual beliefs, and time allocation influenced the attitude of faculty to attending training to improve their use of technology in teaching. Allan (2007) also argued that using online learning for professional development would not be effective unless account was taken of two factors: the extra time involved in networked learning, and for people new to e-learning to adjust to this type of study.

Greener (2009, p. 267) reported that "online, the teacher's status can easily be eroded, as learners can compare teacher-designed resources with video lectures from across the world on similar topics and chat directly with experts in the field through their blogs." The potential for such comparisons inclined teachers to be reluctant to expose themselves to ridicule or unflattering comparisons.

A number of studies have found that beliefs about the usefulness and effectiveness of technology influenced whether teachers integrated technology into their teaching (Aslı Özgün-Koca & İlhan Şen, 2006; MacCallum, 2011). Teachers argue their reluctance to use technology as stemming from a concern for the educational well being of their students. For example, they claim that technology has no beneficial effect on learning and is even instrumental in maintaining students in a state of semi-disengagement (Heaton-Shrestha et al., 2009). The same study reported concern by teachers that technology could decrease student interaction and result in greater social isolation for the student. Christie and Jurado (2009) also found that being convinced of the effectiveness of technology was necessary before teachers would fully engage with it.

Teachers who fail to recognize the benefits of online learning are less likely to create effective blended courses. A negative or indifferent student response to poorly designed online components

in a blended course may reinforce the teacher's belief that such additions to the traditional classroom have little value.

Measuring Effective Blended Courses

There are a number of ways of judging the effectiveness of online and classroom teaching practices. One of the most common is measuring student learning. It is less common to evaluate a course against a set of pedagogical principles. An advantage of evaluating courses using recognized criteria is the removal of the third variable problem that comes into play when students' learning outcomes are used as measurement. A number of factors other than teaching effectiveness can influence student learning. Assessing online and classroom components directly against established criteria is a more direct measure of their quality.

Learning results from the quality of student engagement in learning experiences (Dixon, Kuhlhorst, & Reiff, 2006; Swan & Shih, 2005). It follows then that teaching practices that foster quality student engagement will result in more effective learning. Jeffrey, Milne, Suddaby, and Higgins (2012) constructed from a comprehensive review of literature, a framework of student engagement strategies found to improve learning. Three major categories of student engagement strategies were identified: getting student attention, maintaining engagement, and re-engaging those who drift away or fail to engage. Most of these strategies are applicable both online and in the classroom, which makes them suitable to measuring blended learning practices. These strategies are described below.

Getting Students Engaged: Capturing student attention at the start of the course is must be achieved before effective learning can take place. Two major types of strategies were identified as being important:

1. *Primers for getting student attention*: Curiosity, relevance.
   The literature identifies two possible approaches, *curiosity* and *relevance*. Curiosity is experienced as a result of awareness of a knowledge gap, which creates the motivation to find the answer. A topic that has personal relevance to a student stimulates an optimal level of arousal for learning. (Arnone & Grabowski, 1994; Ashcroft, 1987; Berlyne, 1960; Doo & Kim, 2000; Keller, 1987; Kift, 2008; Levy, 2007; Loewenstein, 1994; Reeve, 1992; Reio Jr. & Wiswell, 2000; Shea, Pickett, & Pelz, 2003)

2. *Social presence and belonging*: Teacher enthusiasm, immediacy and an inclusive environment.
   Students are less likely to feel alienated and more likely to become engaged when they feel a sense of belonging to their class and subject discipline. Teachers play an important role in social presence. This is particularly true of online environments which can be more impersonal students. A sense of teacher immediacy is important to students. (Dixon, et al., 2006; Garrison, 2009; Guan, Tregonning, & Keenan, 2008; Krause, Hartley, James, & McInnis, 2005; Swan & Shih, 2005; Thompson & MacDonald, 2005; Tinto, 1975, 1993)

Maintaining Engagement: Maintaining student engagement through the course requires four strategies:

3. *Clear content structure*
   At the start of a new course, students expect a clear course outline that includes the content structure and other organizational features. (Beck & Davidson, 2001; Hunt, Eagle, & Kitchen, 2004; Light, 2001; MacDonald & Thompson, 2005)

4. *Clear, unambiguous instructions and guidelines in assessment*
   The high levels of anxiety that students typically feel about this aspect of the learning process can be alleviated by clear guidelines. (MacDonald & Thompson, 2005; Madsen & Turnbull, 2006; Rust, 2002)

5. *Challenging, authentic tasks*
   Challenging tasks encourage the student work to the limits of their ability. Learning results from effort: The greater the effort, the greater the sense of achievement and motivation. Students are also motivated by activities that reflect those in 'real world'. (Brown, Collins, & Duguid, 1989; Doyle, 1983; Herrington, Oliver, & Reeves, 2003; Lombardi, 2007; Miller, 2010; Nakamura & Csikszentmihalyi, 2002)

6. *Timely, elaborated feedback*
   The evidence strongly suggests that in most circumstances feedback that is immediate and specific results in better learning. (Bangert-Drowns, Kulik, Kulik, & Morgan, 1991; Beach & Friedrich, 2006; Bransford, Brown, & Cocking, 2000; Corbett & Anderson, 2001; Dorow & Boyle, 1998; Hattie & Timperley, 2007; Kluger & DeNisi, 1998; Kulhavy, White, Topp, Chan, & Dams, 1985; Mason & Bruning, 2001; Mayer & Moreno, 2002; Miller, 2010; Wiliam, 2007)

Re-engaging Students: In most courses a proportion of students will delay or fail to engage at the start of the course, or stop engaging during the semester, usually at key points such as assessment. The literature identifies two critical strategies for re-capturing the engagement of these students.

7. *Monitoring and early identification*
   Monitoring students to identify students in danger of dis-engaging or those who have failed to engage, is important to recovering these students. (Fitzgibbon & Prior, 2003; Gracia & Jenkins, 2002; Trotter & Roberts, 2006)

8. *Personal contact and negotiated conditions for re-engagement*
   The most effective strategy for re-engaging students is personal contact by the teacher. Such contact works best when the teacher works with the student to provide help and support. (Artino & Stephens, 2009; Tuckman, 1999; 2007)

These engagement strategies provided a framework for interviewing teachers about their teaching practice in a blended course, and for evaluating the effectiveness of such practices.

Methodology

This study was part of a larger study on student engagement in a blended learning environment that involved both students and teachers (Jeffrey et al., 2012). The purpose of this part of the study was to:

1. Identify what aspects of their courses teachers put online and what they used in the classroom, and how they explained these decisions.

2. Compare the quality of the online experiences to those of the classroom, using a set of student engagement strategies identified from the literature.

Nine tertiary teachers from two state universities, teaching blended learning courses, were interviewed. The sample included three females and six males, aged between 36 and 60. All were

experienced teachers with more than 5 years tertiary level teaching. All but one teacher had had previous experience of teaching in a blended context.

Suitable courses were identified and the teachers of those courses invited to take part in the research. The selection of courses was based on the nature of the course (business, large class size) and the timing of the course (all in the same semester). Four additional teachers who were approached were unable to take part for a variety of reasons.

Teachers were interviewed individually (between 1 and 2.5 hours) and asked:

- How they decided what to put online and what to teach face-to-face
- For a detailed description of their classroom teaching (based on the student engagement strategies).
- What they considered to be the advantages and disadvantages of classroom teaching and online teaching.

Content analysis was used to interpret the interview data (Neuendorf, 2002). The transcripts were read and key words and phrases identified and recorded. These were then categorized according to theme and labeled. All data was then sorted according to these categories. Data within each group was then re-sorted into variations on the theme and these sub-groups were also labeled.

Two reviewers evaluated each online learning site (inter-rater reliability was 87%). The evaluation sheet used a detailed list of student engagement strategies and each of these was rated using a four-point scale from 0 (not present), 1 (minimal presence), 2 (adequate presence) and 3 (good presence). An overall score was obtained for each of the strategies. The data on the use of engagement strategies used in the classroom was extracted from the interview data and rated in a similar way. These two sets of data were used for rating the two components of each course (online and classroom) on their pedagogical value.

Results

The decision to put learning content online or use in the classroom seems to be largely driven by the teacher's perception of the functions served by the two modes. Usefulness, ease of use, and student pressure were also considerations.

Different Functions for Classroom and Online Contexts

Teachers commonly made three distinctions when discussing how they used classroom or online contexts as they saw lectures, tutorials, and online environments as serving different functions. Lectures were considered to be appropriate for teaching theory, and while these could be made more interesting with examples, theory was described by teachers as being dry and abstract but "*they're here to learn about theories as well as everything else, that's what university's about, so they've got to have that component* [lectures]" (Teacher 5).

Tutorials were regarded as the opportunity for students to interact with theory at an applied level:

> *There's actually quite a separation between the lecture and the tutorial. The lecture follows the textbook, it's purely knowledge and theory-base, going along closely with the textbook and the slides provided by the publisher. Then there's the tutorial, this is purely applied and problem solving.* (Teacher 9)

Almost all teachers saw the lecture as the main forum for the initial teaching of content and tutorials as the consolidation of the lecture through activities. Most teachers also advocated the importance of the set text, for example *"I still like the idea of a textbook, a textbook is actually all you need"* (Teacher 8).

Teachers considered that the most important function of their online sites was a central repository for resources, *"So everything was online"* (Teacher 3). Online content included core content, textbook publisher resources such as slides, PowerPoint notes to be downloaded for the next class, administration information, and other resources such as YouTube videos. Increasing student accessible to these resources was seen as a major advantage of using an online component.

Two distinct but equally strong perceptions on the quantity of material that should be placed online were found. One group favoured large amounts of content, as exemplified by Teacher 8 who expressed particular enthusiasm for putting lots of material online. He felt this reduced pressure on him to cover everything in lectures. He could focus on areas of particular interest and give the topic more depth:

> *…and I think it comes back to having multiple avenues to collect information. . . so they've got a textbook there, which very good. And then I've got PowerPoint slides that are complimentary but not the same, well actually if you read all those and understood them they'd actually know the topic well, so that no matter what I do in class technically there's the information there… And I think takes a lot of pressure off me and allows me to actually get down and do the stuff that they want to learn about I suppose. And having it all online means that I don't feel as if I have to point things out in the lecture.* (Teacher 8)

About half the teachers felt that too much content online was a problem as it gave students a false sense of security and discouraged them from attending class. It was also felt that too much material had the potential to confuse students.

The ease of putting resources online and the plethora of Web-base resources such as YouTube was offered as a significant factor in using the online learning site as a repository, as explained by one teacher:

> *It was very easy to put up the core material, including - the textbooks supplied slides. YouTube is very good, I'm finding more and more stuff on YouTube where there's either a video that might explain a point, might have an advert, it might have a discussion or something like that, that I can put online. And if it's like two or three degrees away from the subject or it doesn't absolutely nail what I want to say then I'll put it online and say, "This is an additional resource or additional material to read."* (Teacher 3)

Work by Gibbs (1992) identified excessive amounts of course material online as a factor in promoting surface learning in students. Large volumes of materials increase the amount and difficulty of the work the students have to do since they must evaluate and select the most appropriate of these to use. Students can find such a task overwhelming. Gibbs goes on to argue that not only should the amount of online material be moderate, but that it should also be carefully integrated into the learning content.

A number of teachers in this study felt that the online component was a way of reducing some of their administration load. Students in several classes were told to refer to the online site to find information and resources for aspects of the course relating to administration and assessment requirements. Students were urged to check the online site before asking questions of teachers.

All of the courses in the study made forums available, but these were mainly used as one-way communication from the teacher. Very few students used the forums to communicate with each other, despite encouragement from teachers. Teachers valued the ready contact with students provided by forums, a finding that supports Aspden and Helm (2004). However, these messages were only sent as a specific need arose, rather than on a frequent and regular basis as recommended by Ryle and Cummings (2007).

Four of the courses used online quizzes. All of these generated higher levels of engagement that were sustained throughout most of the semester.

Pressure from students to put material online was mentioned by a number of teachers. For example, Teacher 9 described how he had previously refused to put PowerPoint slides online before classes for students to download.

> *But students used to complain, and always said, "Why don't we have lecture notes online?" So I finally put them up. But I'm not sure it's beneficial. By giving them the notes they just sit there and are so easily distracted from the lecture itself, they think they can just going through the slides and don't listen to the lecture.*

Other teachers supported this position and felt that the practice of providing PowerPoint handouts encouraged students to stop attending class or to regard only the information on the PowerPoint as being of any importance.

Comparing Online and Classroom Application of Engagement Strategies

Teachers' courses were evaluated on the use of five engagement strategies that appeared in both online and classroom modes.

Table 1: Presence of engagement strategies in online and classroom modes

Teacher	Primer		Social Presence		Challenge, Authentic Tasks		Structure		Re-engaging	
	Online	Class	Online	Class	Online	Class	Online	Class	Online	Class
1	1	3	3	3	3	3	3	3	3	3
2	1	3	2	3	2	3	3	3	3	0
3	1	3	2	3	0	3	0	1	0	0
4	2	1	3	3	3	3	2	2	3	0
5	0	2	1	1	0	1	3	2	0	0
6	0	3	1	3	0	3	3	3	0	3
7	0	2	1	1	0	1	2	2	0	0
8	0	2	1	3	1	2	1	1	0	0
9	0	3	1	3	3	3	2	2	0	2

0 = no strategy used; 1 = minimally developed strategy; 2 = adequate developed strategy; and 3 = well developed strategy.

Overall teachers put much more pedagogical effort into developing and using classroom engagement strategies than online. However three teachers (1, 2, and 4) come close to a balance between the two modes of teaching. What's more, they generally used high quality strategies. Three more (5, 6, and 7) were strongly classroom focused, apart from ensuring their online components were clearly structured. These teachers had fewer materials online. Teacher number 6 used very good engagement strategies in class, and these may have compensated for less attention online. The remaining three teachers occupied a middle position. Below is an analysis of the comparison of the engagement strategies in the two modes.

Primers

The first stage of engagement involves two components: primers and social presence. Primers are devices or strategies to spark curiosity, interest, and relevance in the subject at the start of the course, while social presence includes the teacher's enthusiasm and the extent to which students feel a part of the class and the discipline. Both of these strategies were applied more often and effectively in the classroom than online.

Primers seemed to be strategies that teachers gave relatively little forethought to. They were largely absent from most online sites, with only four teachers using a specific strategy. In the classroom, most suggested that they used relevance, for example, explaining how this course fitted into the student's overall program or how the skills learned would be useful in the workplace. However, these appeared to be done off the cuff rather than as a carefully thought out strategy. Some teachers used their own backgrounds and anecdotes to connect with the personal experiences of the students. A similar strategy employed by one teacher was to use the first part of a lecture to build the relationship with students, for example, talking informally about a topical issue and inviting students to express their views (Teacher 2). Another teacher (Teacher 8) tried to sell students on the idea that the class is a joint venture by both parties. Generally, teachers did not get hugely enthusiastic about this issue, which is summed up in the following quote:

> *…it's fairly much business as usual. I think what I'll do is I go in there and I'll outline the course and my expectations; what they have to do and give them the sort of advice that would be useful in the course, but I don't think I necessarily would go out of my way to you know kind of, attract the students to the course because at the end of the day they've made that call*. (Teacher 4)

There is extensive literature on the importance of curiosity and personal relevance to learning (see for example, Doo & Kim, 2000; Keller, 2010; Levy, 2007; Shea, et al., 2003). These strategies are most important early in the course, when students fail to engage. Experts readily identify gaps in their knowledge and so experience high levels of curiosity that drives them to pursue information to fill those gaps (Loewnestein, 1994). Students, however, have lower levels of curiosity, so teachers must use strategies to prime the curiosity pump and stimulate an interest in knowledge.

Students see learning as relevant when it appears to have the ability to help them achieve personal goals. When students fail to make the connection between learning content and their own aspirations, they are much less likely to pay attention to it (Murray & Sandars, 2009). In addition, a lack of personal relevance has been found to be related to higher student dropout rates (Levy, 2007; Park & Choi, 2009). Consequently, demonstrating relevance at the first opportunity is critical to the learning process.

Social presence

Establishing social presence in the classroom clearly comes from the interaction between teachers and students. Most teachers described positive engagement with their students in the classroom and often made a concerted effort to develop a relationship with their students. For example, several teachers started the class by establishing a dialogue with students. This might involve them telling the students about themselves, for example, their personal interests and their experience and background in the subject area. Most teachers also expressed in interest in finding out more about their students and would spend some time in class asking them questions, for example, about their motivation for taking the class and what they hoped to achieve. Two teachers scored quite low on the use of this social presence in the classroom. Both of these teachers seemed to hold quite negative views about students and had issues interacting with students and managing their behavior. "*So, I feel like I can't control the classes to the degree that I want to in order to*

enable them to be able to do what they can do" (Teacher 5). This teacher also described students as "*lazy*".

Establishing a social presence online is much more difficult than in the classroom, so it was not surprising to find that social presence was largely underdeveloped in most of the study's online environments. All online sites had teacher contact details, a welcome message, and a discussion forum, but these took an informational tone and it was hard to get a sense of the teacher from them. Wang and Newlin (2002) emphasis the importance of the social presence of teachers, especially to those students vulnerable to dropping out. Social presence online is felt as a sense of immediacy and intimacy in the way teachers communicate with their students.

Forums were used by all teachers to contact students, and this was an aspect of the online site that they valued, a finding that agrees with Aspen and Helm (2004). However, these messages were sent on an 'as-needed' basis, and Ryle and Cumming (2007) suggest that they are most effective at embodying teacher presence when communication is frequent and regular.

Two teachers emphasised the care they took to establish a relationship when communicating with students. One of these teachers explained, "*I believe when I come to work each morning if someone has taken the time to ask a question, I answer it then and there. I don't have a set time each day where I sit down and say right I'm only going to do x number of questions and any questions after that will not be answered. I tend to find my personal philosophy [*is that*] I answer questions inside, as well outside, of work hours [*and*] I think that it really goes a long way towards students developing a kind of trust*"(Teacher 4).

He justifies his attention to student questions because he believes that if "*you give them a fairly quick response then they'll feel like they can then approach you, so its not a barrier, … I think they should be able to ask if they're not sure and then that way they gain confidence*". For this teacher, feedback to students was an opportunity to build a relationship with them and to break down barriers that could potentially hinder their learning.

Teacher 1 posted all of her responses to questions from individual students online so that everyone had the benefit of the answer. These responses are supplemented with additional teaching notes. This teacher also made a point of personalizing her responses to students "*as if I'm talking to them,*" and using the student's name. When students start to use her name in their questions, then she feels she has made a connection.

Maintaining Engagement using Motivation

Two types of strategy that work by motivating students are the use of challenging, authentic tasks and providing personal, timely, and quality feedback.

Challenging, authentic tasks

Most teachers described assessment tasks that were challenging and authentic. They involved students interacting with material that was derived from the real world, such as case studies, or with practitioners who brought a business problem to be solved. However, there was more variability between courses in their online learning activities, as opposed to either classroom activities or assessment activities.

Only four teachers had developed online activities, most of which took the form of online quizzes. The levels of student engagement with these activities were very high and sustained over the semester. All teachers used classroom activities; however, several teachers reported frustration at poor attendance at these. Those students who did attend often showed little inclination to take part in the activities. Many failed to bring writing materials and even when provided with these, failed to complete the task. Teacher 5, who had a particular problem with attendance, described her ac-

tivities as '*fun'* (cf 'authentic tasks'). She had modified these activities from ideas picked up from other courses. However, many of these activities where of the type found at training courses and didn't always seem to be directly related to the substance of the course content.

One teacher who had high online engagement with quizzes and high attendance in class described his course as being "challenging" as it involved a close integration of theory and problem solving. He believed that the problem solving, which is done in the tutorials, is essential as it is only when the students work through problems that they realize whether or not they understand the theory. When students appear to be struggling he invites them to *"Come to the whiteboard, we will solve this together"* (Teacher 9) and he works with the student to solve the problem. The teacher closely monitors student engagement with the set problems; "*it's not a class you can hide in*". Students found this course *"one of the hardest classes they've done but one of the most rewarding ones"*.

Teacher 3 described a similar response to a challenging, authentic, group-based assessment task. He found students willing to '*pull all-nighters'* when working on their assessments. He reported students as commenting they *"had never worked so hard on an assignment but had not enjoyed one so much*". Brophy (1987) argued that challenging academic tasks promote motivation when students expend effort through engagement in sustained activity that use complex cognitive processes, a conclusion endorsed by Miller (2010).

Maintaining Engagement through Organisation and Structure

Seven of the nine online learning sites were well or adequately organized and structured. These were divided into appropriate chunks, easy to navigate, followed a logical structure, and had clear guidelines and instructions.

Most teachers described their classroom teaching as being carefully structured for the semester and for each lecture. This structure was also reflected in their online sites. Two teachers, however, argued a need to be flexible rather than following a rigid program, to allow them to be responsive to opportunities that arise in class and the need to cut out portions of the lecture if time had been spent on exploring other issues that cropped up. They managed this process by skipping PowerPoint slides, jumping back and forth between slides, or bringing in new material. One teacher even colour-coded his slides to facilitate this flexible process as "*timing things doesn't work out so a lot of it was hopping about the topic….I was very aware that we had certain material we needed to get through"* (Teacher 8).

Despite complaints from students, these lecturers felt that this type of flexibility enhanced their teaching. As one commented:

> *Because our students are very diverse …. and I think if I had gone in there quite rigidly either doing just lectures or just doing presentations or even having a very, very strict schedule it wouldn't have worked.* (Teacher 8)

The online sites of these two teachers reflected the lack of structure they described in their lectures. One in particular had no apparent structure and used a variety of colors, levels, and font sizes that did not seem to follow any logical order. Resources from a variety of sources were added, with no attempt to integrate or explain how to use them. For example, a large portion of another course (with a different teacher) was added with a little explanation of how it was to be used. No attempt was made to 'fit' or adapt this content for the course.

A third teacher had expressed a preference for this type of flexibility but changed his approach in response to student feedback:

> *Students don't like the lecturer changing the pace of a lecture by skipping slides. You give them these slides and then you realize that oh, there's slightly more here why don't I pro-*

> *vide another example by spending more time here, but then you run out of time and then you skip the next four slides and then the student says, "But you didn't do this slide." So, if it wasn't for the constant complaints and an expectation, I would still prefer not to give them lecture notes."* (Teacher 9)

These results reflect those of others on student preference for structure. Students prefer well-organized courses (Hunt, et al., 2004; Light, 2001) and dislike ambiguity (Madsen & Turnbull, 2006). Evidence suggests that that carefully structured courses increase student confidence and competence (Thompson & MacDonald, 2005) and are an important determinant of a students' tendency to follow a deep or surface learning approach (Rust, 2002). Such structure and support is even more important in an online environment, where the normal social and contextual cues of the classroom are missing (Garrison & Arbaugh 2007).

