Abstract: This paper reports on the design and evaluation of a UK University's global eLearning MBA programme. The aims of the research were to investigate the learning experiences of the students on the course and to evaluate the effectiveness of the support system so as to improve the programme. The primary research method was a longitudinal semi-structured questionnaire survey, and data were collected from students taking the course during the years 2008-2010. Three rounds of survey were conducted, resulting in 149 valid responses. The first round showed a fairly high level of student satisfaction with the programme, but also indicated areas that needed further improvement. The impacts of subsequent changes in the programme and the learning support system were investigated in the second and third rounds of the survey. Feedback from these has helped develop additional changes in the learning content and delivery approach of the programme. Overall, the findings helped improve the course’s delivery approach, enriched the course’s content, enhanced its quality, and improved the satisfaction level of the students. It is hoped that these findings can provide useful insights to course managers and eLearning developers of other courses offered in a global context.

Keywords: eLearning, evaluation, questionnaire survey

1. Introduction

eLearning is still developing rapidly, supported by increasing sophistication of information technology and by better understanding of how to make content and delivery of e-courses more effective. Moreover, various types of eLearning support system have been increasingly introduced to higher education institutions in an effort to meet the student-centred learning paradigms recommended by UNESCO (UNESCO, 1998).

In this context, the creation and implementation of effective quality assurance for such learning process has been identified as one of the most challenging tasks. Jara and Mellar (2010) and Martínez-Argüelles et al. (2010) point out that the collection of student feedback should be a central part of strategies to monitor the quality and standards of teaching and learning in higher education institutions for both conventional learning and eLearning. But Jara & Mellar also note that while research into eLearning abounds, studies that focus on the effectiveness of the provision of eLearning are limited, and that this is a gap to be filled. The research reported below relates to this gap.

The research focuses on the evaluation of a global work-based eLearning programme – the Executive MBA of a UK University. This research has been conducted and is reported here by three members of the MBA team responsible for the programme - two Senior Lecturers and the E-Learning Development Manager. The research focuses specifically on the quality and effectiveness of the developments made in the course's delivery approach and its learning content. The aims were to investigate the learning experiences and perceptions of the students, evaluate the effectiveness of the e-Learning support system, and identify the gaps between the students’ expectations and their actual experiences in taking the programme, with a view to improving the programme. Data were collected by longitudinal semi-structured questionnaire survey of students taking the course over the past three years.

This paper begins with a review of the literature related to eLearning, evaluation, and quality assurance. Then an overview of the MBA eLearning programme is provided. This is followed by a discussion of the research methodology, the findings, and the consequent improvements made to the course. Research limitations are pointed out, and reflections made on the research. Finally, a summary and conclusions are given, followed by research implications.

2. Literature review

The rapid growth of online academic course provision worldwide has changed the learning environment for both students and teachers (Landry et al., 2008; Lapointe & Reisetter, 2008; Williams & Williams, 2010). E-Learning has taken many forms, such as fully online, mixed mode or hybrid, blended learning and web-assisted (Buzzetto-More 2008). It is claimed that eLearning overcomes many drawbacks that are inherent to traditional classroom teaching, especially its lack of flexibility in the use of resources (for example, Lam & Bordia 2008; Williams & Williams, 2010). Goold, et al.
(2007) indicate that this type of online learning environment enables a greater number of students of diverse educational and cultural backgrounds, as well as of modes of study, to come together within the one virtual classroom. However, they warn that many of the clues that help enable staff and students to be culturally sensitive in physical classrooms are missing in the online world. For this and other reasons, it has been suggested that students need better preparation for learning in an online environment than in a traditional classroom.

According to Rajasingham (2009) and Guri-Rosenblit (2009), eLearning has evolved from distance education and is still struggling to gain full recognition and accreditation within mainstream education as an approach for high quality provision. While developments in eLearning have been exciting and beneficial, finding ways of enhancing the quality of provision and effectiveness have posed a serious challenge. In response to this concern of legitimacy, value and quality of online programmes, Davies et al. (2011) develop a model that provides a comprehensive conceptual framework which identifies the factors that enhance the quality of fully-online degree programmes. Pillay & Kimber (2011) argue that globalisation, transnational provision of higher education, and the ‘use of market mechanisms’ have increased the complexity in issues of accountability, authority, and responsibility in quality assurance.

Zygouris-Coe, et al. (2009) note that instituting a well-structured quality assurance process can be expensive and time consuming, but that it can be worth the effort. For example, the study undertaken by Kidney, et al. (2007) supports this. They state that the merit, quality and success of the eLearning programme they investigated were mainly due to the proper application of the quality assurance strategies. Rajasingham (2009) notes that new educational paradigms and models that challenge conventional assumptions and indicators of quality assurance are becoming possible with the help of the increasing sophistication in information technology.

Deepwell (2007) makes a useful distinction between quality assurance and evaluation, and views evaluation as an instrument of quality enhancement rather than quality assurance. Wang (2006) identified learning effectiveness, access, student satisfaction, faculty satisfaction, and cost-effectiveness as the five ‘pillars of quality’ of online programmes. However, Martínez-Argüelles, et al. (2010) identify the key quality dimensions - from the student’s point of view - to be the learning process, administrative processes, teaching materials and resources.

We now turn to evaluation more specifically. Evaluation is defined by Saunders (2003) as the “purposeful gathering, analysis and discussion of evidence from relevant sources about the quality, effectiveness, and impact of provision, development or policy.” (Saunders, 2003: 39). While the measurement of student feedback is recognised as an important component of quality assurance, there have been mixed reports as to its effectiveness. For example, according to Gurău and Drillon (2009), analysing users’ perceptions regarding an eLearning system can provide valuable data to evaluate and improve its functioning and performance. On the other hand, Jara and Mellar (2010) report from their research findings that student feedback was not always fully adequate to support quality enhancement. So a researcher is cautioned that they will need to make judgements in this area, and maybe conduct further research to validate initial findings.

Finally, Lapointe & Reisetter (2008) suggest that the new reality of online learning demands a reassessment of our understanding of what makes for the most productive student engagement. The findings reported below are intended to help move towards an answer to this question.

3. Overview of the MBA programme

The Executive MBA programme discussed in this paper is primarily designed for those with a suitable management background who wish to become more effective and enterprising managers in the knowledge-based global economy. The MBA programme has been delivered for over seven years to work-based eLearning students in the UK and at a number of overseas countries including: Oman, India, Germany, Poland, South Africa and Switzerland. It is delivered mainly online via the UK University’s eLearning support system, but also provides periods of face-to-face teaching. Therefore, it is also called a ‘blended-learning’ programme. The face-to-face teaching can be taken at the overseas counterpart university, or in the UK, or at both. In the cases of the overseas courses, such teaching is delivered by both the ‘flying faculty’ (lecturers from the Business School of the UK university) and by lecturers of the counterpart local universities in partnership with the UK University’s course leaders. Currently there are about 400 students in total taking the course, of which about 40%
are based in Oman, 25% in the UK (full-time and part-time students combined), 15% in South Africa, and remaining 10% in India, Germany and Switzerland combined.

Students on the course are required to take and pass ten course modules to complete the programme – eight taught modules and two applied management projects. It normally takes two years (4 semesters) for work-based students to complete the course. The revised course structure of this programme, based in part on the findings from the first and second surveys of this research, consists of five modules in the first year and five in the second, as follows:

Year 1: Leading and Managing People; Accounting for Leaders; Marketing Products and Services in a Dynamic Environment; Mobilising Creativity and Innovation; and a Leadership project.
Year 2: Strategy; Operations and Project Management; Entrepreneurship and Small Business Management; Thriving in a Competitive Global Context, and an Integrated Management project.

Figure 1 shows the main building blocks of the blended-learning system designed for the programme, and demonstrates the range of learning modes that are available to the students.

Figure 1: The blended learning structure of the executive MBA programme (Priestman, 2010: 14)

At the start of each semester the ‘flying faculty’, with the support of the local institution, conduct induction sessions for the students of each cohort at the overseas centres, and this is followed by two full days of face-to-face teaching. The main purpose of this approach is to give the students an overview of each module run in the semester, and a feeling for the level of teaching, and the degree of response expected of them, throughout the course.