Re-Engaging Students: Monitoring, Personal Contact, and Negotiated Study

Most teachers reported poor levels of class attendance, some as low as 25%. They felt this was due to the over-provision of online materials, which allows students to believe they didn't need to attend class. A number of teachers favored reducing the online material but felt pressured by students to provide it. Teachers in a study by Heaton-Shrestha et al. (2009) expressed similar concerns. They argued that uploading PowerPoint outlines influenced student decisions not to attend class. Agreeing with the teachers in this study, they claimed that such materials created boundaries for student about what content was important and so students failed to explore ideas or material beyond of these narrow boundaries.

Despite the concern with classroom attendance, teachers in this study did not actively monitor student engagement. They felt that their demeanor in class, *"I hope I seem inclusive in class"* (Teacher 8), and regular invitations to contact the teacher if they had problems, "*before each assessment is due I send at least one reminder out and say 'hey by the way the assignment is due, go in it have a look and get questions asked'"* (Teacher 3) was enough to encourage those students who needed help to seek it. Several teachers mentioned the importance of a good relationship with students to encouraging them to meet with the teacher when they had a problem: "*I try to touch base with different sorts of people in the class breaks* (Teacher 8). This teacher became concerned very early about engagement by international students and "*so I made an effort in the first class break to talk"* to them.

Teachers mostly waited for students to take the initiative to come and see them about problems, "*And so they either came to me as a group or individuals came to me squealing or concerned about they felt they had been persecuted … why did they get such bad marks and so I'd explain to them how the assessment worked*" (Teacher 3).

Three teachers actively monitored student engagement online. Mostly, this was through the submission of assignments online, for example:

> *The first thing that we did in this paper was we asked students to submit the first part of an assignment in week 4. And that was probably the strongest thing that identified students who were withdrawing. I sent an email to all students that had not submitted within two to three days of the submission being due saying 'I noticed you haven't submitted, please contact me if there's a problem'. And from that about six students, sent me an email almost straight away saying 'terribly sorry my life's falling apart, this is what's going on.'* (Teacher 1)

These teachers all actively followed up such monitoring by personally emailing the students to ask if there was a problem and could they help. These teachers re-captured the engagement of

most students, though this sometimes took more than one email. These courses had the lowest dropout rates. The results suggest there is a period during which students who become unhappy with their studies can be re-engaged if they are contacted before making the final decision to withdraw. As found by others, the key is early identification, personal contact, and the negotiation of a workable solution for the student (Fitzgibbon & Prior, 2003; Trotter & Roberts, 2006).

Two other teachers used classroom attendance or the physical submission of assignments to identify dis-engaging students and also reported being able to draw students back into the course. However, most teachers in the study did not regard the suggestion that they should take attendance rolls in class with any enthusiasm. They believed that students were responsible for making their own decisions about attendance. The literature, however, emphasizes the importance of taking attendance, both to improve attendance and for early identification of potential disengagement (Trotter & Roberts, 2006). Monitoring engagement is much easier online, as most Learning Management Systems provide teachers with instant reports on student online activity and provide facilities for contacting students.

Advantages and Disadvantages of Online versus Classroom Teaching

Teachers' decisions to use online or classroom components were also driven by the perceived advantages and disadvantages of both modes. All teachers agreed that both classroom and online teaching offered benefits to learning. As a repository, the online environment did not suffer the time and space limitations of a classroom. It was also regarded as an excellent mechanism for rapidly contacting all students: "*the great thing about it is that you can put stuff in it that students can access from any time anywhere. I can broadcast out quickly out to students saying 'I've just found this,' or 'Your results are now available'"* (Teacher 3). However, teachers also had reservations. Several teachers described themselves as "*old fashioned*" which usually prefaced a statement about their personal preference for classroom teaching:

> *I know I'm old fashioned, but my talking in class is more powerful than something happening online. So I still feel as if I can make more of a difference in class than I can online. So I suppose because I have that belief I'm using the Learning Management System as complementary to the classroom.* (Teacher 8)

Another teacher also felt that an online component could complement the classroom, but had limitations:

> *I think it is useful but I think it needs to be in its place and I don't think it can replace classroom contact and individual argument and engagement with individuals in tutorials, I really don't. I think it's very, very useful for making announcements and making sure everybody knows that something is cancelled or something has suddenly been set up and for providing links to extra readings and so on. I think that's great, but it doesn't, it can't replace what the university experience is about. I wouldn't want to see computer-based learning and interaction replacing classroom stuff when you can have the classroom stuff.* (Teacher 5)

Only one teacher noted the ability of an online component to foster multiple approaches to learning. She argued that class lectures move at one pace, which may be too fast for students who are shy about asking questions. Additionally, some issues may not be completely covered in class. The online environment allowed her to make available extra teaching notes and write answers to student questions, extending the teaching in the classroom. This facility was a major consideration in her decision to expend effort developing a course that fully integrated both classroom and online components.

Teachers gave one explanation for the limited use of the online component as a lack of time.

> *I suppose if anything, the biggest obstacle is time… so the time commitment to the actual maintenance of the site; answering questions being available does take time and there's no doubt it does have an impact on your other responsibilities and commitments.* (Teacher 4)

Teachers felt frustrated they did not have time to learn to use the system properly nor to be able to personalize it to reflect their approach to teaching and learning.

> *I haven't got enough time to learn how to use it properly. I think I'm only using maybe 20 or 30 percent of what its real potential is for me as a teacher. And I know I need to sit down and really learn the system but I haven't had time to do more than emergency learning which is not ideal for anybody and leads to problems…Some of the stuff that I've put together I quite like. Some of the stuff where I was kind of obliged time-wise to use more of other people's work than my own I'm not that happy with, not because it's not right but because I want to come with my own twist and I haven't been able to put my own twist on it.* (Teacher 5)

Conclusions

The emergence of blended learning is a major trend in tertiary education (Bliuc, Goodyear, & Ellis, 2007). This trend is being fueled by the accumulation of evidence that points to the efficacy of a blended approach over either online or classroom alone (Oliver & Trigwell, 2005). However, there is a danger that blended learning courses will fall far short of the potential if teachers do not change their attitudes and practices to developing blended experiences.

In the main, teachers neither fully exploited the opportunities offered by online contexts nor integrated the two modes to make their courses coherent for their students. Only one teacher in this study recognized the importance of developing a course that fully integrated both online and classroom components. She thought about the strengths of both teaching modes and designed her course to fit with these. Other teachers added an online component to an existing classroom course. They expressed reservations about the role of technology and argued that the teacher should be the central actor, with technology playing a minor support role. These teachers seemed to view online technologies as being mainly for access and information delivery efficiency rather than to support students' learning experiences.

Developing content for two contexts increases teacher workload, and teachers complained about the time commitments necessary to develop even minimal online components. This is an issue that must be addressed by institutions. The benefits of a blended environment will only be realized when multiple engagement opportunities afforded by the two contexts are developed to present students with a range of different experiences, individually and collaboratively. A critical aspect of this development is the integration of the online and classroom components. As others have pointed out, the key to a successful blended learning design is the "*thoughtful integration* of classroom face-to-face learning experiences with on-line learning experiences" (Garrison & Kanuka, 2004, p. 96).

In 1986 Shuell said, "*It is helpful to remember that what the student does is actually more important in determining what is learned than what the teacher does"* (p. 429). We agree with this – mostly; but we would add "*what the teacher does first strongly influences what the students do*". Teachers are the gatekeepers to learning experiences.

Teachers through their selection and design of learning experiences will influence the nature and quality of student learning. What students learn is determined by what they have the opportunity to DO when they engage in the experiences and activities designed by teachers.

Limitations

The major limitation of this study is the small sample size. However, this was intended to probe and understand what blended learning teachers do and why they do it, a much-neglected area in the literature. The relatively low adherence of teachers to good design practices in their courses would need a larger scale study to get a sense of how common this is. Additionally, this study was limited to business courses, so needs to be repeated in other discipline areas.

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Biographies

Lynn Jeffrey is an Associate Professor at the School of Management in Massey University (New Zealand). The focus of her research is in improving learning and teaching, and understanding the role that technology might play in achieving that end. Technology that she's developed includes a computer-based, examination-on-demand system (CALES) which was used by the New Zealand Civil Aviation Authority for pilot theory examinations; a learning style website that can be used by tertiary students to get advice on improving their learning and by their teachers for developing more relevant teaching methods; a learning style evaluation website for workplace training; and a web-based simulation game for teaching equity in the workplace. Her current research focuses on student engagement in blended learning environments, mobile learning, integral learning and teaching international students.

John Milne. Most of John's career has been supporting academics to innovate their teaching. In his currently role, as a teaching consultant, much of his work is to help staff use technology to enhance learning. This includes developing and facilitating academic development sessions and providing intensive individual consultations to design and redesign courses. John's research area is to enhance teaching and learning through the use of technology. This has included work on e-learning guidelines, tools for formative assessment, and blended learning and student engagement. He has worked in the tertiary sector in New Zealand and in the UK where he was at the University of Edinburgh and then at the Aberdeen University.

Associate Professor Gordon Suddaby. Gordon has recently retired from his position as Associate Professor, Scholarship of Teaching and Learning at Massey University in New Zealand. Prior to that he was Director, Academic Development and ELearning at Massey for 10 years. In that role he led a team responsible for academic and staff development across the University, for supporting Massey's extensive Distance Education programme and for supporting and promoting Massey's elearning and flexible delivery options. Gordon was president of the Australasian Council on Open, Distance and Elearning for four years. As president of ACODE, and in association with Professor Mike Keppell, president of Ascilite, and Natasha Hard, Gordon produced a Good Practice Report on Technology-Enhanced Learning and Teaching for the Australian Learning and Teaching Council (ALTC) and is currently completing a major ALTC legacy project entitled Network of Australasian Tertiary Associations (NATA). Gordon has a strong interest in quality issues and is currently an Academic Auditor with the New Zealand Academic Quality Agency. He was an auditor for the Australian Universities Quality Agency (AUQA) before its replacement by TEQSA and is a current member of the TEQSA Experts register. He is also an International Reviewer for the QAA (Scotland) and a member of the panel just completing the University of Strathclyde ELI.

Dr Andrew Higgins was Director of E Learning on the senior management team at the Auckland University of Technology. His background includes many years service with the Queensland Government in Australia, working variously in the Office of the Cabinet, as senior policy officer with Education Queensland, as Manager of the Queensland Police Service's Distance Education program, as Services Officer for AccessEd., as Co-ordinator of the Rural Secondary Schools Support Scheme and as a teacher. He has held appointments at the University of Western Australia, James Cook University and the University of Queensland. He holds the degrees PhD, MEd, BEd and a Diploma of Teaching. His main area of study was in the provision of education to remote and isolated students. Andrew has been President of DEANZ and of the Australian Rural Education Research Association. He was a member of the Ministerial Advisory Committee on E Learning, the national Tertiary E Learning Reference Group and the Ministry of Education's Tertiary E Learning Research Group. He led the New Zealand delegation to APEC on Bridging the Digital divide and has consulted with the Governments of Oman and Puerto Rico on e-learning matters.

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Factors Impacting Teachers' Adoption of Mobile Learning

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Abstract

As mobile technology has advanced, awareness is growing that these technologies may benefit teaching and learning. However, despite this interest, the factors that will determine the acceptance of mobile technology by lecturers have been limited. This study proposed and tested a new model that extends the technology acceptance model (TAM) with three new variables: digital literacy, ICT anxiety, and ICT teaching self-efficacy.

The TAM models the adoption of new technology based on measuring a users' beliefs and attitudes to the technology. In particular, the TAM states that two factors influence a user's use and perception of new technology. The first factor, perceived usefulness, is the degree to which a person believes that a particular technology will be beneficial to their lives. The second factor, perceived ease of use, is the measure of the degree an individual believes a particular technology is free from effort.

Research has shown that a large portion of lecturers still resists the integration of technology into the classroom. Two aspects, in particular, have been consistently found to impact lecturers' adoption of technology. The first aspect shown to influence the adoption of new technology is the beliefs held by the lecturers. Specifically, it is the perceived value of the new technology (perceived usefulness) and perceived effort needed to learn to use the new technology (perceived ease of use) that have been established as playing a major role in the adoption of technology. The second major aspect seen to influence adoption is the skill of lecturers to use digital technology (referred to as digital literacy) and the skill needed to integrate it into their teaching (teaching self-efficacy).

The new model that was proposed and tested measured the impact of digital literacy, ICT anxiety, and ICT teaching self-efficacy, along with the well established factors of perceived usefulness and perceived ease of use, on lecturer' acceptance of mobile learning. A survey was used to measure the major variables in this study. The research found that

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perceived usefulness, ease of use, digital literacy, anxiety, and teaching self-efficacy were critical factors in lecturers' behavioral intentions to use mobile learning. The results of this study indicated the importance of these factors in the acceptance of mobile learning. From this model, educationalists are able to identify and develop strategies to support the successful introduction of mobile technology with in educational setting.

This research has added to and clarified the existing literature into mobile learning. In particular, it recognizes the role that lecturers play in the future acceptance of mobile learning. It shows that the factors that influence lecturers' adoption of mobile learning may differ from those of their students. It therefore highlights that these factors need to be considered when implementing mobile technology into the teaching environment.

Keywords: Teacher technology adoption, mobile learning, technology use in education, technology acceptance.

Introduction

As technology has become more powerful and pervasive it has provided educators with a valuable tool to support learning. Mobile technology, which has advanced considerably over the last decade, has enabled learning to be more accessible. This accessibility has provided educators with a way to support learning inside and outside the classroom. Mobile technology integrates a wide set of tools and applications that enable learning to be dynamic so that students are no longer tied to their desks to experience and interact with learning objects.

The integration of mobile technology into teaching and learning is expected to have great influence on the experience and performance of learners (Mac Callum, & Jeffrey, 2013). However it will be the acceptance by lecturers that has the potential to have the greatest influence on the successful introduction of mobile learning (Mac Callum, 2010). Students are able to utilize mobile technology to support informal learning; however without the support and acceptance of educators, it is unlikely to be fully integrated into more formal learning. Substantial research has addressed the factors that influence educators' integration of a range of technologies into the classroom, including; environment, policies, support, and beliefs (Albion, 2001; Hammond, Reynolds, & Ingram, 2011; Sang, Valcke, Braak, & Tondeur, 2010). Factors that impact lecturers' adoption of mobile learning, however, has only been addressed in a few studies (Aubusson, Schuck & Burden, 2009; Lefoe, Olney, Wright, & Herrington, 2009; Seppala & Alamaki, 2003). Empirical quantitative research of lecturers' adoption of mobile learning has largely been overlooked, as researchers in the past have tended to focus on student adoption (Uzunboylu & Ozdamli, 2011).

Users' beliefs and attitudes have been shown to have a major influence on the acceptance of new technology (Venkatesh, Morris, Davis, & Davis, 2003). A number of models and frameworks have been developed to measure these influences on users' acceptance and model adoption. One of the most widely adopted adoption models is the technology acceptance model (TAM) (Venkatesh, et al., 2003). The TAM has been used and modified to explore the adoption a range of educational technologies. Since mobile technology offers different affordances to traditional and elearning environments, factors that influence other educational technologies may not necessarily apply. It is important, therefore to establish the pattern of influences on the adoption of mobile technology.

This research extents the TAM by adding three new variables – digital literacy, information and communications technology (ICT) anxiety, and ICT teaching self-efficacy – to determine a more complete picture of lecturers' behavioral intention to use mobile learning. According to the TAM, the intention to use new technology is determined by two factors, the perceived usefulness and perceived ease of use. These two factors have been shown to explain approximately 50% of the variance in acceptance levels (Davis, Bagozzi, & Warshaw, 1992). Other research has extended

and modified the TAM to increase this level within the educational setting (see for example Liu, Chen, Sun, Wible, & Kuo, 2010). This research proposes three additional variables to fully reflect the factors that will play a part in influences lecturers' acceptance of mobile learning.

In particular the following research questions will be addressed:

- What effect does the perceived ease of use and usefulness have on the behaviour intention of lecturers to adopt mobile learning
- How will the three new variables of digital literacy, ICT anxiety, and ICT teaching self-efficacy influence the perceptions and behaviour intention of lecturers to adopt mobile learning

The Teacher Mobile Learning Adoption Model

Research has shown that a large portion of lecturers still resists the integration of technology into the classroom (Balash, Yong, & bin Abu, 2011). Two aspects, in particular, have been consistently found to impact lecturers' adoption of technology. The first aspect shown to influence the adoption of new technology is the beliefs held by the lecturers (Kebritchi, 2010). Specifically, it is the perceived value of the new technology (perceived usefulness) and perceived effort needed to learn to use the new technology (perceived ease of use) that have been established as playing a major role in the adoption of technology (Wang, Wu, & Wang, 2009). The second major aspect seen to influence adoption is the skill of lecturers to use digital technology (referred to as digital literacy) and the skill needed to integrate it into their teaching (teaching self-efficacy) (Pianfettil, 2001).

Digital literacy is the measure of an individual's ability to use digital technology, communication tools, and/or networks to access, manage and integrate digital resources (Markauskaite, 2007). Therefore, the measure of an individual's literacy in technology focuses on their relative skill to use a range of technologies (Madigan, Goodfellow, & Stone, 2007). For lecturers it is becoming increasingly more important to be digitally literate (Zhang, Tousignant, & Xu, 2012). Pianfetti (2001) stressed that lecturers need to be digitally literate. Through their own literacy they are able to inculcate in their students the skills and knowledge needed in a technology dominated world. Technology has become fully integrated into the workplaces, consequently education needs to reflect and support learners to survive in an increasingly connected world. To do this, lecturers must be confident and able to utilize the wide range of technologies in their classrooms.

Perceived digital literacy has been consistently reported in the literature as having a positive relationship with the adoption of new technology (Hasan, 2003; Hasan & Ahmed, 2010; Potosky, 2002). However, there has been little research into how digital literacy will influence the perceptions and acceptance of mobile learning (Wang, Wu, & Wang, 2009).

Along with digital literacy, the lectures' attitude to technology will also play a deciding role on their acceptance of technology. For example, anxiety about using technology has been identified as an important factor in the resistance to new technology (Buabeng-Andoh, 2012). For some people, the thought of having to use information communication technology (ICT) has been found to generate high levels of anxiety (Barbeite & Weiss, 2004). ICT anxiety is a negative emotional response typically ensuing from a fear that the use of the technology may have a negative outcome. The negative outcome may be anything from the fear that the user may damage the equipment to looking foolish in front of their peers. Anxiety about using ICT has been shown to have a strong negative impact on the future use of ICT (Agarwal, Sambamurthy, & Stair, 2000; Beckers, Wicherts, & Schmidt, 2007; Imhof, Vollmeyer, & Beierlein, 2007; Parayitam, Desai, Desai, & Eason, 2010; Saadé & Kira, 2007; Smith & Caputi, 2007).

A number of studies have shown that anxiety about using computers negatively influences a lecturers' adoption of ICT. Phelps and Ellis (2002) argued that there is a large disparity between lecturers' perception of their technological competence and the amount of learning they need to utilize ICT effectively. In particular, they often see technology as threatening and overwhelming. Feelings of anxiety may be further exacerbated if lecturers' perceive the skills of their students as being better than their own when using technology. This feeling of inadequacy can result in lecturers feeling insecure and disinclined to use ICT. This is especially true if there is a fear of looking foolish or incompetent in front of their students (Nunan & Wong, 2005). Such feelings can be a major barrier to lecturers using new technology. Furthermore, this negative attitude can also cause lecturers to doubt the usefulness of ICT in teaching. This will further reinforce their reluctance to use technology it in their teaching (Hennessy, Ruthven, & Brindley, 2005).

Overall, the anxiety of lecturers will influence the extent and the way technology is used in teaching. Teo, Lee, and Chai (2008) argue that anxiety is an important factor that needs to be addressed and managed by the teaching institution. This is important, since technology has the potential to transform the learning in and outside the classroom.

ICT anxiety and its specific effect on adoption of mobile learning has not been extensively researched (Wang, 2007). While, it is agreed that anxiety will play a role in the adoption of users of mobile technology, its role has yet to be tested empirically (Chu, Hwang, Huang, & Wu, 2008).

In addition to lecturer's digital literacy and anxiety impacting on adoption of new technology, the lecturers' perception of their ability to use it within the classroom will also play a role on the adoption of technology for teaching (Albion, 2001, Mac Callum, 2010). Teaching self-efficacy is the belief an educator has about his/her ability to perform a variety of teaching tasks (Dellinger, Bobbett, Olivier, & Ellett, 2008). Previous research has shown that teaching self-efficacy regarding the use of technology in the classroom has a strong influence on the integration of ICT into their teaching practice (Hasan, 2003; Potosky, 2002; Sang et al., 2010). Therefore, teachers' self-efficacy to effectively use ICT in their teaching will be an important factor in the adoption of new technology for teaching. A teacher with a strong teaching self-efficacy for using ICT is more likely to be experienced with technology and less anxious about using it in the classroom (Sang et al., 2010).

Teaching self-efficacy for using ICT in teaching has an impact on the level of anxiety teachers feel when using ICT in the classroom. Teachers' self-efficacy also influences their level of enjoyment and feeling of control when using technology in the classroom (Hammond et al., 2011; Sang et al., 2010). Other factors have also been shown to specifically influence teaching self-efficacy; these include the specific beliefs of an educator about whether they are able to use ICT as an instructional tool (Hammond et al., 2011; Mueller, Wood, Willoughby, Ross, & Specht, 2008) their teaching philosophy (Albion, 2001; Vannatta & Fordham, 2004), their past positive experiences with computers (Albion, 2001; Mueller et al., 2008; Sang et al., 2010), their past training or workshops attended relating to ICT use in teaching (Vannatta & Banister, 2009; Vannatta & Fordham, 2004) and the level of assistance needed from others (Mueller et al., 2008).

While there has been an extensive body of literature on teaching self-efficacy and use of ICT in the classroom, no reference could be found to its impact on adoption within the context of mobile learning. However, it is likely that ICT-teaching self-efficacy will play as significant a role in mobile learning adoption as it does in general technology adoption.

Due to the limited empirical research into lecturers' adoption of mobile learning, this paper proposes and tests a new model of adoption. This model measures the impact of digital literacy, ICT anxiety, and ICT teaching self-efficacy, in addition to the well established factors of perceived usefulness and perceived ease of use, on lecturer' acceptance of mobile learning.

Methodology

The research model of this research is shown in Figure 1. The TAM has been extended to include digital literacy, ICT anxiety, and ICT teaching efficacy.