The UK lecturers are in charge of preparing and uploading all the online course content, including PowerPoint slides, relevant articles and papers, links to useful websites, audio and video clips, podcasting clips, assignment instructions, marking and feedback, etc. although tutors from the overseas partner institutions can also contribute to online material. The latter institutions, with their supporting lecturers and teaching facilities, provide face-to-face teaching once a month throughout the programme. These institutions also provide the local basic services to meet the requirements of the students. In addition, the UK lecturers deliver regular WIMBA (a voice over the Internet system) sessions for each module. WIMBA is a plug-in WebCT Vista which has ‘live classroom’ and ‘voice tools’ components by which the tutor and the students in different locations can hold a virtual class simultaneously, see each other via the webcam, and talk to each other as in a traditional classroom. WIMBA provides a forum, among other things, for UK lecturers to get a good grasp of the progress that the students have made via this blended learning approach, answer their questions related to the subject, and provide additional support for the coursework.
Assignments for all modules are delivered to the students online by the UK lecturers, and the students are required to submit all their assignments to the UK lecturers via the Turnitin system integrated with the eLearning support system BREO. The Turnitin system is an online plagiarism checker for students' course assignments, and is an effective means to check the extent to which assignments submitted for the course are written by the students themselves. Examinations are taken and invigilated at the local institutions, but the scripts are posted to the UK. All assignments and examination scripts are marked by the UK lecturers.

4. Methodology: Semi-structured questionnaire survey

The primary research approach adapted for this study is a longitudinal survey (Dillon et al., 1987), using a semi-structured questionnaire to collect data from respondents over time. This involved three rounds of surveys conducted across selected course sites at different points in time, thus enabling examination of the changes that occurred in the attitudes and satisfaction levels of the students. The first survey round covered four sites – Oman, India, UK, and Poland, and was carried out from April to July 2008. The second round covered two sites - Oman and India, and took place from January to March 2009. The third covered Oman, UK and Germany and was undertaken from June to December 2010. The survey forms were sometimes delivered online, and sometimes handed out in class, depending on what was most convenient. The split of survey respondents by country and by period is given in Table 1. There were 149 valid responses in total, with two thirds of these from the Oman site, which, as mentioned earlier, has had the largest student population on the programme.

Table 1: Summary of survey respondents by country (N=149)

<table>
<thead>
<tr>
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<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Oman</td>
<td>30 responses</td>
<td>30 responses</td>
<td>40 responses</td>
<td>100 responses</td>
<td>67%</td>
</tr>
<tr>
<td>India</td>
<td>18 responses</td>
<td>7 responses</td>
<td>-</td>
<td>25 responses</td>
<td>17%</td>
</tr>
<tr>
<td>UK</td>
<td>6 responses</td>
<td>-</td>
<td>4 responses</td>
<td>10 responses</td>
<td>7%</td>
</tr>
<tr>
<td>Germany</td>
<td>-</td>
<td>-</td>
<td>5 responses</td>
<td>5 responses</td>
<td>3%</td>
</tr>
<tr>
<td>Poland</td>
<td>9 responses</td>
<td>-</td>
<td>-</td>
<td>9 responses</td>
<td>6%</td>
</tr>
<tr>
<td>Total</td>
<td>63 responses</td>
<td>37 responses</td>
<td>49 responses</td>
<td>149 responses</td>
<td>100%</td>
</tr>
</tbody>
</table>

A number of pragmatic considerations led to the changes in choice of survey sites over the course of the surveys. These included dates and times when the courses were offered; accessibility of the students; and, on occasion, the availability of a researcher being available to deliver and collect survey forms. This impacted, to some extent, the comparability of data between sites and over time periods. However it was felt on balance that there was enough continuity between sites, and student cohorts, for useful comparison to be drawn.