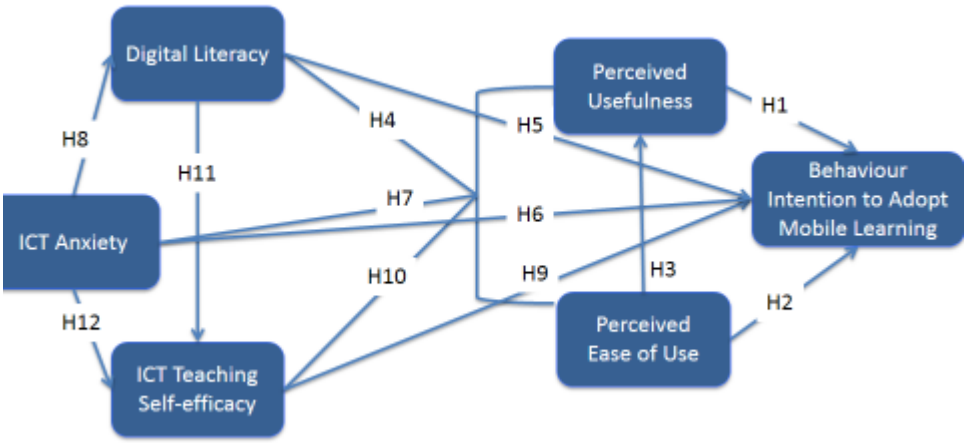

Figure 1: The proposed research model

Perceived Usefulness

Perceived usefulness is the degree to which a person believes that a particular technology will be beneficial to their lives (Chang & Tung, 2008). Research has shown that if a person believes a new technology will be of benefit to them, they will more likely adopt this new technology (Chin & Todd, 1995). Therefore it is hypothesized that:

H1: Perceived usefulness will have a positive effect on the behaviour intention to use mobile learning.

Perceived Ease of Use

Perceived ease of use is the measure of the degree an individual believes a particular technology is free from effort. Previous research has found a positive effect this perception has on the behaviour intention and perceived usefulness of the new technology (Chin & Todd, 1995, Chang & Tung, 2008). Therefore the following are hypothesized:

H2: Perceived ease of use will have a positive effect on the behaviour intention to use mobile learning.

H3: Perceived ease of use will have a positive effect on perceived usefulness.

Digital Literacy

Digital literacy is the measure of an individual's ability to use digital technology, communication tools, and/or networks to access, manage, and integrate digital resources (Markauskaite, 2007). A user's perceived digital literacy has been consistently reported in the literature as having a positive relationship with the adoption of new technology (Hasan, 2003; Hasan & Ahmed, 2010; Potosky, 2002). Therefore, it can be surmised that a lecturer with high digital literacy will be more confident about integrating technology into the classroom and therefore more likely to adopt new technology, such as mobile learning. Therefore the following are hypothesized:

H4: Digital literacy will have positive effect on the behaviour intention to use mobile learning.

H5: Digital literacy will have positive effect on perceived ease of use and usefulness.

ICT Anxiety

ICT anxiety has been defined as "the feeling of discomfort, apprehension and fear of coping with ICT tools or uneasiness in the expectation of negative outcomes from computer-related operations" (Rahimi, Yadollahi, 2011, p. 204). These negative feelings have been shown to have negative effect on lecturers' adoption of new technology and perception of how easy new technology will be to use (Agarwal et al., 2000; Beckers et al., 2007; Imhof et al., 2007; Parayitam et al., 2010; Saadé & Kira, 2007; Smith & Caputi, 2007). Anxiety has also been shown to have a negative influence on lecturers' digital literacy, making them more likely to resist learning new ICT skills (Barbeite & Weiss, 2004; Sun, Tsai, Finger, Chen, & Yeh, 2008; van Raaij & Schepers, 2008). Therefore the following are hypothesized:

H6: ICT anxiety will have a negative effect on the behaviour intention to use mobile learning.

H7: ICT anxiety will have a negative effect on the perceived ease of use of mobile learning.

H8: ICT anxiety will have a negative effect on a lecturers' digital literacy.

ICT Teaching Self-Efficacy

Teaching self-efficacy is the belief of a lecturer that they are able to effectively teach their students. According to Gibbs (2003, p. 3), educators who exhibit high levels of teaching self-efficacy tend to "persist in failure situations, take more risks with the curriculum, use new teaching approaches, make better gains in students' achievement and have more motivated students." When this form of self-efficacy is extended to the context of integrating ICT into teaching, it describes teachers who view technology as an effective way to enable student learning and perceive it as a useful medium to support their learning. Research has shown that a positive attitude to technology and having the skill to use the technology in the classroom are important and measurable factors in the level of integration of technology into their teaching (Zhao & Cziko, 2011). Therefore the following are hypothesized:

H9: ICT teaching self-efficacy will have a positive effect on the behaviour intention to use mobile learning.

H10: ICT teaching self-efficacy will have a positive effect on the perceived ease of use and usefulness.

H11: Digital literacy will have a positive effect on teaching self-efficacy.

H12: ICT anxiety will have a negative effect on a lecturers' teaching self-efficacy.

Research Method

A survey was used to measure the major variables in this study. A multi-stage stratified convenience sampling method was used to survey the lecturers. Two strategies were used to recruit lecturers: staff emails lists and presentations at conferences. These two methods where used to encourage eligible teaching staff to take part. Lecturers were also encouraged to distribute the invitation to participate to other lecturers. Although the sampling method in this research is a form of convenience sampling, the representativeness of the sample was checked against population characteristics and found to be within acceptable limits. However, the sampling approach used has made it difficult to determine the response rate. This therefore indicates an important limitation of this study, which may influence the generalizability of these findings.

A total of 196 responses were received. Of these, 21 surveys were removed because they were incomplete or had significant outliers, giving a total of 175 eligible responses. The number of suitable responses received was not particularly large, but it is close to Hoelter's (1983) recommended 'critical sample size' of 200. While this sample size is considered adequate, caution is still needed when interpreting the results. Of the total responses 61% (n=107) were female. The average age fell within the 40-49 age group ($\bar{x}$=4.38, s =8.21). The vast majority of respondents were of European decent (90%, n=157). The remainder of the respondents were of Polynesian, Asian, or African descent.

Instrument

To ensure the content validity of the scales adopted in this study, the items were derived from existing instruments used to measure the concepts of interest in this study. This approach helped ensure content validity (Chang & Tung, 2008). All items were measured using a 7-point Likert scale where 1 represented "Strongly disagree" and 7" Strongly agree".

The questionnaire included 5 parts. The first part was used to measure the digital literacy of the respondents. Respondents were asked to rate their own skill in carrying out a range of tasks using either a computer or mobile device. These tasks used in this study were taken from Kennedy, Dalgarno, Bennett, Judd, Gray, and Chang (2008). Computer based activities required a range of skills from using word processing software to searching and downloading files from the Internet. Mobile device usage included items relating to activities such as sending and receiving texts and uploading programs onto their phone.

Part 2 of the questionnaire measured the construct of ICT anxiety. This measure was adapted from Wilfong (2006). Examples of statements include, "I feel apprehensive when using a computer" and "I have a lot of confidence when it comes to working with information and communication technology".

Part 3 of the questionnaire measured the respondents ICT self-efficacy for teaching. The items for this construct were derived from Mueller et al. (2008). In their study, they developed a comprehensive summary of teacher characteristics and variables that best discriminated between teachers who integrated computers into their teaching and those that did not. Mueller et al. (2008) did not formally define these characteristics nor coin a label. The scale used in this study assessed the attitudes of educators towards computers and their opinion of computers as an important instructional tool. The statements focused on ICT in general and included the following statements "I see ICT as tools that can complement my teaching," "ICT allows me to bring current information to the class", and "I feel frustrated more often when I use ICT in my classes than when I don't use them."

Part 4 of the questionnaire measured the constructs of the TAM, namely, perceived usefulness, perceived ease of use, and behavioral intention to use. This was adapted from Venkatesh et al. (2003). The items are slightly modified to fit the mobile learning context of this study. The last part collected demographic information and general comments about mobile learning. Questions included "Mobile technology will enable me to access learning content more often" for perceived usefulness and "I think it might take me awhile to get comfortable with using a mobile device for learning" for ease of use. One question was used to capture the future intention to adopt mobile learning, "Overall, I think mobile learning would be beneficial to my learning and I would be willing to adopt it, if I had the opportunity, in the future."

In part 2 and 3 the focus was placed on assessing anxiety and teaching self-efficacy of ICT in general rather than mobile technology specifically. The reason for this was it was considered that mobile anxiety and teaching self-efficacy and ICT anxiety and teaching self-efficacy were not disparate concepts. Furthermore, it could not be assumed that teachers would have used mobile

technology in their teaching, so asking teachers to self-report on this would be limited. Part 1 and 4 focused more specifically on mobile technology. In particular, part 4 did not assume teachers had used mobile technology in their teaching but rather focused on their perceived usefulness and ease of use based on non-teaching experience of mobile technology. This study did not assume that participants had any experience of mobile learning but relied on users' experience with mobile technology. Participants were expected to project their understanding of mobile technology to a situation of using that technology for learning. This approach of developing a mobile learning adoption model based on limited experience is not new and a number of studies have used this same approach (Akour, 2009; Lu & Viehland, 2008; Theng, 2009). In addition, future usage was calculated from a stated intention to adopt. Extensive empirical research has confirmed the causal link between intention to adopt and actual future adoption therefore giving some credence to using behavioral intention as an indicator of actual future adoption (Davis, 1989; Dillon, 2001).

Data Analysis

The research used structural equation modelling (SEM) to test the relationships between the identified factors. The data obtained were tested for reliability and validity using factor analysis. Exploratory factor analysis (EFA) was used to confirm the structure of the data and enable the selection of the strongest indicators of each construct (Pallant, 2007). Four indicators were selected to represent the latent constructs in the structural model (Little, Cunningham, Shahar, & Widaman, 2002). By using only four items to represent each construct the complexity of the structure model was reduced and a reasonable degree of freedom maintained (Schumacker & Lomax, 2010). This also improved parameter estimates and the reliability, validity, and stability of the latent variables (Floyd & Widaman, 1995; Mulaik & Millsap, 2000; Schumacker & Lomax, 2010). When determining which items to select to represent each latent construct, the factor loading was taken into account along with how well the items related to the overall construct of the latent factor (Schumacker & Lomax, 2010). The reliability of the items was also taken into account ($\alpha \geq .7$) (Mulaik & Millsap, 2000; Schumacker & Lomax, 2010). Table 1 shows the result of the factor analysis. Appendix A identifies the items adopted in this study.

Table 1: EFA results for educators

MEASUREMENT CLUSTER	# ITEMS	# FACTORS RETAINED	% VARIANCE EXPLAINED	KMO	BARTLETT'S TEST OF SPHERICITY P<
ICT literacy	16	3	94.8	.901	.000
Anxiety	11	1	57.0	.701	.000
ICT teaching self-efficacy	16	2	56.4	.691	.000
TAM	24	2	57.1	.733	.000

Based on the results of the exploratory factor analysis (EFA) of the 16 digital literacy items measured, three latent constructs for were identified. These 16 tasks were categorized into three key groups, namely tasks associated with basic ICT usage, tasks associated with expert/advanced ICT usage, and tasks associated with advanced mobile usage. In each category four items were retained to represent each construct. The items selected all had loadings greater than 0.7 as consistent with Mulaik and Millsap (2000). Basic ICT literacy assessed the competency of users in relation to basic computing tasks, such as using word processing software, searching and emailing on the Internet, and doing basic mobile activities, such as texting and calling. Advanced

ICT literacy assessed the competency of users in relation to more advanced computing, such as modifying images and sounds and using advanced software (such as Skype). Advanced mobile literacy related to using mobile technology for more complex mobile learning activities, such as accessing the Internet, emailing, and sending photos.

The EFA also indicated two distinct sub-scales for the ICT teaching self-efficacy construct. The first sub-scale related to whether lecturers saw ICT as giving them an advantage in their teaching over traditional methods (r = .85). The second sub-scale related to the ability of lecturers to use ICT in their teaching (referred to as ICT ability) (r = .70).

Correlations between the relationships were assessed to determine the level of multicollinearity. Multicollinearity exists when factors are highly correlated (Gefen, Straub, & Boudreau, 2000). High correlation can pose a risk of Type II errors in statistical modelling (Grewal, Cote, & Baumgartner, 2004). The correlations were determined using a bivariate Pearson product-moment coefficient (r). Based on the results of the correlation it was possible to determine that there were a number of significant relationships between the two important relationships in the study. However, these correlations were not sufficiently high for multicollinearity to be a concern. Table 2 presents the correlation matrix.

The composite reliability (internal consistency reliability) approach was estimated using Cronbach's alpha. Composite reliabilities of constructs ranged between 0.71 and 0.93, exceeding the threshold of 0.7 (Nunnally & Bernstein, 1994).

Table 2: Means, standard deviations, and inter-correlations between latent constructs

ITEM	MEAN	SD	BICTL	AML	AICTL	ANX	SE-ATT	SE-ABL	PU	PEOU
Digital Literacy										
Basic ICT literacy (BICTL)	3.92	1.702								
Advanced mobile literacy (AML)	5.63	1.120	.793**							
Advanced ICT literacy (AICTL)	3.45	2.112	.651**	.627**						
Perceived anxiety (Anx)	3.61	1.505	-.589**	-.545**	-.377**					
ICT Teaching Self-Efficacy										
Attitude (SEAtt)	5.55	.639	.300**	.281**	.179*	-.180*				
Ability (SEabl)	4.47	1.352	.565**	.579**	.444**	-.393**	.334**			
Mobile learning perceptions:										
Perceived usefulness (PU)	5.32	.969	.199**	.206**	.101	-.068	.207**	.086		
Perceived Ease of use (PEOU)	3.51	1.190	.459**	.527**	.283**	-.498**	.426**	.196**	.067	
Behaviour Intention (BI)	5.46	1.159	.157*	.093	.156*	-.001	.006	.012	.168*	.076

Notes: ** $p < 0.001$, *$p < 0.05$ level, highlighted cells refer to non-significant results, $p > .05$. Means for all scales: 1=minimum (low), 7=maximum (high). Educator n = 175

Results

Structural equation modelling was used to analyze the influence that digital literacy, anxiety, and teaching self-efficacy has on perceived ease of use, perceived usefulness, and behaviour intention.

Figure 2 shows all the significant standardized path coefficients for the student model (all paths that were significant were at p<.000 unless indicated with a * where p>.01).

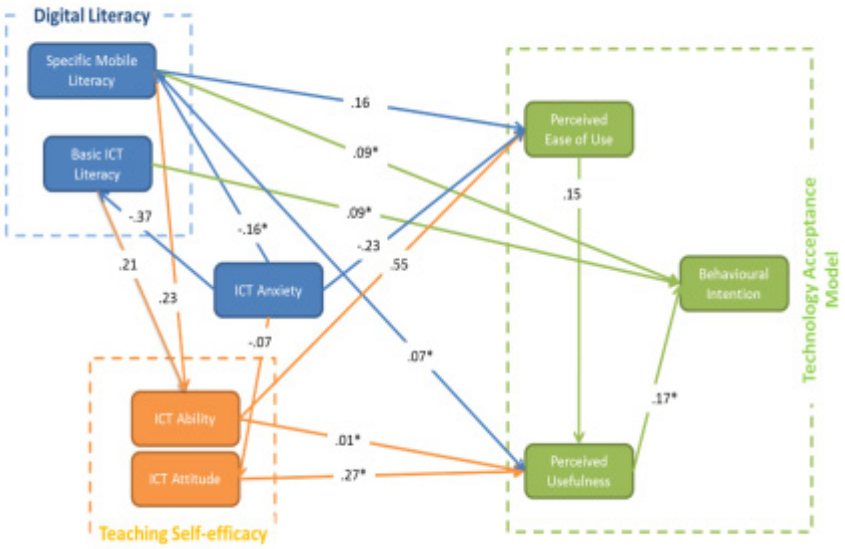

Figure 2: SEM results

As recommended by Hooper, Coughlan, and Mullen (2008), the goodness of fit statistics for the model shows in general good fit (Table 3).

Table 3: Model fit indices

	χ^2	χ^2 /df	SRMR	NFI	CFI	PCFI	RMSEA
Recommended value		<3	<.08	>.90	>.90	>.50	<.10
Model	670.7	2.85	.08	.97	.90	.69	.00

This paper set out to examine the influence of digital literacy, ICT anxiety, and teaching self-efficacy on the adoption of mobile learning. These factors were found to impact both perceived ease of use and usefulness and intention to adopt. Of the 12 hypothesis tested 9 were supported or partially supported in the model. Appendix B outlines and compares the significant hypotheses.

A number of factors were found to be influential in the adoption model. Lecturers' intentions to adopt mobile learning were impacted by all three new variables. However a direct relationship was shown between the behavioral intention of lecturers' to use mobile learning and their perceived usefulness of mobile learning and their digital literacy.

The perceived usefulness of mobile learning was further shown to be influenced by two factors: the level of experience with using advanced features of mobile technology and the self-efficacy of teachers to use ICT in the classroom. Specifically, advanced mobile literacy and ability and atti-

tude to integrating technology into the classroom were shown to have a significant influence on perceived usefulness.

The perceived ease of use of mobile learning was influenced by three factors which were, in order of strength, their perceived self-efficacy of teachers to use ICT in the classroom, their level of anxiety educators felt when using technology, and their experience with the advanced features of mobile technology.

The ability to utilized more advanced computing features, such as modifying images and sounds and using advanced software (such as Skype), was found to have no relationship to the acceptance of mobile learning.

Discussion

Based on the results of the analysis a number of relationships were confirmed. In particular, the study was able to confirm that digital literacy, ICT anxiety, and ICT teaching self-efficacy have an impact on the lecturers' behavioral intention to use mobile learning. Teaching self-efficacy is particularly important. The findings of this research help to identify the role these factors have in influencing the acceptance of mobile learning, thus enabling educators and their institutions to assess and plan a successful introduction of mobile learning.

The results of this paper confirm the role of perceived ease of use and usefulness on the acceptance of mobile learning. These two factors were shown to have a positive effect on the behavioral intention to use mobile learning. This meant that lecturers who see mobile learning as a way to offer a substantial advantage to students' learning or their own teaching will adopt mobile learning. Though perceived ease of use was not shown to have a direct influence on behavioral intention, the study did indicate that it had a mediating effect on perceived usefulness. This result was not necessarily surprising. A number of studies have shown that perceived ease of use does not necessarily have a direct effect on behavioral intention (Akour, 2009; Donaldson, 2011; Huang, Lin, & Chuang, 2007; Wang et al., 2009). It is however, more likely to have a direct impact on the perceived usefulness. The perceived benefits of new technology will often be influenced by how much effort users feel is needed to use and learn to use new technology. This therefore highlights the importance of how lecturers perceive mobile learning. Lectures need to feel that the technology is easy to use and beneficial to their teaching and students' learning. These two findings highlight the need for developers and instructional designers, researchers, and teaching institutions to focus on ease of use and to highlight the benefits of mobile learning. Designers need to remove technical obstacles to ensure that all mobile learning initiatives are as easy to use as possible with little initial learning needed. While institutes and researchers need to provide effective IT support and access to training and pilot initiatives before a major rollout, institutions also need to promote the benefits of the mobile learning initiative so that they are clear and evident to all parties. This can be done by ensuring lecturers are aware of the advantages of mobile learning has to support their students' learning and their teaching. Opportunities should also be provided to lecturers to enable them to explore mobile learning on their own.

In addition to confirming the basic structure of the TAM, the new variables were also confirmed as playing a significant role in the acceptance of mobile learning. Digital literacy, in particular, was shown to have a major influence on a wide range of factors that mediate the behavioral intention to use mobile learning. It also had a direct influence on the behavioral intention to use mobile learning. The study indicated that digital literacy should be considered in two distinct ways as each will influence acceptance to a different degree.

The first category of digital literacy was the basic ICT literacy of lecturers. This included the competency of users using general computing tasks, such as using word processing software, searching and emailing using the Internet, and doing basic mobile activities, such as texting and

calling. Basic ICT literacy was shown to have a direct positive impact on behavioral intention to use mobile learning. It also had a positive impact on teaching self-efficacy to use ICT in the classroom. This confirms the importance of ensuring lecturers have a good foundation in basic digital literacy. Other studies have shown that digital literacy will generally play a role in the adoption of new technology and its use in the classroom. For example, in an early study by Cox, Preston, and Cox (1999) teachers who were already regular users of ICT were more likely to have higher levels of confidence in using ICT in their teaching and were more likely to extend their use of ICT further in the future. This finding was further supported Mueller et al. (2008) who found that educators with direct experience of ICT were more confident using a wider range of technologies. Therefore parties that are interested in implementing mobile technology need to carefully consider lecturers' confidence and ability with ICT. Strategies need to be set in place to up-skill lecturers' general ICT literacy and not just to focus on teaching lecturers how to use the mobile technology.

However, teaching lectures to use the mobile technology is also important. The study indicated that advanced mobile literacy played a significant role on adoption. The second category of digital literacy was the advanced mobile skill; this related to using mobile technology for more complex mobile learning activities, such as accessing the Internet, emailing and sending photos. This factor was shown to have a direct impact on the perceived ease of use and usefulness of mobile learning, as well as having a positive impact on the perceived teaching self-efficacy of lecturers to use ICT in the classroom. Previous research has shown that past experience with a specific technology is a key determinant of the future adoption of technology (Ajzen & Fishbein, 1980; Kidwell & Jewell, 2008; Saadé & Kira, 2009). The study highlighted that lecturers' experience with mobile technology will impact their perceptions of its ease of use and usefulness. The mobile literacy of lecturers' enables them to better evaluate how valuable mobile learning will be in supporting their learning and teaching. It will also give them confidence it its use. The familiarity with mobile technology will help support the extension and experimentation of its use in other areas – such as for teaching. Conversely lecturers that seldom use mobile technology or have a low level of skill with technology will be less likely to experiment or deviate from existing use. It will therefore be less likely that they see mobile learning as easy to use or useful for learning. Lefoe et al. (2009) found that educators who became more familiar with their mobile devices developed a better understanding of how mobile learning activities could be developed and incorporated.

Along with the skills to use technology generally, the study also clearly indicates that lecturers will also need specific skills to use the technology in the classroom. General use of technology does not necessarily translate its effective use inside the classroom. Specific skills and pedagogies are needed to translate this general literacy in using ICT in teaching. In addition to these skills, the lectures' attitudes toward the inclusion of ICT into the classroom will play a mediating role on their behavioral intention to implement mobile learning. This study confirms that teachers who fail to see the value of technology in the classroom will resist its introduction. They are therefore less likely to seek out new technology and integrate it into their teaching (Duncan-Howell & Lee, 2007).

As described by Lim and Khine (2006), support is needed when introducing new technology into education. Duncan-Howell and Lee (2007) argued that "teachers need access to more training, more information and more opportunities to see and use new technologies for themselves" (p. 229). The role of time and support will be vital to mobile learning adoption as it has been for general ICT adoption.

One factor shown to have a negative mediating effect on behavioral intention to implement mobile learning was ICT anxiety. ICT anxiety was shown to influence the digital literacy of lecturers, their attitudes toward the use of ICT in the classroom, and the perceived ease of use of mobile

learning. ICT anxiety is an emotional response resulting from the fear that use of ICT may result in a negative outcome, such as damaging the equipment or looking foolish (Barbeite & Weiss, 2004). Little previous research has specifically investigated the effect that ICT anxiety has on mobile learning; however, the effect ICT anxiety has on an individual's adoption and use of technology in education has been identified in a number of studies (Barbeite & Weiss, 2004; Beckers & Schmidt, 2003; Rahimi & Yadollahi, 2011; Wang, 2007). Other studies have shown that anxiety about computer use will negatively influence an individual's use and adoption of ICT in their teaching and learning (Phelps & Ellis, 2002; Teo, 2011; Wilfong, 2006). For lecturers, ICT anxiety also influenced the perceived ease of use of mobile learning. Phelps and Ellis (2002) found that lectures who perceived their technological competence to be low often felt threatened and overwhelmed when using ICT in the classroom, a finding confirmed later by Jeffrey, Hegarty, Kelly, Penman, Coburn, & McDonald (2011). Therefore, anxiety will make the adoption of new technology seem harder and will ultimately result in lecturers avoiding the introduction of new technology into their teaching. This study therefore establishes the role of ICT anxiety on mobile learning adoption, a finding not been previously discussed in the literature.