5. Data analysis and discussion of key issues

In higher education, evaluation can cover many aspects, such as programme design, adequacy of resources, performance of students, and of lecturers, effectiveness of policies, etc. For evaluating this blended-learning MBA programme, the evaluation process was designed to measure and improve the quality and effectiveness of technology-enhanced teaching, and the learning experience of the course. The investigation focussed specifically on the areas of course management, learning and teaching, online learning content, assessment, the learning support systems in place, and students' overall experience of taking this course. These areas were seen as key for measuring the quality of the programme as provided to the students. In particular, as the focus was on improvement in course content and provision, the outcomes of such changes themselves needed evaluation. For this reason the second and third survey rounds contained a number of different questions from the first. This was to take into consideration the findings from the first survey, as well as the changes that had been made to the MBA programme as a result of these findings.

5.1 The first survey

For the first survey round, as Table 1 shows, 63 completed questionnaires were received from four MBA centres - Oman, India, UK and Poland. The students in Poland and UK completed the survey online; while those in Oman and India completed it off-line, with the lecturers directly handing the
questionnaire to the students and collecting it on the same day. The latter process contributed to a higher rate of returns from these centres. An overview of the perceptions of the respondents for this first survey round is given in Table 2.

Table 2: Results from the first survey (% response by category)

<table>
<thead>
<tr>
<th>Q</th>
<th>Survey Items</th>
<th>Excellent</th>
<th>Good</th>
<th>Average</th>
<th>Poor</th>
<th>% (E&amp;G)</th>
<th>% (A&amp;P)</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Registration process</td>
<td>31</td>
<td>55</td>
<td>11</td>
<td>3</td>
<td>86</td>
<td>14</td>
</tr>
<tr>
<td>2</td>
<td>Teaching at Induction</td>
<td>20</td>
<td>60</td>
<td>16</td>
<td>4</td>
<td>80</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>Teaching at local institution</td>
<td>18</td>
<td>58</td>
<td>24</td>
<td>0</td>
<td>76</td>
<td>24</td>
</tr>
<tr>
<td>4</td>
<td>Module Handbooks</td>
<td>22</td>
<td>47</td>
<td>27</td>
<td>4</td>
<td>69</td>
<td>31</td>
</tr>
<tr>
<td>5</td>
<td>Local Tutor support</td>
<td>15</td>
<td>45</td>
<td>33</td>
<td>7</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>6</td>
<td>Module information from local institution</td>
<td>9</td>
<td>67</td>
<td>22</td>
<td>2</td>
<td>76</td>
<td>24</td>
</tr>
<tr>
<td>7</td>
<td>Local support facilities</td>
<td>9</td>
<td>51</td>
<td>26</td>