ICT anxiety also influences the digital literacy of lecturers. As found in other research, as a user becomes more experienced with computers they are more likely to form a positive attitude to them (Shih, Munoz, & Sanchez, 2006). Anxiety typically arises from the fear of the unknown and the confidence to cope with changes (Beckers, Rikers, & Schmidt, 2006). When individuals become more secure and positive about their technology usage, they are more likely to relax and not feel as anxious about its use (Beckers & Schmidt, 2003; Cowan & Jack, 2011). This is because they have developed an assurance that they can cope with learning new technology and can solve issues that may arise.

Support is therefore needed for lectures that have negative attitudes toward technology. Additional support and training may therefore be needed over and above the standard support given.

Conclusion

This study extends the TAM with digital literacy, ICT anxiety, and teaching self-efficacy to model the acceptance of mobile learning by lecturers. The study helps predict the influence of each factor on the adoption and discusses the impact these factors will have on the successful implementation of mobile technology into the education setting. In particular this study had the following major contributions:

1. This research found that digital literacy, ICT anxiety, teaching self-efficacy, and perceived ease of use and usefulness were critical factors for lecturers' behavior intentions to implement mobile learning.
2. This research confirmed the role of perceived ease of use and usefulness on the acceptance on mobile learning and confirmed that the TAM provides a valuable tool for modelling lecturers' adoption of mobile learning.
3. The research indicates the negative role of ICT anxiety in digital literacy, teaching self-efficacy, and perceptions of mobile learning.
4. The study highlighted that digital literacy has a distinct role on acceptance. Specifically, basic ICT literacy and advanced mobile literacy each play a separate but vital role on acceptance.
5. The findings also differentiated between digital literacy and the ability to use technology within the classroom. The study highlights the notion that lecturers not only need to be digitally literate but also be able to implement the technology into the classroom. This research indicated that ability and attitudes played a strong role in acceptance of mobile learning.

6. This research fills the current gap in mobile learning adoption and addresses an often-overlooked area of research addressing lecturers' adoption.
7. This research identifies the role of three new research constructs – digital literacy, ICT anxiety, and teaching self-efficacy – within the limited research investigating mobile learning adoption.

The research strongly indicates the role of support needed for lecturers to successfully implement mobile learning into the classroom. Support is needed in terms of supporting general literacy. In particular, support is needed to help teachers with the technology and supporting them to effectively integrate it into the teaching environment.

This research has added to and clarified the existing literature into mobile learning. In particular, it recognizes the role that lecturers play in the future acceptance of mobile learning. It shows that the factors that influence lecturers' adoption of mobile learning may differ from those of their students and therefore need to be considered when implementing mobile technology into the teaching environment.

In general, though these factors have been explored in other studies, gauging ICT adoption, there have been a limited number of studies specifically looking at mobile learning adoption by lecturers. The measures adopted in this study focus on existing variables, such as digital literacy, ICT anxiety and ICT teaching self-efficiency, to a context of mobile learning. This however may limit the study's findings, in general, since the variables adopted are ICT focused, rather mobile specific. Despite this however, the study has been able to confirm the role of perceived ease of use and usefulness on the acceptance of mobile learning. However, results have indicated that mobile learning adoption is influenced by some of the same factors that influence adoption of other technologies in the classroom. The findings indicate that mobile technology may not be too dissimilar to other technology adoption in education. However, a different approach may be needed when introducing mobile technology to lectures. Specifically, if mobile learning is to be introduced into the classroom, teachers need to first have a good foundation in general computing. The need to scaffold technologies is seen as very important to successful introduction of mobile learning.

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Appendix A

Table A. 1: Statements from digital literacy scale adopted

ADVANCED MOBILE LITERACY (AML) ITEMS
Use a mobile phone to send or receive email
Use a mobile phone to access information/services on the web
Use a mobile phone to access information/services on the web
Use a mobile phone to send pictures or movies to others
BASIC ICT LITERACY (BICTL) ITEMS
Use the web to send or receive email
Use the web to look up reference information for study purposes
Use a mobile phone to call people
Use a mobile phone to text/ SMS people
ADVANCED ICT LITERACY (AICTL) ITEMS
Use a computer to create/edit audio and video
Using a computer to play digital music files (e.g. iTunes) without accessing the Internet
Use a computer to manage/manipulate digital photos
Use a mobile phone to download and play games or applications from the Internet

Table A. 2: Statements from ICT Anxiety scale adopted

ICT ANXIETY (ANX) ITEMS
ICT is difficult to use
ICT frustrates me
I feel insecure about my ability to use ICT
I need someone to tell me the best way to use a computer

Table A. 3: Statements from ICT teaching self-efficacy scale adopted
ICT ABILITY (SEABL)
I see ICT as tools that can complement my teaching.
ICT provide variety in instruction and in content for my students.
ICT allows me to bring current information to the class
ICT provides opportunities for individualized instruction.
ICT ATTITUDE (SEATT)
I feel frustrated more often when I use ICT in my classes than when I don't use them (R)
I have positive ICT experiences at my teaching institute.
I had positive experiences with computers when I was younger
I feel I am trained well enough to use a variety of ICT tools when teaching

Table A. 4: Statements from the Technology Acceptance Model (TAM) scale adopted
PERCEIVED USEFULNESS (PU)
Mobile technology will make learning and teaching more interesting
I see ML as a way of encouraging more interaction by students and educators
I see ML as a way to improve student learning as it allows students to access learning content anywhere and anytime
I see ML as a way to enhance/encourage my students' self-directed learning
PERCEIVED EASE OF USE (PEOU)
I would be anxious about having to use my mobile device to help support my teaching (R)
I think it might take me awhile to get comfortable with using a mobile device for teaching (R)
I believe I would find it easy to use a mobile device to support my teaching
I feel that I would have the knowledge necessary to implement and use mobile technology in my teaching
I would be anxious about having to use my mobile device to help support my teaching (R)

Appendix B

SUMMARY OF HYPOTHESES	PATH	SUPPORTED?
H1: Perceived usefulness will have a positive effect on the behaviour intention to use mobile learning.	PU → BI	Yes
H2: Perceived ease of use will have a positive effect on the behaviour intention to use mobile learning.	PEOU → BI	No
H3: Perceived ease of use will have a positive effect on perceived usefulness.	PEOU → PU	Yes
H4: Digital literacy will have positive effect on the behaviour intention to use mobile learning.	H4a: BICTL → BI H4b: AML → BI H4c: AICTL → BI	Yes Yes No
H5: Digital literacy will have positive effect on perceived ease of use and usefulness.	H5a: BICTL → PEOU H5b: BICTL → PU H5c: AML → PEOU H5d: AML → PU H5e: AICTL → PEOU H5f: AICTL → PU	Yes No Yes Yes No No
H6: ICT anxiety will have a negative effect on the behaviour intention to use mobile learning.	H6: Anx → BI	No
H7: ICT anxiety will have a negative effect on the perceived ease of use of mobile learning.	H7: Anx → PEOU	Yes
H8: ICT anxiety will have a negative effect on a lecturers' digital literacy.	H8a: Anx → BICTL H8b: Anx → AML H8c: Anx → AICTL	Yes Yes No
H9: ICT teaching self-efficacy will have a positive effect on the behaviour intention to use mobile learning.	H9a: SEAtt → BI H9b: SEabl → BI	No No
H10: ICT teaching self-efficacy will have a positive effect on the perceived ease of use and usefulness.	H10a: SEAtt → PEOU H10b: SEAtt → PU H10c: SEabl → PEOU H10d: SEabl → P	No Yes Yes Yes
H11: Digital literacy will have a positive effect on teaching self-efficacy.	H11a: BICTL → SEAtt H11b: BICTL → SEabl H11c: AML → SEAtt H11d: AML → SEabl H11e: AICTL → SEAtt H11f: AICTL → SEabl	No Yes No Yes No No
H12: ICT anxiety will have a negative effect on a lecturers' teaching self-efficacy.	H12a: Anx → SEAtt H12b: Anx → SEabl	Yes No

Biographies

Kathryn Mac Callum is a senior lecturer at the School of Computing at Eastern Institute of Technology, New Zealand. Her PhD addressed the adoption of mobile learning by students and teachers in the tertiary sector. Her PhD research proposed and tested a structural model of the adoption of mobile learning in tertiary education. Her current research focuses on the use of smart devices in the primary sector. She has a strong interest in the effective use and adoption of technology in education. Her current research interest is looking at how smart technology can be effectively used to support students in Primary education.

Lynn Jeffrey is an Associate Professor at the School of Management in Massey University (New Zealand). Her PhD is in learning psychology. She has a particular interest in improving adult and tertiary learning, and the role that technology might play in achieving that end. Technology that she's developed includes a computer-based, examination-on-demand system (CALES) which was used by the New Zealand Civil Aviation Authority for pilot theory examinations; a learning style website that can be used by tertiary students to get advice on improving their learning, and by their teachers for developing more relevant teaching methods; and a learning style evaluation website for workplace training. Her current research focuses on student engagement in blended learning environments, occupational competency identification, teaching international students and mobile learning.

Dr. Kinshuk is Full Professor and Associate Dean of Faculty of Science and Technology at Athabasca University, Canada. He also holds the NSERC/iCORE/Xerox/Markin Industrial Research Chair for Adaptivity and Personalization in Informatics. Areas of his research interests include Adaptive and personalized learning; learning analytics; learning technologies; mobile, ubiquitous and location aware learning systems; cognitive profiling; and, interactive technologies. With more than 400 research publications in refereed journals, international refereed conferences and book chapters, he is frequently invited as keynote or principal speaker in international conferences. He has been twice awarded the prestigious fellowship of Japan Society for the Promotion of Science (2008 and 2013). He is Founding Chair of IEEE Technical Committee on Learning Technologies, and Founding Editor of the Educational Technology & Society Journal (SSCI indexed with Impact Factor of 1.171 according to Thomson Scientific 2012 Journal Citations Report).

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Online Learners and Their Self-Disclosure Preferences

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Abstract

To understand and identify information-sharing preferences among online students, a US survey collected data from university students. Specifically, this study analyzes students' information disclosure preferences and to what extent demographics influence a student's willingness to disclose personal information. This study also examines whether or not students feel more comfortable sharing information with specific user groups, such as teachers, teachers' assistants (TAs), classmates, or friends. While using the communication privacy management theory as a theoretical framework, it was found that graduate students were significantly more likely than undergraduate students to share information with many different groups. Specifically, graduate students disclosed more information to teachers, classmates, group-members, and the TA group when compared to undergraduate students. In addition, graduate students were more likely than undergraduate students to share specific categories of information, including work-related information and contact information. These results provide important insights into how graduate students and undergraduate students interact within online learning environments.

Keywords: information sharing preferences, communication privacy management theory, social constructivism, online learning environments, online privacy settings.

Introduction

Online education is continually evolving to provide a flexible environment that accommodates a variety of students and learning styles. In light of Darkenwald and Merriam's (1982) definition of an adult learner as a self-guided and internally-motivated learner, adults, in particular, can benefit from online learning as it provides an adaptable format for participants to learn as self-determined students (Cercone, 2008). Specifically, constructivism, which highlights learner-centered environments and stresses that knowledge is socially constructed, has been used to evaluate the ways instructors and students interact in online learning environments (Huang, 2002). It is not a new concept that interaction is a factor in education; however, its role has been repositioned from face-to-face (F2F) to online settings (Anderson, 2004).

While online learning frees students from the physical constraints of co-location, it may potentially hinder students' ability to socially interact with their peers. As social interaction is being recognized as a core component for higher student motivation and satisfaction (Cobb, 2009; Sung & Mayer, 2012),

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it is important that researchers understand students' desire, or lack thereof, to disclose information as a way to promote social interaction connection in online environments.

When designed correctly, online learning environments can address individual learners' preferences and assist learners in attaining their desired level of learning (Ally, 2004). Some researchers suggest that online learning environments may provide a social classroom where students feel more connected to one another when compared to F2F environments (Walther, 1996). More recent studies show these classrooms as environments that foster relationships (Walther & Parks, 2002). Online learning environments that promote discourse among students and instructors can provide learners with a more meaningful learning experience (Kiriakidis, 2008). Additionally, online learning environments can foster collaboration and community building as well as allow for learners to connect with and utilize a greater range of shared resources (Ma & Yuen, 2010).

Social networking systems (SNSs) facilitate the social connections of the participating individuals and support online communities. In SNSs, individuals determine the amount of information being disclosed (Boyd & Ellison, 2008). Used in online learning environments, SNSs can thus promote interaction and socialization among students, support informal learning, build the learning community, and improve motivation (Dabbagh & Kitsantas, 2012; Leskovec, Huttenlocher, & Kleinberg, 2010; Roblyer, McDaniels, Webb, Herman, & Witty, 2010).

The primary goal of this study is to identify privacy and information-sharing preferences among university students. Specifically, this study intends to understand students' information disclosure preferences, and to what extent demographics influence a students' willingness to disclose personal information. The study also looks at whether or not students feel more comfortable sharing information with specific user groups, such as teachers, teaching assistants, classmates, or friends. This information will give insight into the role of social interaction in online environments and the design and implementation of online education.

Literature Review

Online social software, such as SNSs, is a commonly used communication medium among students of higher education. In fact, 90.3 percent of 30,616 undergraduate students enrolled in 115 US institutions reported that they use social networking sites, and this number is steadily increasing (Smith, Salaway, & Caruso, 2009). Unfortunately, however, these students access social networking sites for recreational use, but not necessarily academic use (Alexander, 2008; Forkosh-Baruch & Hershkovitz, 2011; Madge, Meek, Weelens, & Hooley, 2009). While the use of social communication in courses is limited, SNSs can be used in online environments to promote learning and build social connections among learners and instructors (Dabbagh & Kitsantas, 2012). From a social constructivist perspective, online learners require a certain amount of social learning, which is influenced by the learners' ability to foster relationships and socially communicate with others in the online setting (Huang, 2002). SNSs can influence student engagement and social connectivity in online courses (Dabbagh & Kitsantas, 2012) and promote interaction and socialization among learners (Leskovec et al., 2010; Livingstone & Brake, 2010; Roblyer et al., 2010). Although SNSs can foster social interaction in online learning, standard implementation does not always result in successful social interaction (Kreijns, Kirschner, & Jochems, 2003). Understanding the social dimension of interaction can enhance the chances of effectively implementing SNSs (Kreijns et al., 2003).

When individuals are physically separated and capable of presenting themselves in carefully defined ways, they can potentially construct a more controlled representation of themselves and avoid the social preconceptions that are sometimes found in F2F environments (Simonson, Smaldino, Albright, & Zvacek, 2000). Privacy concerns may influence a student's willingness to share the information necessary for self-definition, and in turn, hinder social connections made

within online learning environments (Chen & Bryer, 2012). Researchers, however, disagree on the factors that can influence such privacy concerns. Some suggest that demographics, such as gender and age, may play a role in a student's willingness to connect with their online peers (Junco, 2011). Some comment on conformity as a factor; individuals have a tendency to reveal compliance among those who are involved (e.g., majority talk about a certain topic or share a certain kind of information) (Dron, 2007). Another supposed factor is students' learning styles (e.g., autonomous learners choose to influence the social structure and more dependent learners choose to be more influenced by the social structure) (Dron, 2007). Regardless of the influencing factors, users of SNSs have the ability to control their privacy settings (Stutzman & Kramer-Duffield, 2010). Researchers turn to the Communication Privacy Management (CPM) theory to explain how and why users manage their personal information in SNSs (Child & Petronio, 2011; Metzger, 2007).

Communication Privacy Management (CPM) differentiates between private and public information and outlines a set of rules that are followed when determining which private information to disclose (Petronio, 2002). By defining the borders between private and public information, privacy is carefully balanced with the need to form relationships. Students are more willing to disclose personal information in low-risk environments and less willing to disclose this information in high-risk environments (Metzger, 2007), suggesting that students' perception of risk level determines how much information will be disclosed.

Originally developed to understand how people decide to disclose information, CMP has expanded to include other settings (Metzger, 2007), such as online environments. While examining social network usage in online learning environments, it was found that online students consciously select specific profile information to disclose to particular groups (e.g., the instructor, teaching assistant (TA), classmates, working group members, and existing friends) (Heo, 2011). In line with CPM, the findings show that students carefully weigh their desire to make personal connections with their need to maintain a certain level of privacy. This behavior suggests that not only do students consider privacy when presenting themselves in online environments, but they actively set rules and boundaries to protect specific, personal information.

Research Question Development

From a social constructivist perspective, the ability of students to make connections and interact with other students is an important aspect of reaching a desired level of social learning when participating in online courses (Huang, 2002). Self-disclosure, one of the factors that positively contributes to social presence (Polhemus, Shih, & Swan, 2001), has been witnessed to yield an increase in the quantity and depth of interaction within online learning environments (Swan, 2002), and to help establish a common ground among the learning group (Ziegler, Paulus, & Woodside, 2006). Additionally, recent literature has suggested that participants in online environments carefully reveal specific categories of information in order to self-disclose and connect with others (Chou & Chen, 2009).

While social communities thrive when participants willingly share personal information (Palen & Dourish, 2003; Strater & Lipford, 2008), privacy is also an important aspect of the socialization process, as privacy is necessary for intimacy (Gerstein, 1984; Gross & Aquisti, 2005). Acknowledging privacy concerns while facilitating the social aspect of the online community is crucial, as perceptions of community are important to online learning (Song, Singleton, Hill, & Koh, 2004). Within online environments, privacy is often explicitly controlled through profile settings (Strater & Lipford, 2008). Through examining profile settings within online learning environments, researchers and instructors may better understand how online learners balance their privacy concerns with their need to disclose information. In addition to examining online privacy settings, online teaching practices may also benefit from an improved understanding of how individual

student demographics influence disclosure and privacy preferences. By creating the proper balance between privacy and public community, and by considering the various demographic information that may influence perceptions of privacy, students may experience enhanced social learning within their online learning communities.

Based on 99,000 student responses collected across 108 institutions, of which approximately 29,000 indicated they were graduate students and 64,000 indicated they were undergraduate students, the 2011 national online learners' priorities report (Noel-Levitz, 2011) revealed the following: over three years between 2008 and 2011, the majority of the online learners are females (female: 67%, male: 33%), enrolled at an undergraduate program (undergraduate: 66%, graduate: 34%, other: 4%), range in age from 25 to 44 years old (25-34 years: 30%, 35-44 years: 28%, 45-54 years: 20%, 24 and under: 15%, 55 and over: 7%), and are employed full-time while working on their degrees (full-time: 61%, other: 39%) (Noel-Levitz, 2011). Acknowledging the current online learners' demographic profile, this study examined whether the profiles (gender, degree program, and age) influence how these learners balance communication privacy concerns and the desire to disclose information. Specifically, the following two research questions (RQ) are sought after:

- RQ 1. Are certain demographics more willing to disclose to particular groups in relation to others (i.e. the instructor, teacher's assistant(s) (TA(s)), classmates, group members, close friends)?
- RQ 2. Are certain demographics more willing to disclose particular types of information (e.g., personal, appearance, work-related, educational-background, course-specific, and contact information)?

Method

Recruitment

Using Wilson's (1997) text titled, "Distance Degrees" as a guide, the first step in the recruitment process was to identify education programs that offer online courses. After higher education programs were identified, course instructors were identified and contacted through email. An email invitation was distributed to 6,500 identified email addresses, asking for the instructors' support by forwarding the research invitation message to their students. Undergraduate and graduate students were invited to participate; the only requirement was experience with online courses at the time of recruitment.

Participants

The population size was unknown because it was not clear how many students received the invitations from their instructors; however, because sample size does not change much for populations larger than 20,000, a sample size of 377 was set to obtain a 95% confidence level with 5% margin of error and 50% response distribution. When the target sample of completed surveys was collected through Zoomerang, a commercial online survey service, the survey link was deactivated. Participants' demographic information is illustrated in Table 1.

Table 1: Demographic characteristics of participants		
Category	**Ranges**	**Percent**
Age	18-25	35.54
	26 – 39	38.99
	Over 40	25.46
Gender	Male	21.75
	Female	78.25
Educational enrollment	Undergraduate	30.77
	Graduate	69.23
Employment status	Not employed	15.92
	Employed part-time	31.30
	Employed full-time	50.66
	Self-employed	2.12

Instrument

Literature was reviewed on the topic of social awareness, and a pool of survey questions was generated. The questionnaire was reviewed by a panel of faculty in the field of education, in order to establish face validity. The newly-created questionnaire was then pilot tested to a group of 56 online course taking students at a medium size private university in a Northeastern State.

The survey contained two categories of questions. The first category of questions (a total of 21 questions) collected participants' demographic information, e.g., "What is your gender?", and online learning experiences, e.g., "How many online courses are you taking currently?" The second category of questions (a total of 52 questions) collected the data representing participants' social awareness within online classroom settings, e.g., "In an online course during the first few weeks of the semester/quarter, what kind of personal information is most effective with helping you to get acquainted with people?"; and group-specific confidentiality questions within online classroom settings, e.g., "In an online course, of the following people, to whom are you willing to share your major information? - teacher, teaching assistant or mentor, classmates, coursework group members, personally close friends in class, and none of the above."

Social information that students gather in online settings to become acquainted with others (Useful = 1; Not Useful = 0) and willingness to disclose relationship-based online information (Willing = 1; Non-willing = 0) were scored using a dichotomous procedure. To ensure the internal consistency of the dichotomous survey scores of the sample, a series of Kuder-Richardson Formula 20 (KR-20) tests were computed. Calculated KR-20 alpha coefficients of reliability were 0.82, 0.77 and 0.99, respectively. User responses for each audience group and information category were computed (0 = Not share with any one; 5 = Share with all audience groups) for analysis. The measured reliabilities using Cronbach's alpha were .873 and .906, respectively.

Results

Due to the non-normality of the data, unequal variances between groups, and unequal sample sizes, a Kruskal-Wallis test was conducted to evaluate differences in participants' willingness to share information with various audience groups. Differences in age group were also analyzed using Kruskal-Wallis tests. For tests with only two groups, such as gender and degree programs, a Mann-Whitney U test was conducted to again account for the non-normality of the data, unequal variables between groups, and unequal sample sizes. A large number of group comparisons

were generated; to counteract the problem of multiple comparisons, the Bonferroni correction method was used and an individual alpha level of 0.001 was set to control Type 1 error.