<td>14</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>8</td>
<td>Textbook availability</td>
<td>18</td>
<td>33</td>
<td>22</td>
<td>27</td>
<td>51</td>
<td>49</td>
</tr>
<tr>
<td>9</td>
<td>Usefulness of CD ROMS</td>
<td>20</td>
<td>44</td>
<td>22</td>
<td>14</td>
<td>64</td>
<td>36</td>
</tr>
<tr>
<td>10</td>
<td>Quality of CD ROM materials</td>
<td>20</td>
<td>58</td>
<td>20</td>
<td>2</td>
<td>78</td>
<td>22</td>
</tr>
<tr>
<td>11</td>
<td>Reading materials on BREO</td>
<td>26</td>
<td>38</td>
<td>27</td>
<td>9</td>
<td>64</td>
<td>36</td>
</tr>
<tr>
<td>12</td>
<td>Learning resources/weekly online</td>
<td>22</td>
<td>45</td>
<td>22</td>
<td>11</td>
<td>67</td>
<td>33</td>
</tr>
<tr>
<td>13</td>
<td>UK Lecturer support</td>
<td>11</td>
<td>51</td>
<td>33</td>
<td>5</td>
<td>62</td>
<td>38</td>
</tr>
<tr>
<td>14</td>
<td>Slides on BREO</td>
<td>25</td>
<td>44</td>
<td>25</td>
<td>6</td>
<td>69</td>
<td>31</td>
</tr>
<tr>
<td>15</td>
<td>Audio/video clips</td>
<td>3</td>
<td>45</td>
<td>21</td>
<td>31</td>
<td>48</td>
<td>52</td>
</tr>
<tr>
<td>16</td>
<td>Relevant website links</td>
<td>15</td>
<td>43</td>
<td>29</td>
<td>13</td>
<td>58</td>
<td>42</td>
</tr>
<tr>
<td>17</td>
<td>Voice Café</td>
<td>11</td>
<td>26</td>
<td>25</td>
<td>38</td>
<td>37</td>
<td>63</td>
</tr>
<tr>
<td>18</td>
<td>Course/module response</td>
<td>2</td>
<td>47</td>
<td>42</td>
<td>9</td>
<td>49</td>
<td>51</td>
</tr>
<tr>
<td>19</td>
<td>IT training and support</td>
<td>11</td>
<td>35</td>
<td>42</td>
<td>12</td>
<td>46</td>
<td>54</td>
</tr>
<tr>
<td>20</td>
<td>Assignment instructions</td>
<td>16</td>
<td>53</td>
<td>27</td>
<td>4</td>
<td>69</td>
<td>31</td>
</tr>
<tr>
<td>21</td>
<td>Assignment submission procedures</td>
<td>16</td>
<td>55</td>
<td>13</td>
<td>16</td>
<td>71</td>
<td>29</td>
</tr>
<tr>
<td>22</td>
<td>Assignment feedback</td>
<td>15</td>
<td>36</td>
<td>29</td>
<td>20</td>
<td>51</td>
<td>49</td>
</tr>
<tr>
<td>23</td>
<td>Referral procedure</td>
<td>13</td>
<td>57</td>
<td>23</td>
<td>7</td>
<td>70</td>
<td>30</td>
</tr>
<tr>
<td>24</td>
<td>Failure procedures</td>
<td>18</td>
<td>39</td>
<td>17</td>
<td>26</td>
<td>57</td>
<td>43</td>
</tr>
<tr>
<td>25</td>
<td>Academic offence procedures</td>
<td>16</td>
<td>44</td>
<td>16</td>
<td>24</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>26</td>
<td>Social networking opportunities</td>
<td>9</td>
<td>38</td>
<td>33</td>
<td>20</td>
<td>47</td>
<td>53</td>
</tr>
<tr>
<td>27</td>
<td>Overall experience with the tutors</td>
<td>24</td>
<td>51</td>
<td>23</td>
<td>2</td>
<td>75</td>
<td>25</td>
</tr>
<tr>
<td>28</td>
<td>Overall experience of online support</td>
<td>8</td>
<td>49</td>
<td>36</td>
<td>7</td>
<td>57</td>
<td>43</td>
</tr>
<tr>
<td>29</td>
<td>Overall experience of undertaking the blended leaming MBA</td>
<td>20</td>
<td>46</td>
<td>29</td>
<td>5</td>
<td>66</td>
<td>34</td>
</tr>
</tbody>
</table>

The results in this table are self-explanatory. Overall, the survey results showed a fairly high level of satisfaction with the MBA programme, with an average of 63% of the respondents perceiving the average of the 29 aspects of the course measured as being either ‘excellent’ or ‘good’, versus 25% perceiving this average as ‘average’, and 12% as ‘poor’. In terms of the service quality as perceived by the students, 22 out of the 29 aspects surveyed showed a combined percentage of ‘excellent’ and ‘good’ (% E&G’ in Table 2) to be greater than the combined percentage of ‘average’ and ‘poor’ (% A&P). Six results had these percentages about the same (questions 8, 15, 18, 19, 22, 26), and one (question 17, on Voice Café) had this percentage significantly reversed (37% versus 63%).

As this was a semi-structured questionnaire survey, the respondents were given the opportunity to offer comments where appropriate in order to provide more detailed information on the topic areas being investigated, and to encourage suggestions for improving the course content, delivery approach, and support systems. Examples of positive comments included:

‘Voice over the Internet, Blackboard, and the student records system are excellent facilities for remote students like us. I found this course very balanced and suitable for working candidates’.
‘I was impressed with the free wireless Internet facility and the ever-helpful nature of the faculty office and administration team’.

‘It has been really a correct decision for me to enrol onto the MBA programme. The wisdom I derived from [taking this] e-MBA is tremendous’.

‘It was a pleasure and enjoyable experience taking the MBA with this UK University’.

Not surprisingly, there was also a range of negative comments, and the ratio of positive to negative comments was about three to two. To put these comments into context it needs to be borne in mind that the students were mostly at middle and senior-level management in full-time employment, and were working on the Executive MBA often on day or week release schemes from their employer, and at weekends. As a result, student expectations of the course were generally high, and the time pressure on the students was often quite onerous.

The following are examples of some of the criticisms from respondents:

- Many respondents asked for more consistent and comprehensive module information and guidance, clearer assignment instructions, and for the formats of examinations. Some mentioned that they had a desire to have all the essential information about the course issued at the induction sessions (rather than having some information fed piecemeal later).

- Some felt that BREO had been under-used, e.g. it was not used to provide effective discussion forums.

- A few respondents expressed a dislike for the different assignment submission systems used on different courses within the MBA, as these were often seen as time-consuming and confusing.

- Some felt very dissatisfied if they failed to receive their assignment feedback within the specified time, but appreciated the cases where more detailed and customised feedback had been given, rather than just a brief and general comment, as they wanted to understand what was wrong in their work. They also had a desire for quicker responses to requests for information and feedback.

- Some felt the need to spend more time with the UK-based tutors, and expressed a wish for an additional round of face-to-face interaction in the middle of a semester from the UK course leaders. Some would have liked to gain the opportunity for the classroom experience at the UK University.

- In addition, it was suggested that the communication and collaboration between the education partners be improved, so that better and more effective on-line support can be provided.

Overall, the above comments could be summarised as indicating a need for more support for the students’ independent learning process. As can be seen from Table 2, the average of positive responses (‘excellent’ plus ‘good’) on support for eLearning itself (questions 4, 6, 10, 12, 20, 21) was reasonably high. Nevertheless, the perceptions of individual students showed that there was still room in a number of areas for the university to make improvement. Suggestions from the above research, together with additional feedback collected from consultation with both the UK and local staff, were considered in detail, and subsequently, a significant range of changes to the programme were made. Some of these are discussed in the following section.

5.2 The second and third surveys

Subsequent to the changes made after the first survey round carried out early in 2008, a second survey round was conducted in 2009 covering two overseas sites: Oman and India. This survey had 28 questions of which 19 were the same as those in the first survey. Thirty-seven valid responses were received. The primary purpose of this second round was to measure any improvement (or otherwise) resulting from the course changes, and to uncover additional issues. A comparison between all the three rounds of surveys is given in Table 3. (For consistency, question numbers match those of Table 2.)

An examination of the results from the first two survey rounds showed that 14 out of the 19 topic areas investigated in common across the two surveys had improvements in the second survey in the ‘positive’ response category (i.e., % of ‘excellent’ plus ‘good’), with nine areas showing a gain of 10% or more. Significant improvements included: teaching at induction by the UK ‘flying faculty’; the quality of module handbooks; UK tutor support; audio/video clips; ICT training and support; social networking opportunities; overall experience of online support; and the overall experience of
undertaking the MBA (where the latter response rose from 66% to 79% in the ‘E&G’ category). In addition, the percentages in the ‘E&G’ category for both Question 10 (the change from providing ‘learning materials on CD Rom’ in the first survey to providing ‘weekly online material’ in the second), and Question 17 (the change from using ‘Voice Cafe’ for Internet conference in the first survey to the adoption of ‘WIMBA’ in the second), rose from 64% to 73% and from 37% to 85%, respectively, after the changes were made.