Among the studied demographic categories, only the degree program category demonstrated group differences in self-disclosure with varied audience groups. Results showed that graduate students (over 25 years: 81.6%; 18-25 years: 18.4%) were consistently more willing than undergraduate students (18-25 years: 74.1%; over 25 years: 25.9%) to share more information with each audience group; significant results at the .001 level appeared within the teacher ($z = -4.58$, $p < .001$), the classmates, ($z = -4.97$, $p < .001$), the group-members ($z = -3.23$, $p < .001$), and the TA ($z = -4.19$, $p < .001$). In addition, undergraduate students were more likely than graduate students to withhold information from all groups ($c^2(2, N=310) = 18.77$, $p<.001$). Participants' willingness to disclose information to the friends did not differ significantly at the .001 as it relates to degree programs. Table 2 outlines the mean and standard deviations for each group.

Table 2: Mean and standard deviation values for each group

Category	Undergraduate		Graduate	
	M	SD	M	SD
Teacher	22.02	7.07	26.34	4.82
Classmates	16.42	6.76	20.82	5.64
Group-members	16.53	7.76	21.27	6.71
Friends	21.07	7.58	22.18	7.65
TA	18.31	8.32	23.25	6.27
No Group	5.00	3.65	2.99	2.03
Average of All Means	**16.56**		**19.48**	

Degree program, again, demonstrated group differences in self-disclosure of types of information. Results showed that graduate students were consistently more willing than undergraduate students to share all categories of information; a significant difference at the .001 level appeared in the work category ($z = -4.46$, $p < .001$) and contact information category ($z = -4.52$, $p < .001$). Table 3 outlines the mean and standard deviation values that represent specific categories of information.

Table 3: Mean and standard deviation values for specific categories of information

Category	Undergraduate		Graduate	
	M	SD	M	SD
Personal Information	18.62	6.54	21.21	5.46
Appearance Information	9.07	6.04	11.41	5.70
Work Information	16.80	6.97	22.05	4.82
Education Information	18.75	4.69	20.99	3.94
Course Information	20.45	10.52	22.78	9.48
Contact Information	10.65	4.52	15.41	5.97
Average of All Means	**15.72**		**18.98**	

Discussion

The results of the study provide important insights into how graduate students and undergraduate students differ in their management preferences of privacy settings in online learning environments; however, no significant differences were found between gender and age.

While previous research suggests that gender can determine the extent to which a student will disclose private information (Barak & Gluck-Ofri, 2007; Petronio, 2002), the current study, as highlighted by Fogel and Nehmad (2009), found that gender was not a discriminating factor for self-disclosure preference. Research in the area of psychology has suggested that females perceive more positive benefits related to information disclosure when compared to males (Petronio & Martin, 1986), but recent literature in online privacy preferences does not necessarily support this implication (Acquisti & Gross, 2006). The current study found that male and female students demonstrate relatively similar information disclosure preferences, suggesting that both genders balance privacy concerns with information disclosure preferences in a comparable manner. It should be noted, however, that the majority of the study's participants were female (78.25%), which may have influenced the results.

Recent literature has also shown that younger students tend to be less concerned with privacy when compared to older students (Tufekci, 2008) and has proven that the amount of self-disclosure is diminished as age increases (Kisilevich, Ang, & Last, 2011; Nosko, Wood, & Molema, 2009). This study's findings, however, showed no preference difference between the three age groups (18-25; 26-39; 40 and over). Research focusing on age and information disclosure habits often show that younger participants are more willing than older participants to place less value on personal information, such as political views and sexual orientation (Stutzman, 2006); yet, the current study surveyed students within similar educational settings, and focused on less personal, identifying information, such as personal photos.

The current study's findings suggest a significant relationship between degree type and information disclosure preferences: Graduates students were more willing than undergraduate students to share specific categories of information (personal, appearance, work, education, course, and contact information), particularly work and contact information. In line with CPM, undergraduate students, who possess less relevant and incomplete work and contact information profiles, may feel these categories do not fall in line with the rules and boundaries for acceptable information-sharing habits (Petronio, 2002). In light of findings highlighted by Gross and Aquisti (2005), participants' perceptions of the benefits associated with information disclosure determine the online privacy behavior. CPM posits that students weigh the risks of disclosing particular information in an online environment such that the lower the perceived risk the more likely they will disclose information. These findings suggest that graduate students are more willing than undergraduate students to favor personal connections over privacy needs.

When looking at the different groups of users (teachers, classmates, group members, friends, and TAs), graduate students were also more willing than undergraduate students to share information with teachers, classmates, group members, and TAs. While this study did not examine motivation factors in relation to privacy concerns, the literature indicates that graduate students exhibit stronger intrinsic motivation than undergraduate students (Rovai, Ponton, Wighting, & Baker, 2007); as self-motivated learners have a desire to make interpersonal connections and assimilate their personality according to their surroundings (Gagne & Deci, 2005), graduate students are likely to disclose more information to a diverse set of users in order to reach a higher level of social learning. These findings again show a trend for graduate students to relinquish a certain level of privacy in return for reaching a higher level of social learning.

In support of CPM, these two major findings reveal that graduate students, who are often recognized as more self-motivated learners, prioritized their desire to make personal connections over

their need to maintain privacy boundaries. This behavior shows that students, including both undergraduate and graduate students, consider privacy when presenting themselves in online environments, but actively set rules and boundaries according to their desire to actively participate in a social learning environment. As social learning plays an important role in the success of an online learning environment (Huang, 2002), these findings suggest that instructors and practitioners need to be cautious of privacy boundaries when attempting to conduct social learning activities. By employing technology such as communication privacy and disclosure management systems (see Heo, 2011), instructors may provide environments where online students actively configure privacy settings based on information type and group (teachers, classmates, etc.), giving students more control over individual privacy boundaries.

Limitations

While the results provide insights for online learners' social behavior and information disclosure preferences, a few limitations need to be noted. First, the study was based upon the self-reported views and preferences from an online questionnaire without observation of actual behaviors of online learners. Since there often exists discrepancy between stated preferences and actual behavior of privacy among online users (giving away more information about themselves than their stated preferences) (Berendt, Günther, & Spiekermann, 2005), online learners' actual information disclosing behavior could differ from what was reported in this study. Future in-depth studies using methods of observation is recommended to further extend our understanding of online learners' information sharing preferences and actual practices.

Second, the analysis was made based upon the demographic information provided by the participants. Personal motivation and learning styles, which were outside the scope of the current study, may provide another point of view regarding students' willingness and unwillingness to disclose information. Examining learners' personal information may supplement the findings of the current study and possibly reveal learning styles that could explain individual motivation for certain social behaviors.

Finally, the various groups, including teachers, classmates, group members, friends, and TAs, were classified according to their academic and/or professional position. This study's findings indicate that graduate students were more willing to disclose information to all of the groups with the exception of the friends group. The results may provide a different perspective if research were to focus on whether the students understand the roles of these particular groups (teachers, classmates, etc.) and if there is a perceived benefit in the relationship according to the student. Perhaps examining the learners' perceptions of their already established relationships could provide additional insight into information disclosure behavior.

Conclusions

Using CPM as a theoretical framework, the study originally assessed age, gender, and the degree program as indicators of information-sharing preferences. Results revealed that among the categories of demographics examined, degree program is the only predictor of information disclosure preferences. The results showed that graduate students were significantly more likely than undergraduate students to share information with many different groups, including teachers, classmates, group-members, and the TA group. In addition, graduate students were more likely than undergraduate students to share all categories of information, especially work-related information and contact information.

While this study focused on privacy preferences, future studies may benefit from studying motivations that support information disclosure habits. In support of CPM, we speculate that different levels of learners have various motivations for disclosing information to certain groups of people.

For example, graduate students may perceive developing relationships with their professors, fellow classmates and TAs as beneficial. Therefore, future research can examine online learners' perceived relationship with different groups of users to confirm their motivations for revealing otherwise private information. Future research could also compare the amount of information the learner actually holds with the amount of information that is disclosed. These findings could reveal whether the learner is withholding information that actually exists or if they are simply not disclosing because there is minimal information to reveal.

Finally, future research may link information disclosure habits with students' perceived social presence in online learning environments. The Social Presence Theory (SPT), which suggests that communication is directly associated with the level at which people feel socially aware of each other (Richardson & Swan, 2003), may help future researchers further explore the importance of students' information disclosure habits. Students' perceived level of learning in online learning environments has been shown to directly correlate with their perceived level of social interaction (Richardson & Swan, 2003). Such results indicate that students who are more actively engaged in online learning environments, and who are able to make connections with other students, tend to succeed in online courses (Richardson & Swan, 2003). Future research may further explain online learners' willingness or unwillingness to disclose information by identifying particular perceptions of learners and whether these perceptions are connected to learners' motivational needs and online social presence.

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Increasing Critical Thinking in Web-Based Graduate Management Courses

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Abstract

A common approach for demonstrating learning in online classrooms is through submittal of research essays of a discussion topic followed by classroom participation. Issues arose at an online campus of a university regarding the originality and quality of critical thinking in the original submittals. Achievement of new course objectives oriented to demonstrating synthesis and analysis were being impacted by questions which typically resulted in paraphrased reports from the course text, websites and articles. This research study posited that conscientiously revising the types of questions, developing writing skills within the course, and utilizing rubrics which rewarded original content (the guidelines) could increase the original content within submittals.

A mixed-methods approach was used. The experience of taking a combo Accounting/Operations Management Course for IT Majors was defined as the phenomenological case study. A section with the existing questions provided an 'as is' basis for content analysis. Changes to the course were developed by a panel of senior faculty and implemented in a pilot section of the course. The impact of the changes on the pilot section was measured using content analysis.

There were varied improvements in the pilot course. While all Discussion Question (DQs) had increased original content, they were not equally improved. Further analysis revealed that ongoing content analysis and writing skills training would continue to improve results.

Keywords: Critical Thinking, Discussion Questions, Online Learning, Graduate Online Management Education, Online MBA, Bloom Taxonomy in Management Courses, Delphi approach.

Introduction

In recent years online learning has become an accepted approach to earn a graduate degree in business. As a result many graduate business programs have emerged with different online teaching paradigms. Several UK schools, including Open University and University of Liverpool, represented at the 2013 European Distance Education Network (EDEN) Conference (www.eden.com), have offerings that are accredited and recognized as having the same rigor as

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traditional education. Each year more traditional universities are adding online programs using a variety of educational paradigms.

A United Kingdom based online graduate program (The University) uses weekly asynchronous discussions triggered by learner responses to discussion questions as one of their primary methods for online learning (Du, Yu, & Olinzock, 2011). Discussions are used in every online course taught for the graduate business and information technology programs. Each week, the course faculty will assign Discussion Questions (DQs) from an available list of questions for that week. Students asynchronously post answers to these questions in a weekly discussion area of the online classroom by a stated 'due by' date. These posts are accessed by all the students taking the class to read and reply to as part of the participation requirements. The intent is for the students to demonstrate learning from both developing the original essays and by entering into an exchange of ideas asynchronously for the remainder of the week.

Students are graded for the initial answers to the Discussion Questions as well as separately for the quality of their participation in the discussion between students. Students must make a number of follow-on posts (the minimum number varies between programmes) and their comments must add positively and significantly to the classroom discussion (Choi, Land, & Turgeon, 2007). However, some research studies have shown that students are not always effective at engaging in critical discussions (Levy & Ellis, 2006; Strang, 2010). The authors particularly experienced this problem in an Accounting and Operations Management Course for Information System Management Majors. Additionally, because the students tended to answer the questions by reporting what the text or other authors said, the majority of the content was unoriginal and often also incorrectly cited.

The question was raised as to whether there was anything faculty could do in their courses to decrease the volume of unoriginal content and increase the portions of the original essays that reflected the students' own experience and illustrated their ability to think critically. During workshop discussions at an annual conference at the University of Liverpool, faculty identified several potential reasons that could explain the problems discussed. For instance, some students are admitted to graduate studies based on their previous professional experience or technical education but they might not have had any courses which developed English composition and critical thinking skills. Land (2000) found that enrolled students are often limited in prior subject matter coverage. Some students may have learned within their culture not to question authority, indeed, that repeating what an authority has said in their own words and without citation is honoring that authority.

An opportunity to research the issues arose when the UK University (The University) reviewed all courses to ensure that the course objectives implemented the use of the Bloom's Higher Order Thinking (Choi et al., 2007; Du et al., 2011; Ward, 2011). This happened as part of refining all Masters of Business and Masters of Information Systems by using verbs that are associated with Bloom's Level 4, 5 and 6 higher order thinking to optimally meet accreditation requirements. The new objectives required learners to demonstrate the ability to go beyond reporting what others have said (level 1, 2 and 3) and rather analyze each of the elements identified in the course objectives and synthesize findings. In order to achieve the new objectives the discussion questions (DQs) needed to require the use of Bloom's level 4 through level 6 thinking. The researchers noted that the current questions did not require the students to exhibit analytical thinking. They further noted that the students were not currently demonstrating the thinking and writing skills to achieve the objectives.

Several faculty members reported that, in some courses, the discussion questions did not always align with the updated objectives. During preliminary research it was agreed that simply changing the questions would not necessarily result in responses which included analysis or synthesis. A

research project was sponsored to enhance the achievement of learning objectives and critical thinking in online class forum asynchronous discussions. Prior research (Dennen & Wieland, 2008; Guldberg & Pilkington, 2006) has shown that the success in achieving learning outcomes is impacted by the type of discussion questions developed for a course. The researchers posited that the current questions did not require the students to exhibit analytical thinking. They further suggested that the students did not have the thinking and writing skills to achieve the objectives. The study therefore intended to answer the following research question: Can the DQ process from design through implementation and grading be improved to increase the achievement of learning objectives and critical thinking in online class forum asynchronous?

Literature Review

The importance of class discussion dates back as far as Kolb's study in 1984 (Andresen, 2009) when the process was identified as critically important to learning. The goal of the two weekly DQs and reply participation is to stimulate critical thinking and to demonstrate the achievement of learning objectives. According to Webb, Jones, Barker, and van Schaik (2004) student achievement of learning outcomes was significantly related to student participation in discussions via original discussion question submittals and replies. Higher levels of substantive participation correlated to higher grades on course exams.

Critical Thinking

Not all thinking is 'critical thinking.' A review of some university websites revealed different views amongst faculty as to their interpretation of a discussion question that requires critical thinking. A syllabus of the University of Dayton (2013) relates it to having a hypothesis that is analyzed and evaluated as opposed to who, what, or how questions providing only a summary or a definition. Similarly, a course of the University of Michigan (2013) takes the position that definitions and questions asking for facts are not critical thinking. Their position is that critical thinking questions require reasoning and should also take implications and consequences into consideration. The Salt Lake Community College (2013) takes a different approach and provides a table of example questions with a hierarchy of rankings similar to Bloom's Higher Order Thinking (see Bloom's levels in Table 1).

On the contrary, Porter (2002), in his text, did not actually provide a definition of critical thinking but opened with an example of a dyad discussion in which each person had a position and they provided reasons to justify their position. A more recent text by Moore and Parker (2011) also opened with an example but provided no precise definition. All of these do establish that critical thinking is dependent upon the bases of the reasoning of the person justifying his or her position. Along the same mode of thinking Tittle (2011) builds a definition based upon Critical Thinking being judicious reasoning. She further stipulates that being judicious means being deliberate and thorough and hence it cannot just be something you have looked up. She argues that it involves comparing and contrasting and noting similarities and differences and also includes examining and evaluating. Critical Thinking requires setting up an argument that can be analyzed with inductive or deductive reasoning when writing and analyzing an argument deductively and inductively when reading (Tittle, 2011). She identifies Richard Paul as the 'guru' of critical thinking. Richard Paul notes, "Most people are not in charge of their ideas and thinking. Most of their ideas have come in to their minds without them having thought about it. They unconsciously pick up what the people around them think. They unconsciously pick up what is on television or in the movies. They unconsciously absorb ideas from the family they were raised in" (Paul & Elder 2013).

Richard Paul, a noteworthy source for understanding what critical thinking is and what it is not and credited with a root definition for academic study of critical thinking, as from 1987 concurs

that “Critical thinking is the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information..." (Paul & Elder 2013). Richard Paul is a fellow of the Critical Thinking Community (CTC). The site of the CTC (http://www.criticalthinking.org) provides a more up-to-date definition with, “Critical thinking is that mode of thinking — about any subject, content, or problem — in which the thinker improves the quality of his or her thinking by skillfully analyzing, assessing, and reconstructing it” (Critical Thinking Community, 2013). In their most recent book, Paul and Elder (2013) refer to people being in stages of development of their thinking skills: unreflective, challenged, beginning, and practicing.

The two elements of these descriptions that align with this research study are the concepts of differentiating between deductive and inductive reasoning as highlighted by Tittle (2011) along with the ability to do so being developed over time as argued by Paul and Elder (2013) with their stages of development for thinking skills. The students at The University have not had prior courses in their undergraduate studies which required them to develop critical thinking writing skills. During our research it was revealed that several faculty members did not feel they had received solid training in critical thinking writing. Indeed, one faculty member was using a sample essay which was almost all paraphrased content on the basis that it was less than 30% quoted content. This essay was largely a report of the thinking of others and contained no reasoning by the student. During discussions with other faculty one faculty member posited that students did not earn the right to question authors’ arguments/reasoning/claims until they had earned doctoral degrees. In discussions it was therefore agreed that The University aligns with Paul and Elder's (2013) beginning stage of critical thinking.

In prior courses with The University the both authors’ experience was that students predominantly utilized deductive reasoning as a result of their responses coming from what they believed to be valid sources. The result was that the majority of content was quoted, represented a modified quote or was paraphrased which aligns with Bloom's level 1 and 2 thinking (See Table 1). Inductive thinking (Tittle, 2011) aligns with a combination of all of Bloom's levels of thinking building from the deductive elements to the inductive elements. The goal of the case study was to develop a process whereby students would be challenged, trained, and graded based upon increasing the percentage of inductive reasoning in their initial discussion submittals. Recognizing the student's habit of reporting, it was determined that to achieve the goal it would be important to avoid 'who, what, when, where' questions that would tend to be answered by reporting sources that gave specific answers to those questions. The authors determined that questions that called for comparative analysis of the students’ experience with the text and research along with training would be more likely to achieve inductive reasoning.

Facilitated Discussions

The University Online Campus is based upon a facilitative learning model in which the faculty is responsible for stimulating students to increase their learning through critical thinking discussions (Gorsky & Blau, 2009; Winsted, 2010). The DQ instructions typically included a length range in words rather than paragraphs and did not reiterate or emphasize the requirement to support responses with citations and references. However, being specific in the instructions has been supported in prior studies. Andresen’s (2009) review of prior literature reports Guldberg and Pilkington’s 2007 findings that “simply forming an asynchronous discussion forum, providing the technology and a question or topic of discussion is not enough to ensure success in an asynchronous discussion.” Other research has shown that not all courses are appropriate for the same type of discussions. According to Andresen (2009), at least two studies found that problem-based courses could have DQs related to ideas and concepts and not for actual problem solving. This correlates to the concept that DQs need to have ‘no right answer.’

In some courses students are learning new concepts at the 'how' and 'what' level. In those cases it is the faculty member's goal to have the students find information that is new to them and report what they have found or how something is done. It is important to establish that these are reports rather than critical thinking DQs and correlate them to course objectives that do not ask for synthesis or analysis. Some courses are especially suited to the use of case studies with DQs which require critically thinking about the case. Because there are different 'types' of DQs, the development of each course's options for DQs and the process for DQ selection each week must consciously include the establishing and balancing of the required effort for the DQ type while increasing the percentage of original thinking in critical thinking DQs.

In the light of prior research regarding the benefits of online discussion, Dennen and Wieland (2008) posited that task type would significantly impact the levels of interaction and results. In prior research Dennen and Wieland (2008) found that "when students were asked to discuss topics clearly related to assessments or that encouraged them to share their own experiences they were more likely to contribute than when asked to participate in more generic discussion tasks with unspecified outcomes" (p. 110). In their study Wolff and Dosdall (2010) used discussion questions which were "intended to be provocative and no 'correct' answers were assumed to exist" (p. 57). This differentiation in typing may have significantly contributed to their results demonstrating that such questions and their resulting participation do have a significant impact on learning outcomes. As a result, it is important to have course DQ development processes which include conscious selection of DQ type. It is critically important to have discussion questions which are related to the course readings (Andresen, 2009; Wolff & Dosdall, 2010)

Gilbert and Dabbach (as cited in Bradley, Thom, Hayes, & Hay, 2008) categorized discussion questions by the type of instruction provided which results in the ranking in Bloom's order for the response (See Table 1). In essence, if a student is asked 'how' to do something. an appropriate response from the student is to find a reputable source that says 'how to' and submit his or her answer with very little original content. This 'how' response was ranked as a Bloom's level 1 out of 6 if it is a quote (or modified quote) of the course readings or a level 2 out of 6 if it is a personal interpretation of an article in the student's own words (paraphrase; requires citation). We did code quote/modified quote as level 1 and paraphrases as level 2.

In alignment with The Universities policy that critical thinking essays be a maximum of 30% quoted material, our goal was to achieve less than 30% quoted or paraphrased content. We did want to have quoted and/or paraphrased content as support for the students' thinking so any lower goal would not have accurately reflected the balanced writing we sought to achieve. While they included assessing whether the essay was on or off-topic, our goal was to simply examine the extent to which the content was unoriginal (quote, modified quote, or paraphrase) or original (personal experience or critical thinking in synthesis or analysis). Our resulting table is Table 1.

Table 1: Coding Scheme

Code	Description	Bloom's Level	Gilbert and Dabbach
1	Exact/Modified Quote	1	1
2	Paraphrase	2	2
3	Prior Knowledge	2	3
4	Experience	3	4
5	Analysis	4	5 & 6
6	Synthesis	5,6	5 & 6

Based on the gaps in the literature identified in the literature review section and the online campus of the University of Liverpool's need to increase the Bloom's higher order of thinking for the online discussions of the modules that it offers, the researchers hypothesized that:

> H_1: Using discussion questions based upon Bloom's higher order thinking to achieve the weekly objective would increase the percentage of critical thinking in the original response essay.
>
> H_2: Providing critical writing training within the course in announcements and rubrics would increase the percentage of critical thinking in the original response essay.

Research Methodology

The research was authorized to focus upon a course which was based upon four (4) weeks of Financial Management studies and four (4) weeks of Operations Management studies for Information Systems Management Masters students in a comparative analysis of an existing (original) section and a pilot section. Before the guidelines were developed and implemented, data was collected from the DQs submissions for the selected existing course for weeks 2, 4, and 7 in order to create an 'as is' state content analysis (See Table 2). Content analysis was performed on the DQ original responses. Based upon the experience of the authors in discussions with other experienced faculty, discussion questions were developed which both authors' believed would require a significant percentage of the content to be inductive reasoning in essay format. Because students needed training in essay writing and comparative analysis, the authors collaborated with other experienced faculty of The University to develop writing training, rubrics, and feedback that encouraged comparative analysis essays. This was initiated with informal discussions prior to the research project and completed in three review sessions prior to the pilot section of the course.