Table 3: Comparison of equivalent questions from all three surveys (% response by category)

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<thead>
<tr>
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<th></th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>Excel (E)</td>
<td>Good (G)</td>
<td>Av</td>
<td>Poor (P)</td>
</tr>
<tr>
<td>1</td>
<td>Registration process/</td>
<td>admin support</td>
<td>31</td>
<td>55</td>
</tr>
<tr>
<td>2</td>
<td>Teaching at Induction/Asmin support</td>
<td>20</td>
<td>60</td>
<td>16</td>
</tr>
<tr>
<td>3</td>
<td>Teaching at local institution</td>
<td>18</td>
<td>58</td>
<td>24</td>
</tr>
<tr>
<td>4</td>
<td>Module Handbooks</td>
<td>22</td>
<td>47</td>
<td>27</td>
</tr>
<tr>
<td>5</td>
<td>Local Tutor support</td>
<td>15</td>
<td>45</td>
<td>33</td>
</tr>
<tr>
<td>10</td>
<td>CD ROM materials/</td>
<td>weekly online material</td>
<td>20</td>
<td>44</td>
</tr>
<tr>
<td>13</td>
<td>UK tutor support</td>
<td>11</td>
<td>51</td>
<td>33</td>
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<td>Voice Cafe/WIMBA</td>
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<td>IT training and support/</td>
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<td>Social networking</td>
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<td>Overall experience of</td>
<td>online support</td>
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<td>29</td>
<td>Overall experience of undertaking the MBA</td>
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<td>Average of responses shown</td>
<td>16</td>
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However, it was surprising to see that in spite of the effort made for improvement after the first survey some areas did worse, including teaching by local institutions, and the referral procedure and the failure procedure. This indicated that further effort was needed to improve the experience of the students, though in part it might be that later students were more demanding, especially for services related to certain university procedures. Overall, the average percentage of respondents who rated the course as ‘excellent’ and ‘good’ on the topics included in this comparison improved from 63% in the first survey to 74% in the second. This was seen as a very encouraging finding, and justified the extensive work by all the parties involved to improve the design and provision of the course.

Note that other questions in the second survey were different from those in the first as many changes had been made in various aspects of the course after the first survey, and questions on these changes were incorporated in second survey to examine the impacts on the students’ learning experience. For example, more informative and meaningful module handbooks and ICT training guides were introduced, and questions related to these changes were added.

Some of the more significant changes that had been made to the programme following the first survey are discussed below, set against the findings from the two surveys to indicate how the gains mentioned above in student satisfaction were achieved.

The introduction of WIMBA: WIMBA was adopted since August 2008 to replace the Voice café system (voice over the Internet). WIMBA is an audio component to Blackboard courses enabling users to
record voice announcements and audio blogs, send email messages with embedded audio, and conduct live voice chat sessions. One student commenting on this after a WIMBA session said that “it is the best teaching session after the induction”. Regarding the WIMBA live classroom, the survey showed that the respondents who responded in the ‘excellent’ and ‘good’ categories were over 50%, and 30%, respectively. The students also liked the idea of archiving the WIMBA sessions as an additional eLearning resource, as it allows students (such as those who have missed a class) to see the archived files. BREO tracking statistics showed that for the seven WIMBA archives which were made available for one cohort of students during March 2009, there were 107 hits, which indicated that the students appreciated the effort the university had made to provide this facility. Most respondents considered WIMBA as the better eLearning supporting system, as the second survey showed that the students’ perception of WIMBA was significantly more positive than that for Voice Café (85% versus 37%).

Improved course delivery approach: A significant change made in the blended learning support system for the MBA programme was the restructuring of the format and timing of the online learning content. This was changed so that all content was presented online in a standard format, and made available weekly consistent with the learning schedule. This represented a significant change compared to the previous system where the key course material was provided on a CD for each module. In comparing the two elements (provision of CD ROMs versus material online weekly), the percentage of students viewing course provision as being ‘excellent’ plus ‘good’ increased from 64% to 73%. The respondents also liked the audio and video clips prepared by the UK tutors on specific topics, and 80% wished to have more such clips for each of the modules.

Improved course and module information: In the first survey, students expressed their wish that each module handbook provide all the information about the module, in particular, including details about the exams and assignments, and examples of good assignments. The format of all the module handbooks were therefore expanded and standardized, and as a result the students reported that they were clearer about requirements for assignments in each module that they took. In terms of response to the questionnaire, the positive response level for this area improved from 69% to 81%.