Comparative Case Study

A case study methodology was chosen to emphasize and explore factors, which may lead to directions for the answers to the research question (Benbasat, Goldstein, & Mead, 1987). Case study based research is an exploratory research technique that investigates a contemporary phenomenon within its real-life context (Yin 1994). Soy (1996) proposed a number of steps that can be used to successfully conduct the case study research. These steps include the definition of the research objective, the selection of the case to be studied, the determination of the methods for data gathering, and the case study analysis techniques. Thereafter, the case study data can be collected and analyzed, and the findings can be summarized in a report (Soy 1996).

As mentioned in the introduction section of this article, the case selected was a course for Information Systems Management majors (ISM masters students) within an online campus affiliated with a United Kingdom university (the University). The course topic was split between 4 weeks for each topic. The first four weeks focused on Accounting/Finance and the next four weeks focused on Operations Management. Online ISM masters students at the University are typically mid-career professionals, generally in their 30s, in the information technology fields with students from all over the world but a higher concentration of African continent students. The classes are predominantly male, but with some females in all sections. While the students will have had some budgeting experience in the management of projects, they typically consider the course topics to be unrelated to their careers.

The University provides an online classroom with the same course materials for every section of the course each term. In this case the same course materials were provided for both the original section and the pilot section. The original section selected was chosen because the faculty person teaching the section made no changes to the course. The DQs and rubrics were used as provided for the course. In addition, it also had a female faculty. The pilot course had the same materials

provided. The difference was that the DQs were changed to questions that were posited to increase the percentage of level 4 through 6 that require from the student to express experience, analysis, and synthesis, as shown in Table 1. In addition, during the first four weeks of the course, training was provided in writing skills, and revised rubrics and feedback were used that emphasized the importance of using an increased percentage of original content from the students' own experience and demonstrating critical thinking in the analysis and synthesis.

The case study focused on the lived experience of students in initial discussion question submittals for weeks 2, 4, and 7 in a comparative analysis of a section using the original discussion questions and course materials and a pilot section using the revised discussion questions, writing trainings, rubrics, and feedback. The weeks were selected with specific intent. Week 1 was not selected because students would not have had sufficient time to adjust to the new course and faculty nor would they have had any feedback yet. Week 2 performance demonstrates which students adjust quickly and/or may have had prior experience in critical thinking essays. By week 4 students in the pilot section have had 4 weeks with the revised types of questions, expectations set in trainings, rubrics, and feedback. It is posited that those who will quickly adapt or have prior experience will have adapted by week 4. Week 7 demonstrates that some of those students who had not yet adapted by week 4 would adapt over more time, or not adapt at all.

The research study used content analysis as the main methodology to perform the comparative analysis of the DQs. Before the revised course contents were finalized, a section of the Resource Management course was selected to test the original DQs and data was collected and analyzed by using content analysis. Online class discussions were updated by using new designed DQs. After the DQs were updated, a pilot term DQ post submittals for weeks 2, 4, and 7 were analyzed for their DQ type, originality/composition, balance of critical thinking/citations, and experience. A qualitative and quantitative comparative analysis between the essays for weeks 2, 4, and 7 in a section prior to the new DQs was performed. The result of the analysis was used to improve the Guidelines used to prepare DQs, and the improvements were validated by using the Delphi method (Loo, 2002).

Faculty with extensive backgrounds in online teaching and over two years experience with The University who participated in a preliminary webinar and a discussion during an annual faculty conference were invited to participate in reviews of the materials developed for the pilot section (the guidelines). Six faculty representing the Computing, Business and Law programs (the panel) accepted the invitation and participated in each of the Skype and Email sessions.

Discussion Question Development

The primary researcher has prior experience teaching critical thinking together with course design experience and training with the ADDIE methodology (Lohr, 1998; Van Rooij, 2010; Way, 2012). This model takes a developmental approach to the design of a course which builds each assignment and discussion upon the course objective that the student's submittals demonstrate as being achieved. A review of the format of current DQs revealed that the questions that were in use generally oriented to 'how' or 'what' answers. When a DQ is a 'what' question, it can result in an attempt to produce a conversation ending with a 'correct' answer (Wolff & Dosdall, 2010). Winsted (2010) suggests that creating a debate environment for the classroom discussions increases student engagement and stimulates critical thinking. Amanda Cooley (2009) also creates a form of a debate for her course. She notes that it is important to have such discussions because "Business students benefit from as much exposure to best communication practices as possible" (p.437). Upon this basis and pre-grant faculty workshop discussions, an initial draft of the guidelines, including a DQ development process, was developed utilizing the ADDIE model. The guidelines were reviewed by the panel who provided suggestions for improvement and samples

from their courses in a sequence of reviews and improvements. While the panel agreed that courses would benefit from a variety of discussion types – 1) Single concept short DQ essay; 2) Multiple concept longer DQ essay; 3) Case study; and 4) Use of the prior week's hand-in assignment) – the pilot course limited the type of discussion to those that would be close to the original question with the exception of being applicable to the student's career experience and challenging the student to use inductive reasoning.

Writing Quality Development

The panel agreed that critical thinking essay writing requires composition skills. They noted that it is currently assumed that students are trained in critical thinking essay writing. However an informal review of 210 essays during the 2009/2010 school year indicated that this is not a valid assumption. During the international faculty workshop it was identified that many students come into the program with educational backgrounds that have not included training in writing or critical thinking. The panel concluded that courses that include DQs requiring critical thinking need to include instructions that demonstrate how to write in a style that is primarily critical thinking rather than reporting the ideas of others. It was agreed that DQs should include a requirement to apply the topic to the student's life experience. As Porter (2002) cites Socrates, "The unexamined life is not worth living." Additionally, this focus and self-application is part of the Socratic Method. Including the experiential component also increases the breadth of application. Requiring application can show the class all the variations that apply to their various careers and countries.

During each session members provided suggestions for improvement and feedback. These included the realization that not all students or faculty have prior education in critical thinking writing. The panel also pointed out that some cultures expressly teach to only present ideas of published authors, often without credit, and to not disagree with their faculty but to only restate what has been taught. Most have not been taught the structure of an essay. Business writing is not done in critical thinking essay format but in conclusive paragraphs.

The need for writing tutorials was confirmed as faculty shared that not all students participated in undergraduate programs which required academic research or writing, especially in English grammar. Many students with technical undergraduate degrees participated in programmes which were focused on the technical elements. Faculty who were former students of such programs were also accustomed to reporting rather than critical essay writing.

When a discussion question instruction included 'an essay', it was agreed that it could not be assumed that students knew that an essay is structured with at least three paragraphs or that a paragraph is at least three sentences. It could not be assumed that they knew that all facts, figures, and definitions must come from a source that is cited and that changing a few words did not change a quote to a paraphrase as the student was to write in their own words from notes. It was agreed that providing a writing tutorial once would not be sufficient to develop a habit of academic writing. On the other hand, providing the same writing tutorial in each course would soon be ignored. It was agreed that the guidelines should include samples but that the course author should customize tutorials for each course. The panel reviewed and refined samples of writing trainings to be provided during the first four weeks of each course.

Rubrics and grading provide students an incentive to post timely and high quality discussion essays followed by robust participation (Andresen, 2009). Clear expectations and clear guidelines for grading provide consistency across different sections of the same course. That is not to say that all courses ought to have the same rubric. Rather, the DQ Development Process needs to support the creation of course specific rubrics that align with the DQs which align with the Learn-

ing Objectives but with the same standards of excellence across all courses. The panel members provided and agreed upon samples for rubrics for each of the agreed upon DQ types.

In the next term, the DQs, trainings, and rubrics were implemented. After the course, content analysis data was collected for weeks 2, 4, and 7. The same content analysis was conducted on the pilot course as had been collected on the prior term in order to measure originality/composition and balance of critical thinking/citations and experience. The summary of the research methodologies used are depicted in Figure 1.

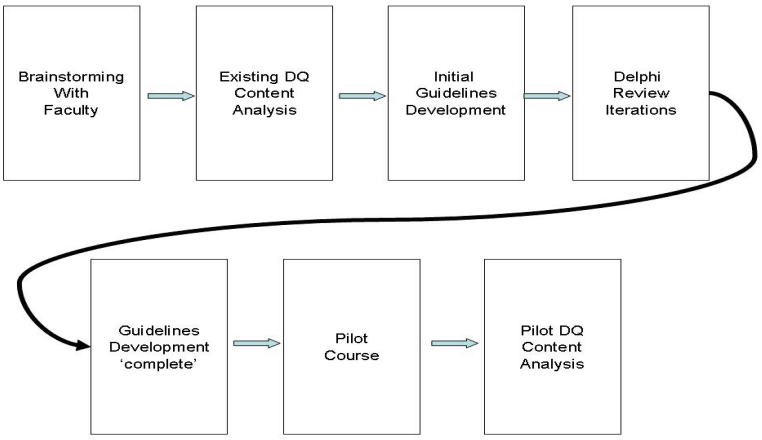

Figure 1. The Research Process Flow

Results and Analysis

A comparative analysis was performed of the original section of the course and the pilot section of the course. Data was collected for the submissions to the original DQs for the case study analyzed for weeks 2, 4, and 7. Content analysis was performed over the collected data and results summarized in Table 2. For each DQ, the percentage reached at each level was calculated based on the coding technique discussed in the methodology section. We were not concerned with how much of the 30% was quoted or paraphrased, so the data was captured as levels 1 - 3 individually, but analyzed together.

The following discussion questions were used in the original course design:

> Week 2 DQ 1: List and describe three accounting and finance features for limited companies? How is accounting and financial reporting regulated in your country? (Chapter 4)
>
> Week 2 DQ 2: What information does a cash flow statement provide? Using a self-created example, explain the direct and indirect methods for calculating cash flows from operations activities. (Chapter 5)
>
> Week 4 DQ 1: List and describe the four main investment appraisal methods. Which one is the best method to evaluate a risky investment and why? (Chapter 10)
>
> Week 4 DQ 2: What are the sources of finance for a limited company? Describe the advantages and disadvantages of using debt. (Chapter 12)
>
> Week 7 DQ 1: What roles do operations managers play in addressing the major aspects of service quality?
>
> Week 7 DQ 2: Explain how higher quality can lead to lower costs.

Table 2: Content Analysis for original DQs				
Week DQ#	**Level 1-3**	**Level 4**	**Level 5-6**	**Level 4 - 6**
Week 2 DQ 1	81.89%	11.26%	6.72%	17.98%
Week 2 DQ 2	47.99%	40.69%	11.92%	52.61%
Week 4 DQ 1	81.81%	0.00%	18.21%	18.21%
Week 4 DQ 2	100.00%	0.00%	0.00%	0.00%
Week 7 DQ 1	85.76%	2.90%	11.34%	14.24%
Week 7 DQ 2	76.51%	2.14%	21.35%	23.49%

New DQs were designed using the proposed guidelines and the pilot course was updated with these new DQs:

> Week 2 DQ 1: If you had to select one, which financial ratio category (profitability, efficiency, liquidity, gearing, or investment) do you think is most useful for ISM project managers? Why?
>
> Week 2 DQ 2: Why do international business managers need to be sensitive to account and financial reporting regulations in your country?
>
> Week 4 DQ 1: ROCE measures return on assets after the fact. ARR measures potential returns. Why might a finance department be quizzing the proposal manager (PM) about the ARR? And more importantly, why is it important that the PM give a reasonable ARR?
>
> Week 4 DQ 2: Under what conditions will a company change its payment terms? Why? Limit the breadth of your essay to what you think are the top two reasons in order to have enough depth in your answer.
>
> Week 7 DQ 1: Take a solid position for good or bad: Why is it good or bad to operate an IT support services system (help desk) on a strictly, first-come, first-served basis?
>
> Week 7 DQ 2: Take a solid position: Why and which seasonal period(s) might an IT support services system (help desk) need to be aware of? Limit yourself to one type of seasonal period that applies.

Data was collected for weeks 2, 4, and 7 and analyzed by using content analysis and results are summarized in Table 3. The following example is provided for the Week 4 DQ2. In the original section one student's response was broken down as 529 words total with 529 words being quoted or paraphrased. None of the responses to the original Week 4 DQ2 had any analysis or synthesis. The TurnItIn report found 11% matched content. This aligns to students potentially following instructions not to use their own experience. In a personal conversation this week in the most recent revised section of the course, when asked why the student was not following the DQ instructions, training, and feedback, a student advised that, "it was clearly mentioned by other Instructor ... purely paraphrase many papers with many citation to write a good academic paper. One instructor told us that we can't post any idea or personal comment without having citation, which is probably why I'm still in the citation/descriptive mode."

In the pilot section one student's response to Week 4 DQ2 was broken down as 602 words with 252 words which were quotes, modified quotes, or paraphrases (level 1 -3) and 0 words experiences and 353 words which were analysis and synthesis (level 5 -6). The TurnItIn report found

0% matched content. This was the highest percentage of analysis and synthesis amongst the pilot students, but all students did include more analysis and synthesis than the original section.

Table 3: Content Analysis for original DQs

Week DQ#	Level 1-3	Level 4	Level 5-6	Level 4 - 6
Week 2 DQ 1	56.26%	16.26%	27.60%	43.86%
Week 2 DQ 2	61.41%	18.88%	19.52%	38.39%
Week 4 DQ 1	51.80%	8.00%	39.36%	47.36%
Week 4 DQ 2	50.24%	14.60%	35.17%	49.77%
Week 7 DQ 1	22.97%	22.17%	43.10%	65.27%
Week 7 DQ 2	27.81%	24.88%	29.66%	54.54%

The original course DQ served as a baseline for the study. Preliminary results demonstrated that the level of critical thinking significantly improved from week 2 to week 7 according to Figure 2. For week 2, DQs 1 and 2 scored 6.72% and 11.92% respectively for levels 5-6; for the same week after the update with the new DQs was performed, DQs 1 and 2 scored 27.6% and 19.52% showing a considerable improvement in terms of critical thinking. For week 4, DQs 1 and 2 originally scored 18.21% and 0%. For the same week after the update, DQs 1 and 2 scored 39.26% and 35.17% showing again a considerable improvement. Week 7 showed also improvement from 11.34% to 43.10% for DQ1 and from 21.35% to 29.66 for DQ2.

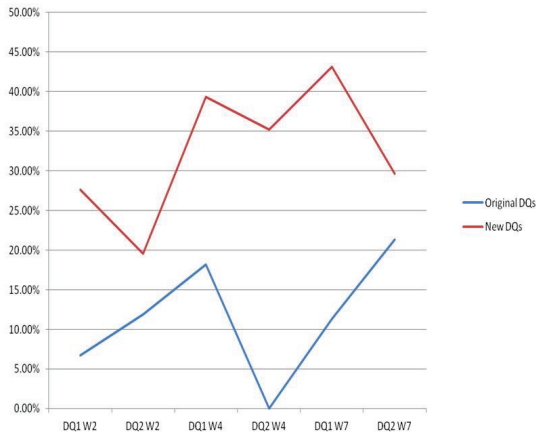

Figure 2. Comparative Analysis of DQ Content

The mean values of the Bloom's taxonomy levels 5-6 for the original DQs and new DQs were compared to check if there was an improvement in the achievement of learning objectives and critical thinking in online class forum asynchronous. The mean values were tested using the t-Student test, and the t-values were calculated by using the following formula:

$$t\text{-value} = (\text{Mean of post-test} - \text{Mean of pre-test}) / \sqrt{(\text{Variance of post-test} / \text{Sample size of post-test} + \text{Variance of pre-test} / \text{Sample size of pre-test})}$$

The Alpha level used was 0.05 of one tail test; the sample size is 9, the degree of freedom = sample size of original DQs + sample size of new DQs – 2 = 16. According t-distribution significance table, the critical value is 1.746 for one tail test. As shown in Table 4, as far as the Null Hypothesis is concerned, there is no difference between the original DQs and new DQs sample means for the Bloom's taxonomy levels 5-6.

Table 4. Null Hypothesis of the difference of means

	Mean	Standard Deviation	Mean	Standard Deviation	t-value	p-value	
DQ1 Week 2	6.72%	10.14%	27.60%	26.57%	2.202	0.0213	Reject
DQ2 Week 2	11.92%	11.99%	19.52%	18.67%	1.028	0.1596	Accept
DQ1 Week 4	18.21%	9.20%	39.36%	23.79%	2.488	0.0121	Reject
DQ2 Week 4	0.00%	0.00%	35.17%	19.47%	5.420	0	Reject
DQ1 Week 7	11.34%	17.31%	43.10%	25.19%	3.118	0.0033	Reject
DQ2 Week 7	21.35%	22.21%	29.66%	25.10%	0.744	0.2338	Accept

The hypothesis for DQ2 for week 2 and DQ2 for week 7 were accepted, this means that these were the only two questions that did not show a significant difference of the means. The other 4 questions were rejected; this means that their means showed a significant difference that can be attributed to the implementation of the new guidelines.

Using the above methods two DQs did not show enough difference to be statistically significant. The other DQs did demonstrate the effectiveness of the proposed guidelines. It must be noted that the goal was not to have no level 1 through 3 content but to have a balance of content dependent upon the DQ type with all DQs having increased original critical thinking. Further examination of the questions and responses to the two questions with the least variance revealed that although the question asked the student 'why,' the resulting answers were based upon focusing on reporting definitions or words used in the questions and/or reporting what researched articles provided as the reasons.

Conclusion

The answer to the research question was achieved with the generation of guidelines that are based upon on-going education in critical thinking and writing for both Faculty and Students during the facilitation of courses. The content analysis of the research showed that the guidelines were able to increase the achievement of learning objectives and critical thinking in online class forum asynchronous. It was observed that ongoing content analysis could be used to identify whether any specific DQ was achieving the level of critical thinking intended for that DQ, as may vary by DQ type.

The contribution of the results of this research can benefit the universities, faculty, and students. Students can benefit from being challenged to increase their depth and quality of critical thinking. The ability to question why things happen or if they are true or false are critically important to debate and contribute to the development of executive leadership skills and career advancement into top management positions. Thus the improved discussion activities will enhance the student learning outcomes.

The course designers and faculty can benefit by having tools to assist them in the development and facilitation of effective discussion activities. The templates for writing training will promote more effective essay writing by students, which stimulates more robust participation. The rubrics for discussion activity grading will aid faculty in consistent grading across all sections.

The universities can benefit by having discussion activities which are designed to meet the course learning objectives. This methodology will support any accreditation or other approval or certification processes. The reputation of the university will be enhanced as a result of graduating students with higher levels and depths of critical thinking and communication skills.

Although the research results are beneficial, there are still challenges that need to be addressed. Further research into why some students do not read and reply and others might read but do not begin to comply might lead to methods to increase the depth of learning and application of critical thinking. Additional research into the impact and advantage of an initial Faculty training, as part of faculty development, and a Student readiness course is recommended.

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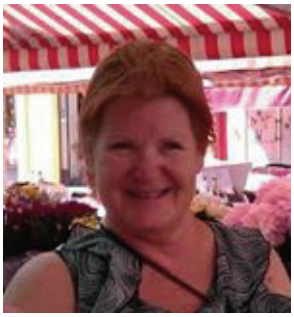

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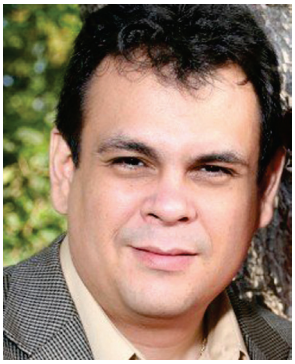

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To Improve the Learning Experience of the First Trimester Undergraduate Students in an Australian University's Offshore Campus: A Knowledge Management Methodology

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Abstract

Due to the successful implementation of knowledge management (KM) in many commercial organizations, KM has been recently extended to higher education institutions (HEIs) to manage scholar knowledge, and institution policies and procedures. To address the lack of insight in regards to the engagement of tertiary students to manage knowledge at a course level, a KM methodology is proposed to allow students to interact with lecturers in and outside large lecture halls to create, disseminate, use and evaluate knowledge.

The proposed methodology provides electronic, telecommunication and manual channels to allow students to ask questions in lectures when they fail to understand any incoming knowledge delivered by academics regardless of time and space constraints. Knowledge developed based on students' questions can further be evaluated and extended using mechanisms to comment and recommend features. In additional, students are able to create new knowledge and to solve problems using incoming knowledge as the methodology which can enhance knowledge understanding throughout the learning process.

The proposed methodology was applied to a business computing course at an undergraduate level, conducted in an offshore campus of an Australian university in the third trimester of 2012. The methodology was evaluated using quantitative analysis. The findings show that the majority of the students agreed the computerized tool incorporated in the methodology (Facebook) could enhance their learning experience by allowing students to ask for, share, discuss and extend knowledge. In particular, the knowledge

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management system provided additional channels and a platform for those who are passive and preferred not to seek help from lecturers directly, due to cultural or other reason.

Keywords: Offshore Campus, Australian university, Knowledge Management, Knowledge Management tools, First Trimester, Tertiary Student, Learning Experience, Knowledge Understanding, Facebook.

Introduction

Knowledge is defined as a justified true belief that is rational, dynamic, humanistic and context-specific and can appear in the form of facts, attitudes, opinions, issues, values, theories, reasons, processes, tools, relationships, risks and probabilities (Coulson-Thomas, 1997; Nonaka, Toyama, & Konno, 2001). Ever since the establishment of the first university by Plato about 2400 years ago, universities and other higher education institutions (HEIs) have played an important role in knowledge transfer for higher education.

Until now, HEIs are still considered as key players in the knowledge business as they are heavily involved in the tasks of knowledge creation and dissemination (Rowley, 2000). However, HEIs are currently facing a number of challenges in which HEIs have to respond to by changing the way they teach, conduct research, and manage institution and its various stakeholders (Cranfield & Taylor, 2008). One of the biggest challenges is the drastic increase of the number of students due to the democratisation and massification of higher education and the continuous demand for knowledge workers in the knowledge economy (Economist, 2005). For example, the Australian Vice-Chancellor's Committee (2002) foresees that more than 60% of Australians will have completed some form of higher education by 2020.

The demands for quality teaching, programs and curriculums are higher than ever as students view education as a commodity to be bought. If a university fails to deliver to student expectations, students can turn to many alternatives such as studying in other local or overseas universities, studying via distance learning and studying in offshore campuses established by overseas universities. To attract and retain students, universities are no longer concentrated solely on traditional research activities but also focused on developing university-wide infrastructure that leads to the improvement of teaching quality.

Unfortunately, public funding for higher education has been tremendously reduced in some countries, thus universities are more reliant on students' tuition fees. For instance, universities including Melbourne, Monash, Adelaide and Sydney in Australia decided to boost their income by accepting more fee-paying local students that have relatively lower scores than those Higher Education Contribution Scheme (HECS)-funded students who only required to pay a part of the tuition (Macnamara, 2007). HEIs now contain a diverse range of students in their lecture halls instead of high performing top-tier students. The pressure of having a large student cohort combined with a decrease of government funding has forced HEIs to put a large number of students together in lecture halls, this is especially true for courses at introductory levels (MacGregor, Cooper, Smith & Robinson, 2000).

Similar to other knowledge-intensive organizations, concepts of knowledge management (KM) have been used to secure competitive advantages in HEIs. Scholar knowledge (such as research findings, journals and conference proceedings), teaching and learning materials (such as lecture slides), and institution policies and procedures are created, categorized and stored in electronic knowledge bases to enable academics, executive and administrative personnel and students to have easy access to the knowledge. This research aims to investigate a KM approach to enhance the learning experience of first year tertiary students in the context of higher education. The KM approach is designed to allow students to interact with lecturers to manage knowledge at course level. The rest of the paper is organized as follows. The next section presents related literature on KM and its application in HEIs, followed by a discussion of the impact of large lecture to first

year tertiary students in HEIs. Research objectives and methods are described and a KM methodology is proposed and a case study is described. This is followed by the evaluation method and research findings and a discussion of research findings, implications and limitations. Finally, conclusion is given.

Background of Knowledge Management

Back in mid 1980s, management tools and techniques such as total quality management, downsizing and business process reengineering had been developed by western companies to aid in regaining market share in automotive and electronic appliance industries which were dominated by Japanese companies (Chase, 1997). However, both input and improvement were short-term, the methods used to develop solutions were generic and easily replicated by rivals (Sharkie, 2003). Once an approach was proven successful, the rival companies would duplicate and adopt the same practice. The practices of downsizing, outsourcing and business process reengineering had resulted in the loss of many experienced employees, along with their expertise and knowledge (Coulson-Thomas, 1997). The practices would further lead to the loss of inspiration and creativity as well as failing to secure a long term competitive advantage (Chase, 1997).

Companies are currently using the concept of KM to sustain long term competitive advantage by preserving organizational knowledge (Turban & Aronson, 2001). Knowledge is recognized as one of the most important management assets because knowledge enables organizations to utilize and develop organizational resources, enhance competitive abilities and develop sustainable competitive advantage (Neumann & Tome, 2011; Plessis, 2007; Sharkie, 2003; Wu & Lee, 2007).

KM seeks to manage and capitalize on knowledge that accumulates in the workplace using appropriate means and technologies (Abdullah, Ibrahim, Atan, Napis, Selamat, Hairudin, & Hamidon, 2008; Martensson, 2000). This is achieved by organizing formal, systematic and direct processes to create, store, retain, evaluate, enhance and increase organizational knowledge for future benefit of the organization (Leung, Lau, & Tsang, 2013; Martensson, 2000; Turban & Aronson, 2001). KM also aims to enhance the quality, content, value and transferability of individual and group knowledge within an organization (Mentzas, Apostolou, Young, & Abecker, 2001). Therefore, KM is capable of sustaining long term competitive advantage. Sharkie (2003) indicates rival company can easily duplicate and imitate the process of KM or even its technology, but it will be very difficult to copy the knowledge and skills which may reside within employees. The spirit of KM encourages organizations to create and use knowledge continuously and also to enable them to take initiative in innovating and enhancing products, services and operations.

In addition, Krogh, Ichijo, and Nonaka (2000) divide knowledge into tacit and explicit. Tacit knowledge (or know-how) is gained through individual insights overtime, is personal, complex and hard to communicate as well as codify as it resides within the person's mind and body in the focus of beliefs, assumptions, behaviours, perceptions, actions, procedures, routines, commitments, ideals, values and emotions (Goh, 2002; Martensson, 2000; Nonaka, Toyama & Konno, 2001). Conversely, explicit knowledge (or know-what) is structured and relatively simple. It can be captured, recorded, documented, codified and shared using formal and systematic language in the forms of manuals, patents, reports, documents, assessments, databases, scientific formulas and other information technology (IT) media.

There are variations among researchers in describing processes of KM. For example, Wiig (1997) divides the process into knowledge building, transforming, organizing, deploying and using, whereas Chait (1999) depicts that the KM process is based on capturing, evaluating, cleansing, storing, providing and using of knowledge. In this research, we adopted the KM process developed by Leung, Lau and Tsang (2013) in which the process is divided into five stages (see Figure 1): create, store, disseminate, use and evaluate knowledge.

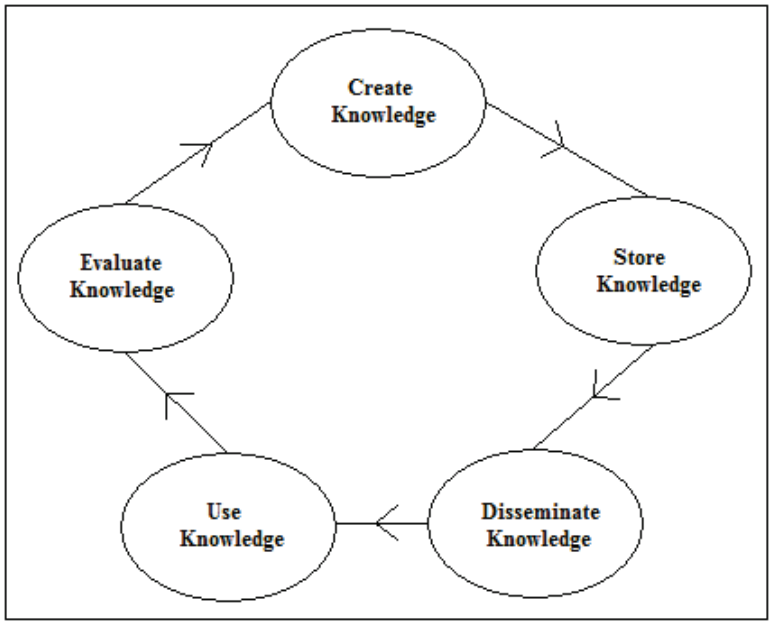

Figure 1: Five stages of knowledge management

Nonaka, Toyama, and Konno (2001) suggest that there are four methods to create organizational knowledge by means of interaction between explicit and tacit knowledge. The first method is socialization. It is the process of developing new tacit knowledge from tacit knowledge embedded within people or organizations through sharing experiences, observation and traditional apprenticeships. The second method is called externalization. This is the process of changing tacit knowledge into new explicit knowledge simply by transforming tacit knowledge in the form of documents such as manuals and reports. The third method is internalization. This is the process of embodying explicit knowledge as tacit knowledge by learning, absorbing and integrating explicit knowledge into an individual's tacit knowledge base. The last is called combination, this is the process of merging and editing "explicit knowledge from multiple sources" into a new set of more comprehensive and systematic explicit knowledge.

The storage and dissemination of knowledge is often linked with technology. Explicit knowledge created is collected and stored in databases or a knowledge base in which users can access the knowledge using "search and retrieve" tools through platforms such as intranets (Abdullah et al., 2008; Alavi & Leidner, 1999; Chen & Xu, 2010; Smith, 2001). The retrieved knowledge can then be used by knowledge workers to add value to current business processes, implement and coordinate organizational strategy, predict trends in the uncertain future, deliver new market values, create new knowledge, solve existing problems and so on (Bailey & Clarke, 2001; Metaxiotis & Psarras, 2006; Richtner & Ahlstrom, 2010). The fifth stage of KM is knowledge evaluation. This phrase eliminates incorrect or outdated knowledge (Alavi & Leidner, 1999). Organization must continue creating new knowledge to replace any knowledge that has become invalid or obsolete (Leung, Lau, & Tsang, 2013).

Application of Knowledge Management In Higher Education Institutions

Other than commercial organizations, practices of KM have recently been extended to higher education industry. A research conducted by Cranfield and Taylor (2008) shows that four out of seven HEIs in UK were engaging in either institutional-wide KM or faculty-wide KM. Rowley

(2000) argues that KM in higher education should focus on four objectives, namely to enhance the knowledge environment, to manage knowledge as an asset, to create knowledge repositories and to improve knowledge access. As most of the HEIs are sizeable in terms of their population, the challenge is to ensure the four KM objectives embrace all HEIs' stakeholders that include faculty members, associated researchers, executive and administrative personnel, and students.

HEIs have started to digitalize strategies, policies, procedures, guidelines, teaching and learning materials as well as research outputs so that they can be stored in electronic repositories. The digitalized materials are made available for stakeholders through intranet/internet. Although HEIs are regarded to be more willing to share knowledge, it may not always be the case. For example, administrators tend not to take initiative to share knowledge unless they are asked (Cranfield & Taylor, 2008). Some academics avoid sharing certain aspects of their knowledge as they consider knowledge as proprietary and a source of differentiation (Ho, Cheng, & Lau, 2008; Ramachandran, Chong & Ismail, 2009) but some of them are more likely to share as the knowledge created and shared can benefit faculty members to advance knowledge cycle which in turn contributes to the good of society (Basu & Sengupta, 2007), and to distinguish HEIs in the academic market place. In addition, academics actively participating in knowledge creation and dissemination may be rewarded in terms of reputation, salary, promotion and opportunities to participate in further research (Rowley, 2000).

Townley (2003) studied more than fifty KM projects and identified seven factors that can lead to the success of a KM project in HEIs: 1) identify KM as a priority by institutional leaders, 2) provide KM training, 3) use existing data source in KM projects, 4) align personal and unit goals with KM projects, 5) adopt knowledge sharing and collaboration as a norm, 6) Coordinate KM when it reaches a critical mass and 7) change organizational philosophy and practice fundamentally. A number of researches have been conducted to investigate how HEIs engaged with managing and collaborating knowledge across various departments and faculties. For example, Kidwell, Linde and Johnson (2000) proposed to apply KM principles to staff at universities by providing intranet portals for financial services, procurement and human resources.

In addition, Omona, van der Weide, and Lubega (2010) developed a KM framework to support knowledge development and transfer in HEIs. These include academic services and learning (such as teaching, learning, research and content development), student life-cycle management (such as management of student recruitment, admission and records), institutional development (such as market research, and management of alumni and academic profile), and enterprise management and support (such as human capital management and operation support). Piccoli, Ahmad and Ives (2000) proposed a conceptual KM model consisting of a research, production and learning engines that can be implemented by teams of faculty members, researchers and students to acquire, generate, codify, store, share and apply scholar knowledge in universities.

Significant efforts have been put to manage scholar knowledge by developing knowledge management systems (KMS) and KM processes in many research-based HEIs. Besides, digital libraries and full-text databases hosted by professional associations (such as Association for Information Systems) and publishers (such as ScienceDirect and Springlink) have been established to allow academics, researchers and scholars to access and download publications gathered from journals, books, magazines, conferences, workshops, protocols, technology standards as well as professional and educational activities. Most of these libraries and databases not only provide an electronic repository for storing and categorizing digitized publications but also provide an intelligent search functionality to maximize the effectiveness of knowledge retrieval process.

It is not unusual for HEIs to adopt KM approaches to manage teaching and learning materials. A common approach is to store and disseminate lecture slides and other relevant materials in virtual learning environments (VLE) such as Blackboard. However, KM practices that allow students to

participate directly within an academic environment are limited. One way to engage students in KM is to use web communication and collaboration tools (such as wiki) in collaborative knowledge creation and sharing (Parker & Chao, 2007; Raman, Ryan & Olfman, 2005). These tools can be adopted as an ongoing documentation of student research projects, a collaborative annotated bibliography for prescribed readings, a media to allow students to edit and comment directly on publishing course resources, a knowledge base to share reflections and thoughts as well as a linked network of resources used to map concepts (Duffy & Bruns, 2006).

Impact of Large Lecture to First Year Tertiary Students

Some researches show that lecture size has minimal impact on student achievement (Gleason, 2010) but the majority of them demonstrate lecture size is inversely proportional to student achievement and student satisfaction (Bedard & Kuhn, 2008; Cuseo, 2007; Kokkelenberg, Dillion, & Christy, 2008; Light, 2001; Lindsay & Paton-Saltzberg, 1987). In other words, student achievement and satisfaction decrease as lecture size increases. Many researchers have studied the impact on large lectures and they have two important findings:

- Large lectures discourage academics-student interactions and deter students from asking questions (Cuseo, 2007; Karl & Yoels, 1976; Stones, 2006; Wulff, Nyquist, & Abbott, 1987).
- Large lectures reduces the depth of student thinking in lecture halls (Cuseo, 2007) and evidences show that there is a strong association between small lecture size and the development of higher-order cognitive processes (Pascarella & Terenzini, 2005)

Cuseo (2007), Stagg and Lane (2010) as well Walker, Cotner, Baepler, and Decker (2008) identified a number of challenges encountered on large-sized lecture environments which include low overall learning experience, low attendance, low student emotional engagement, low level of student achievement and academic performance, lack of student preparedness, lack of immediate feedback on student understanding, reduced depth of student thinking inside a lecture as well as reduced breadth and depth of course objectives, course assignments and course-related learning strategies used by students outside a lecture. Another well-recognized issue is the increase of social barriers when group sizes grow which can make students standing out of a lecture feel uncomfortable (Bry, Gehlen-Baum, & Pohl, 2011).

Stones (2006) surveyed over one thousand university students from twelve HEIs in Birmingham area and found that 82% of the students preferred small-sized tutorials and seminars than large lecture settings as students wanted to have some interaction with academic staff rather than just listening. Furthermore, 60% would be deterred from asking questions with the presence of a large number of students in a room. Interacting with academic staff has significant impact on learning even though it is occurring outside of lecture halls (Trowler & Trowler, 2010). The values of such engagements between students and academic staff are no longer questioned as almost every reform report emphasized to varying degrees the important link between student engagement and desired outcomes of HEIs (Kuh, 2009).

Statistics show more than half of the students who withdrew from HEIs did so in their first year (Consortium for Student Retention Data Exchange, 1999). Moreover, withdraw rates for first year students are more than 25% at four-year HEIs and almost 50% at two-year HEIs respectively (ACT, 2003). One factor that might be contributing is the practice of higher education lecturing them in huge, introductory general-education classes (Cuseo, 2007).

Yorke and Longden (2008) studied the first year experience of full-time undergraduate students in 25 HEIs in the UK and also identified factors that influenced 462 identifiable “non-returners” who had left their programmes of study during, or at the end of academic year 2005-2006. The

findings indicate that poor learning experience is one of the causes which makes it hard for them to transit into higher education from high schools. In particular, the large lectures made them feel as though they could not ask questions. They also felt that if they missed something there was nothing they could do as academics staff tend to leave after delivering the lecture, with no time or opportunity to ask questions.

Students who commence their first year of degree programs in offshore campuses of western universities located in Asia also need to go through a similar transition from high school to higher education. They may find it more difficult to adapt due to the fact that most of them come from a local education system with very little understanding of the foreign education system. Hence the approach of lecturing in a large lecture hall may have an impact to first year students in terms of learning experience. Garrison and Vaughan (2008) define learning experience as the transaction between teacher as pedagogue and subject expert and the engaged community of learners to collaboratively construct core concepts and schema based on important ideas and information.

Interaction is a major component of learning (Murray, Perez, Geist, & Hedrick, 2012) To promote student and academic staff interaction in large lectures, Chickering and Ehrmann (1996) suggested information technology (IT) can increase opportunities for students and faculty to interact and such an IT-facilitated interaction is crucial to learning and satisfaction. His suggestion is echoed in another research representing a sample size of 8000 students enrolled in more than 40 online degree programs that investigate the level of successfulness of the online learning environment in the State University of New York (Shea, Fredericksen & Pickett, 2001). The research shows students were about twice to report active participation online than in classrooms and 86% of respondents put more effort into online discussion and a classroom one. Moreover, students were about twice as likely to ask for clarification online than in classrooms and 69% of respondents were more likely to ask an awkward question online. Bry, Gehlen-Baum and Pohl (2011) proposed to use digital backchannels that allow students to communicate with lecturers using short microblog messages to allow academic staff to receive immediate concise feedback which aims at strengthening the awareness for students' difficulties.

Research Objectives and Methods

In this research, a KM methodology is proposed to address the lack of insights from research into engaging tertiary students in the KM process. The proposed methodology is developed to allow students to interact with academic staff in and outside a large lecture hall to create, disseminate, use and evaluate knowledge at course level in the setting of higher education. The methodology has a computerized tool incorporated to promote knowledge sharing.

This research investigates the factors that impact first trimester students to construct concepts and schema in a big lecture hall in an offshore campus of an Australian university located in South Asia. This research also investigates if the knowledge sharing nature of the computerized tool can improve the learning experience of students in a big lecture hall by establishing an interactive knowledge sharing platform to assist students to construct course specific core concepts and schema. The proposed KM methodology is developed using design science research methodology.

Design science research methodology focuses on the design and development of an artifact to provide a solution for a research problem (Hevner and Chatterjee, 2010). The artifact is illustrated in experimentation, simulation, case study, proof or scenario to observe and measure how well the artifact solves the research problem. We argue that design science is a desirable research methodology in our research as the focus of the study is on the creation of an artifact to impact first trimester students who are having lectures in a big lecture hall. In this research, the proposed KM methodology is the artifact to be illustrated in a case study conducted in the offshore campus

of the Australian university. The case study will then be evaluated using a survey instrument in the form of a quantitative questionnaire consisting of 18 close-end questions. It was demonstrated that the rich details of case studies when integrated with surveys are useful to aid in the interpretation of quantitative findings (Gable, 1994).

A Knowledge Management Methodology to Enhance Learning

In HEIs, academics are responsible for giving lectures to tertiary students for a particular course. As illustrated in Figure 2, a lecture delivered by an academic generally consists of both tacit and explicit knowledge. All teaching and learning materials such as lecture slides are regarded as a form of explicit knowledge whereas verbal explanations and descriptions as well as demonstration given by the academic are considered as a form of tacit knowledge.

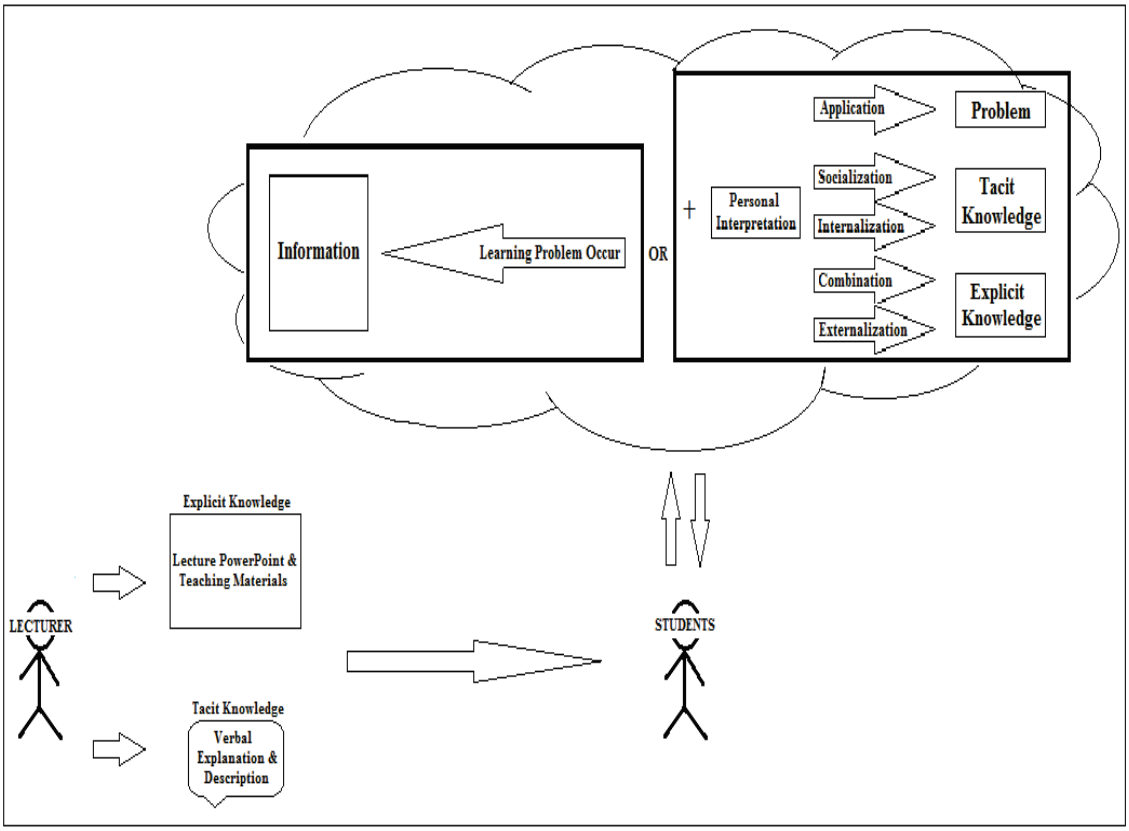

Figure 2: How students learn in a lecture?

Knowledge understanding is more emphasized than memorization as understanding supports thinking alternatives that are not readily available if one only memorizes facts (Bransford & Stein, 1993). Knowledge understanding can be defined in terms of mental activity contributing to the development of understanding that includes relationship construction, knowledge justification and explanation, individual knowledge construction, and knowledge extension and application (Carpenter, Blanton, Cobb, Franke, Kaput, & McClain, 2004).

These four activities can be categorized into two types. The first three activities are closely related to knowledge creation in which: 1) relationship construction enables students to create new knowledge by relating incoming knowledge to knowledge that they already understand, 2) knowledge justification and explanation allow students to work together in a community with the

aim of sharing and creating new knowledge, and 3) knowledge construction involves the construction of new knowledge by individual students through their own activity. The last activity is about extending and applying incoming knowledge to solve problems not explicitly taught to students.

By adding their personal interpretation of experiences, beliefs and commitments, students should be able to use incoming knowledge to solve relevant problems in assessments and in the real world if they can understand the knowledge. Another benefit of being able to understand knowledge delivered by the academic is students can make use of the incoming knowledge to create their own set of knowledge. To achieve this, the students need to make use of socialization, internationalization, externalization and combination to transform teaching and learning materials, verbal explanations and descriptions, and demonstration into a new set of tacit and explicit knowledge.

However, knowledge application and creation process may halt if students experience learning problem(s). The major learning problem includes "failure to understand" the knowledge delivered by an academic. One way to directly deal with this problem is by asking appropriate questions during lectures but most of the teaching and learning environment settings actually discourage students from asking questions. For instance, students may be scared or shy to ask questions in front of a large group of students in a lecture hall. Even though they have the courage to ask, they may lack the required language skills to formalize the questions. On the other hand, the academic also has very limited time and space to allow students to ask questions.

The students can still choose to ask questions through email after lecture or face-to-face during consultation time, but they may lose their motivation to ask or simply forget their questions if they cannot ask right away. Hence, failure to ask questions at the right time may lead to superficial learning in which students are forced to memorize information rather than using incoming knowledge to create a new set of knowledge or to solve problems. To address this long existing problem, we propose to develop a KM methodology to enhance student learning experience in lectures. The proposed KM methodology aims to provide a systematic process to collect student learning problems as well as create, store, disseminate, use and evaluate knowledge that are required to solve the learning problems. Whenever students experience any difficulties in understanding contents of a lecture, they can choose to send their questions through (see Figure 3):

- E-channel: students can send their questions by accessing a designated communication application using smartphones, tablets, laptops or other computerized devices that have internet access.
- Tele-channel: students can send their questions to a designated mobile number in form of SMS messages using their smartphone and mobile phones.
- Manual-channel: students can write down their questions on papers and put them in designated drop boxes at the end or after the lecture.

These three channels allow students to deliver their difficulties to academics in any lecture environment regardless of time and space constraint. Students can send any questions anonymously without the concern of having negative consequences. In addition, these three channels can also address the problems of motivation, shyness, fear and insufficient language skills that prevent them from asking questions in a lecture.

The collected questions will be examined by an academic to remove duplicate questions. The academic can choose to break down a question if it is too complex or summarize several questions into one if they are too simple. Modified questions can then be categorized according to requirements of individual course such as topics and keywords.

The academic also needs to develop solution for each question and store the question and solution pair in the knowledge base of a computerized tool. To ensure the accuracy of knowledge, course leader must choose an academic who is familiar with course content and course structure to develop solutions to if the course is taught by more than one academics. It is also very important to ensure the knowledge is created, stored and make available in a timely manner otherwise students may lose interest to retrieve and use the knowledge.

All students of the course will be informed when the knowledge is available so that they can retrieve and apply the knowledge to solve their learning problems or to create a new set of knowledge. If the retrieved knowledge is satisfactory, students can recommend the knowledge by leaving positive feedbacks in the comment area or simple clicking on the recommend button. The recommend button will show a number to indicate how many students have recommended the knowledge.

On the other hand, the students can further extend the knowledge by including additional insights, experiences, beliefs and commitments in the comment area. They can also use the comment area to report the insufficiency of the knowledge created by the academic. Based on the recommend and comment features, the academic can modify the knowledge accordingly to address the insufficiency of the knowledge.

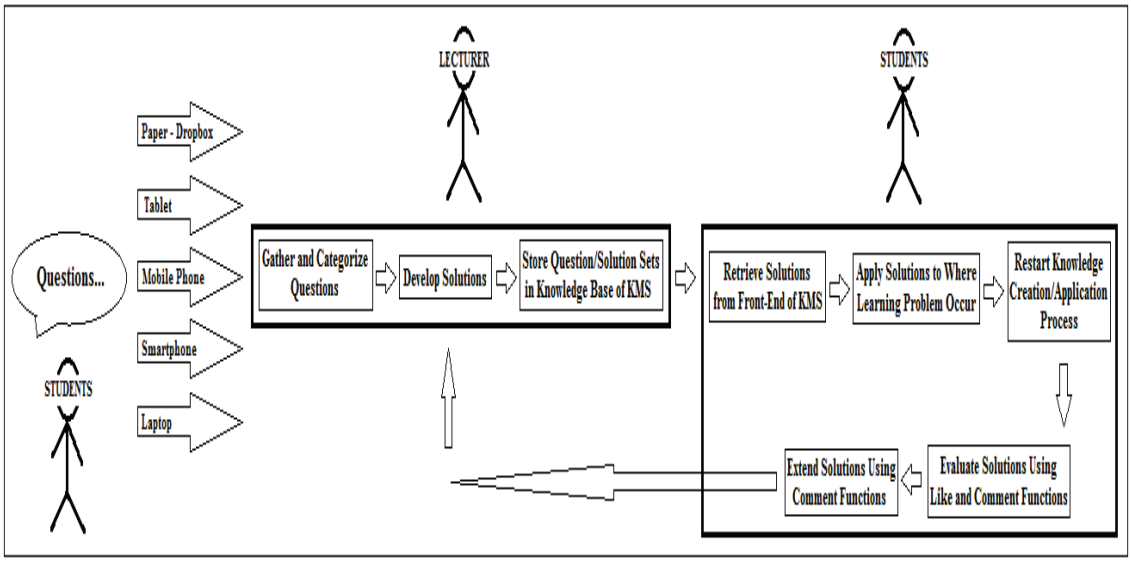

Figure 3: The proposed knowledge management methodology to enhance learning experience

The Case Study

This case study setting was an undergraduate course conducted in an offshore campus of an Australian university in South Asia. This business computing course aimed to develop skills used to build solutions that meet the requirements of business to effectively integrate information and communication technologies into its operations and is taken by students enrolling in the first trimester of the Bachelor of Commerce and Bachelor of Business. The direct contact hours of this course was three and a half hours per week (for twelve weeks) in which one and a half hours and two hours were allocated for lecture and tutorial respectively. While lectures were focused on theoretical knowledge, tutorials required students to learn how to build models using database and spreadsheet technologies. There were four assessments in the course including an analysis report (due in week eight), two in-class assessments (due in week six and eleven) and a final exam (held in week fourteen). The proposed KM methodology was implemented in this setting in the third trimester of 2012.

In the trimester, the course coordinator established ten tutorial groups to be chosen by 217 students enrolled in the course. Majority of them were local students with our international students coming from Australia, Finland and South Korea. He also assigned the first five tutorial groups to the first lecture and the rest to the second lecture. In other words, there were about one hundred and nine students in each lecture and less than twenty-two students in each tutorial group. The lectures were held in a big lecture hall that could accommodate one hundred and sixty students whereas the tutorials were held in various laboratories that could accommodate thirty students.

In general, students studying in the Bachelor of Commerce and Bachelor of Business resisted to take courses that were related to technology as they preferred to study courses that can expand their foundational and specialized business knowledge and this course had no exception. Like most students in Asian countries, they tended not to ask any questions in lectures even though they did not understand. This could be reflected in the way they answered final exam questions as they could only write down definitions for questions that required providing application of theoretical knowledge. According to the experience of academic staff from previous trimesters, students were more active during tutorials and they would ask questions if they could not follow demonstrations provided by academic staff.

All undergraduate students who are eligible to enroll in a degree program must possess an IELTS score of 6.5 (or above) as all courses are taught in English in this offshore campus. If language proficiency was not a major concern, it indicated that students might not have sufficient confidence to ask questions in front of a large group of classmates within a big lecture hall. To improve their learning experience, we decided to apply the proposed KM methodology in which students could interact with academic staff by asking questions in lectures from week one to eight of the trimester.

Following the methodology, a Facebook page was created to be used as a computerized tool for knowledge storage and dissemination as most of the students have a Facebook account. Other than that, the Facebook page could be used to collect questions sent electronically from mobile phones, smartphones, laptops and other mobile devices during lectures. A drop-box was also set up in the lecture hall to collect questions written on papers and a mobile phone account was established to collect questions in SMS format. In the Facebook page, students could leave feedbacks or extend knowledge in comment fields and they can also recommend knowledge by clicking on the "like" button inside or outside the lecture hall.

Table 1: Summary of questions received from mobile devices and drop box

Week	Questions From Mobile Devices	Questions From Drop Box
1	0	2
2	0	1
3	1	0
4	0	0
5	20	0
6	1	0
7	3	0
8	26	0

Verbal announcements were made to students in the lectures describing the application, purposes and mechanism of the KM methodology from week one to four. During the eight week duration, there were ninety-five students who joined the Facebook page and fifty-three questions were received in the lectures. Out of the fifty-three questions, only three of them came from the drop-box and the rest were sent to the Facebook page and mobile account. The received questions were summarized into thirty-seven and posted on the Facebook page with relevant solutions. As shown

in Table 1, only a few questions were asked in week one, two, three, six and seven. There was a big increase in week five and eight probably because two assessments were due in week six and eight. This can be confirmed by the nature of questions student asked as most of them are related to the application of course-specific knowledge. Although there are more than ninety-even views per each question and solution pair in average, student participations in evaluating and expanding the knowledge are far from satisfactory with less than three likes and one discussion in average (see Table 2).

Table 2: Summary of View, Like and Discussion on the Facebook Page

	Average	Maximum	Minimum
View (per question)	97.13	150	0
Like (per question)	2.51	12	0
Discussion (per question)	0.86	10	0

Evaluation Method and Findings

The case study was evaluated through the use of quantitative analysis. A survey instrument consisting of 18 questions was developed and deployed via an online survey tool to collect data from week 8 to week 10. The survey can be broadly divided into three sections. Questions 1 to 7 were designed to collect data relating to profiles of respondents such as age and gender. Questions 8 to 11 aim to identify learning behavior of students in lectures conducted in a big lecture hall. Finally, questions 12 to 18 are used to evaluate the effectiveness of the proposed KM methodology implemented in this case study. The survey data was analyzed using a combination of descriptive and cross-tabulation analysis.

Out of the 217 students enrolled in the course, 49 students participated in the survey in which 36% were male and 64% are female. Majority of them (82%) were in their first trimester of a bachelor degree program. Regarding their degree programs, 23% of participants were taken Bachelor of Commerce, 43% in Bachelor of Business majoring in economics and finance, 18% in Bachelor of Business majoring in accountancy, 9% in Bachelor of Business majoring in business information systems and 7% in marketing. Despite 7% of them were enrolled as international students, their primary language spoken at home is still Vietnamese.

As shown in Table 3, only one third of students thought that class sizes were a major influential factor of learning in a big lecture hall. While class sizes seemed to have less impact in a big lecture hall, most students believed that understanding PowerPoint slides, keeping up to date with their studies, coming to lecture having complete readings or homework, and the amount of contact with lecturer in lectures had high level of influence in their learning, with the frequency 93%, 68%, 56%, and 54% respectively.

When the cross-tabulation analysis was performed between trimesters that students were studying in and class sizes that were too large as an influential factor to learn in a big lecture hall (see Table 4), 75% of students who were in their second trimester or above believed that class sizes influenced their learning in a big lecture hall whereas 75% of first trimester students thought that class sizes had little or no influence on learning. As the relationship between class size and its influence on two groups of students (first trimester and second trimester or above) is statistically significant at less than 5%, this implies that big class sizes are more likely to affect senior students.

Table 3: Factors that influenced learning in a big lecture hall

Influential Factors		None and a Little	Moderately and Very	Total
Class sizes that are too large	N	29	15	44
	%	65.9	34.1	100.0
Keep up to date with your studies	N	14	30	44
	%	31.8	68.2	100.0
Come to lectures having completed readings or homework	N	19	25	44
	%	43.2	56.8	100.0
Ask questions in lectures	N	29	15	44
	%	65.9	34.1	100.0
Understand PowerPoint presentations, explanations and descriptions delivered by a lecturer in lectures	N	3	41	44
	%	6.8	93.2	100.0
The amount of contact with lecturer in lectures	N	20	24	44
	%	45.5	54.5	100.0
The way the course is taught does not suit me	N	36	8	44
	%	81.8	18.2	100.0

Table 4: Cross-tabulation between trimesters that students were studying in VS class sizes that are too large as an influential factor to learn in a big lecture hall

		Class sizes that are too large as an influential factor to learn in a big lecture hall				Total
		Not at all	A little	Moderately	Very	
Trimester 2 or above	Count	1	1	6	0	8
	% within Trimester	12.5%	12.5%	75.0%	0%	100.0%
	% within "Class sizes that are too large as an influential factor to learn in a big lecture hall"	5.3%	10.0%	42.9%	0%	18.2%
Trimester 1	Count	18	9	8	1	36
	% within Trimester	50.0%	25.0%	22.2%	2.8%	100.0%
	% within Class sizes that are too large as an influential factor to learn in a big lecture hall"	94.7%	90.0%	57.1%	100.0%	81.8%
Total	Count	19	10	14	1	44
	% within Trimester	43.2%	22.7%	31.8%	2.3%	100.0%
	% within "Class sizes that are too large as an influential factor to learn in a big lecture hall"	100.0%	100.0%	100.0%	100.0%	100.0%

A striking finding is that 66% of the students considered asking questions in lectures had no or little influence in their learning (see Table 3). Using cross-tabulation analysis, it is found that sen-

ior students perceived asking questions in a big lecture hall was important to their learning, but first trimester students thought it was not the case. Table 5 shows that 75% of students who were studied in second trimester or above revealed asking questions in a lecture was moderately or very important. In contrast, 75% of first trimester students considered asking questions in a lecture was not important or had little importance.

Table 5: Cross-tabulation between trimesters that students were studying in VS asking questions in lectures as an influential factor to learn in a big lecture hall

		Asking questions in lectures as an influential factor to learn in a big lecture hall				Total
		Not at all	A little	Moderately	Very	
Trimester 2 or above	Count	1	1	5	1	8
	% within Trimester	12.5%	12.5%	62.5%	12.5%	100.0%
	% within "Asking questions in lectures as an influential factor to learn in a big lecture hall"	9.1%	5.6%	35.7%	100.0%	18.2%
Trimester 1	Count	10	17	9	0	36
	% within Trimester	27.8%	47.2%	25.0%	0%	100.0%
	% within "Asking questions in lectures as an influential factor to learn in a big lecture hall"	90.9%	94.4%	64.3%	0%	81.8%
Total	Count	11	18	14	1	44
	% within Trimester	25.0%	40.9%	31.8%	2.3%	100.0%
	% within "Asking questions in lectures as an influential factor to learn in a big lecture hall"	100.0%	100.0%	100.0%	100.0%	100.0%

Although more than half of the students thought that the amount of contact with lecturer was important (see Table 3), most of them (73%) still preferred not to ask questions in a big lecture hall even if they found PowerPoint presentations, explanations and descriptions difficult to understand (see Table 6). The primary reasons why students preferred not to ask questions are that they were scared of asking questions in front of other students and in a big lecture hall, with the frequency of 56% and 53% respectively (see Table 7). Nearly half of the students declared that they preferred solving problems by themselves rather than asking questions. Less than 40% were scared of asking inappropriate questions.

Table 6: Preference of asking lecturer questions in a big lecture hall if PowerPoint presentations, explanations and descriptions were difficult to understand

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	12	21.1	27.3	27.3
	No	32	56.1	72.7	100.0
	Total	44	77.2	100.0	

Table 7: Barriers which prevented students from asking lecturer questions in a big lecturer

Reasons	Frequency (N=44)	%
Scared of asking questions in front of other students	17	53.1
Scared of asking questions in a big lecture hall	18	56.3
Scared of asking inappropriate questions	12	37.5
Prefer solving problems by myself	15	46.9

Table 8 shows the methods students used to handle learning difficulties. Majority of them chose to seek help from lecturer/tutor using email (57%) and from classmate (75%) as well as to find relevant information online (52%) and read textbooks or other relevant materials (57%). Some students still tended not to seek help from lecturer using face-to-face communication, either in a lecture or consultation time, with 25% and 41 % respectively.

Table 8: Methods to handle learning difficulties

Methods	Frequency	%
Seek help from lecturer in a lecture	11	25
Seek help from lecturer/tutor in consultation time	18	41
Seek help from lecturer/tutor using email	25	57
Seek help from classmate	33	75
Find relevant information online	23	52
Read textbooks or other teaching and learning materials	25	57

To see whether the students who prefer not to ask questions in class are likely to ask question via the three channels, the cross-tabulation analysis was performed. The result indicates 1) about 53% of students who preferred not to ask questions in a big lecture hall, chose to ask questions through the three channels, and 2) half of the students who preferred asking questions in a big lecture hall, chose to ask questions using the three channels (see Table 9). The implication of this finding is that the three channels can be considered as a useful media for most students when they encounter learning difficulties in a big lecture hall. Among the three channels, the students rated electronic channel as the most effective channel for knowledge learning as shown in Table 10.

Table 9: Cross-tabulation between preferences toward asking questions in a big lecture hall VS asking questions using the three channels in the past six weeks

			Asking questions through the three channels in the past six weeks		Total
			Yes	No	
Preference of asking lecturer questions in a big lecture hall if PowerPoint presentations, explanations and descriptions were difficult to understand	Yes	Count	6	6	12
		% within "Preference of asking lecturer questions in a big lecture hall…difficult to understand"	50.0%	50.0%	100.0%
		% within "Asking questions through the three channels in the past six weeks"	26.1%	28.6%	27.3%
	No	Count	17	15	32
		% within "Preference of asking lecturer questions in a big lecture hall…difficult to understand"	53.1%	46.9%	100.0%
		% within "Asking questions through the three channels in the past six weeks"	73.9%	71.4%	72.7%
Total		Count	23	21	44
		% within "Preference of asking lecturer questions in a big lecture hall…difficult to understand"	52.3%	47.7%	100.0%
		% within "Asking questions through the three channels in the past six weeks"	100.0%	100.0%	100.0%

Table 10: The extend of channels that contributed to knowledge learning

Channels		**Not at all**	**A little**	**Moderately**	**Very**	**Total**
Electronic	N	0	3	12	6	21
	%	0	14.3	57.1	28.6	100.0
Telecommunication	N	3	6	10	3	22
	%	13.6	27.3	45.5	13.6	100.0
Manual	N	1	7	12	1	21
	%	4.8	33.3	57.1	4.8	100.0

From Table 11, students who preferred to ask questions in the big lecture hall, only 58% accessed the computerized tool (the Business Computing page on Facebook) in the past six weeks. However, the proportion of accessing the page increases significantly to 84% among the students who preferred not to ask questions. On the other hand, among the students who accessed the tool, 79% were those who preferred not to ask questions in a big lecture hall. In other words, the students who preferred not to ask questions in the lecture hall tended to access the tool more than those who preferred to ask questions. As the relationship between asking lecturer questions in a big lecture hall and accessing the tool is statistically significant at the level of less than 10%, the finding

implies that the tool incorporated in the KM methodology is an electronic means of learning for those who prefer not to ask questions in a big lecture hall.

Table 11: Cross-tabulation between preferences toward asking questions in a big lecture hall VS accessing Business Computing page on Facebook in the past six weeks

			Accessing Business Computing Page on Facebook in the past six weeks		Total
			Yes	No	
Preference of asking lecturer questions in a big lecture hall if PowerPoint presentations, explanations and descriptions were difficult to understand	Yes	Count	7	5	12
		% within "Preference of asking lecturer questions in a big lecture hall…difficult to understand"	58.3%	41.7%	100.0%
		% within "Accessing Business Computing Page on Facebook in the past six weeks"	21.2%	50.0%	27.9%
	No	Count	26	5	31
		% within "Preference of asking lecturer questions in a big lecture hall…difficult to understand"	83.9%	16.1%	100.0%
		% within "Accessing Business Computing Page on Facebook in the past six weeks"	78.8%	50.0%	72.1%
Total		Count	33	10	43
		% within "Preference of asking lecturer questions in a big lecture hall…difficult to understand"	76.7%	23.3%	100.0%
		% within "Accessing Business Computing Page on Facebook in the past six weeks"	100.0%	100.0%	100.0%

The computerized tool could provide a platform for students to share, extend and discuss knowledge as approximately 60% of the students agreed like/dislike and comment functions had moderate or significant contribution for knowledge sharing and discussion (see Table 12). Finally, nearly 80% of students agreed that the tool enhanced their learning experience in Business Computing (see Table 13).

Table 12: The extend of functions of the computerized tool that contributed to knowledge sharing and discussion

Function		**Not at all**	**A little**	**Moderately**	**Very**	**Total**
Like/Dislike	N	4	9	10	9	32
	%	12.5	28.1	31.3	28.1	100.0
Comment	N	4	10	9	9	32
	%	12.5	31.3	28.1	28.1	100.0

Table 13: The computerized tool incorporated in the KM methodology can enhance learning experience in Business Computing

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	18	31.6	40.9	40.9
	Agree	17	29.8	38.6	79.5
	Neutral	7	12.3	15.9	95.5
	Disagree	2	3.5	4.5	100.0
	Total	44	77.2	100.0	

Discussion and Implications

Cultural issues often play a very important role in the learning experience of students. In this research, most of the respondents chose not to ask questions during lectures when they experienced learning difficulties in a big lecture hall, in particular those who were in their first trimester in the Australian university as the majority of them believed large class sizes and asking questions in lectures have no or little impact to learning. Asian students often sit quietly in classes and listen to an academic's presentation as Asian culture does not encourage student to ask questions and share knowledge. Students who ask questions and share knowledge in classes may be considered as a displaying disrespectful behavior (Sue, 1990). Asian students also consider authors and lecturers as the final authority who are always right (Ladd & Ruby, 1999; Yap, 1997). Sooner or later, students will lack the self-confidence to ask questions in a big lecture hall or even in front of other students. Unfortunately, this mentality was carried over even when the first trimester students switched to a western education system by studying in the offshore campus of the Australian university.

Unlike first trimester students, the senior students perceived asking questions was important to their learning in a big lecture hall. Even though big class sizes is another important influential factor, they still chose to ask questions simply because they were aware of the benefits of asking questions. In fact, the culture of asking question and knowledge sharing can be changed by implementing a proper reward system (Goh, 2002). Unlike commercial organizations, reward systems such as promotion and salary increments cannot be applied to students. In HEI settings, students must be clearly informed of the benefits of participating in KM activities. For instance, the proposed methodology aims to provide solutions to learning difficulties that they encounter in lectures. Simply by solving these difficulties, students can resume their knowledge creation process rather than just memorizing information. In addition, knowledge can further be created, extended and evaluated through the recommend and comment features. The reward of contributing questions and knowledge is to enhance their learning experience which can in terms improve their performance in assessments.

Although technology itself adds no value to knowledge (Smith, 2001), technology provides many of the foundations for the development of specific KM tools to streamline KM processes (Jurisica, Mylopoulos & Yu, 2004). The computerized tool used in this research has demonstrated its capability of encouraging students to ask questions manually and electronically, especially to those who were more passive in class or those who preferred not to ask questions in a big lecture hall, in front of students or during consultation time. Furthermore, the tool not only provided a platform for students to share, extend and evaluate knowledge, it also allowed the students (who chose not to ask in class) to look for relevant knowledge.

Research Limitations and Future Research Directions

Two limitations of the study should be noted. First, with a response rate of 22.6%, non-response bias may limit the ability to generalize the research results. Second, we had to use Facebook as the tool to support knowledge sharing in the case study. Other social networking services such as Google + and Twitter were also taken into consideration but Facebook was chosen due to its popularity in the region. One major weakness of Facebook is the tool can only list its contents on chronological order and does not provide a function to index its contents that make it hard to find relevant knowledge. Hence, it is natural to extend this research by developing a customized knowledge management system that integrates a formal knowledgebase, E-channel and Telechannel as well as supports keyword indexing and advanced search functions. Another extension is to investigate 1) what type of questions (such as questions related to theory or practical application) student prefer to ask using the KM methodology, 2) how the methodology can be improved to support those questions.

Conclusion

HEIs have started to adopt KM to manage administrative and scholar knowledge due to the successful implementation of KM in many commercial organizations. However, the lack of insights into the engagement of tertiary students to create, disseminate, use and evaluate knowledge at course level has driven the development of the proposed KM methodology. The proposed methodology includes a mechanism to engage students in the KM process by providing electronic, telecommunication and manual channels to ask questions in lectures when they fail to understand any incoming knowledge delivered by academics regardless of time and space constraints in any lecture halls. Knowledge developed based on students' questions can further be evaluated and extended using the comment and recommend features. Another major contribution of the KM methodology is that students are able to create new knowledge and to solve problems using incoming knowledge as the methodology can enhance knowledge understanding in their learning process.

The proposed methodology was applied to a business computing course at an undergraduate level conducted in the offshore campus of the Australian university in the third trimester of 2012. The methodology was evaluated using quantitative analysis. The findings show that majority of the students agreed the computerized tool incorporated in the methodology could enhance their learning experience by allowing students to ask for, share, discuss and extend knowledge. In particular, the methodology provided additional channels and platform for those who were passive and preferred not to seek help from lecturers directly.

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