Provision of online training materials: Subsequent to the first survey, a range of training materials, including an ICT guide and audio/video clips for using the university’s digital library were developed and made available online to the students. As a result, in the second survey the students rated the MBA ICT guide, the WIMBA live classroom guidelines, the clips on digital library, and the Harvard referencing guidelines, as the most useful tools, followed by the guide for using Net-mail (the e-mailing system for students). Overall, the survey evaluation of ‘excellent’ plus ‘good’ for the training and supporting materials available rose from 46% in the first survey to 68% in the second.

Improved usability of the eLearning tool: As mentioned above, in the first survey one respondent had commented that BREO was “the most under-used tool”. However, after the changes were introduced, statistical tracking showed very high hit rate for the weekly online material for all the modules. For example, a total of 182 students from four randomly selected modules in Oman (semester 2 of the academic year 2008/9) showed a total of over 8047 hits within one week. These included the weekly online course content (6566 hits), WIMBA live classroom (657 hits), and ICT training guide (824 hits). This meant an average of 22 hits per student per week, more than doubling the number of hits (9 hits per student per week) before the change was made.

Additional online contact time: For each module, the UK lecturers on the programmes were assigned additional online contact hours to provide better support to the students, including the WIMBA sessions as discussed above. Comparison of the surveys indicated that student positive satisfaction of the online tutor support improved from 62% in the first survey to 81% in the second.

Assessment feedback: In terms of providing students with feedback on their assignments, the first survey showed 51% of the respondents rated this either ‘excellent’ or ‘good’. Subsequently, a great deal of effort was made to improve this area. There was improvement in this rating (to 62%), but this was still a fairly low score for a topic on which so much effort had been made. Some students felt that for some assignments the feedback was too general and not enough to help them improve future assignments. However, many students also acknowledged that some lecturers gave very good feedback. Clearly, given the constraints on lecturers’ time in all such courses, fully satisfying student demands in this area will always be a challenge.
Other topics: Other conclusions from the surveys included the fact that respondents were not keen on writing wiki-text and blogs on Blackboard (and neither were the lecturers!). In addition, students really disliked receiving the information on plagiarism and the use of Turnitin for submitting assignments (over 80% said ‘no’, only 9% said ‘yes’). By contrast, they much liked the examples of good and bad assignments for each module (80% said ‘very useful’ or ‘useful’); and while responses on the topics of referral, failure, and academic offence procedures, though positive, were not especially so.

In terms of the students’ overall experience of this blended-learning MBA, while the first survey showed that 66% of students graded this as ‘excellent’ or ‘good’, in the second this increased to 79% as a result of changes to the programme and its delivery. This was very encouraging, though - interestingly - not quite as good as the course providers had hoped, which indicated that there was more work to do.

5.3 The third survey

In 2010, a third round of surveys was carried out, covering the Oman, Germany and UK sites. Forty-nine valid responses were obtained. A number of questions in the third round were different again from the second, but there were 11 questions which covered the same areas as in the first and second surveys (see Table 3).The MBA programme had been further changed following the second survey, but not radically in most areas, so for many of the questions that were the same it is not surprising that the results were fairly similar. For example, for the key question that asked about the students’ overall experience of the MBA, there was a marginal improvement (from 79% to 81%), though this is unlikely to be significant. Some other findings were disappointing. For example, evaluation of the teaching at the local partner universities was again rated lower than previously (down to just under half of responses being in the ‘E&G’ category), but it is worth noting that over 80% of the responses of the second and the third rounds of the survey was from the same overseas site (see Table 1) which clearly show that the UK university needs to take some action to improve the situation. This fall in rating was partly counterbalanced, however, by a large jump in the rating of quality of local tutor support, reflecting the very significant effort that had been put into improving this area.

The third survey round comprised quite a number of individual surveys. For example, at the Oman site there was a mid-course on-line survey, and also a mid-course ‘off-line’ (hand-out and return) survey. In addition, students were asked to fill in an online exit survey at the completion of their course. And, as mentioned earlier, the questionnaires were ‘semi-structured’ in the sense that respondents could add comments to clarify or expand their questionnaire answers. Indeed, respondents were specifically encouraged to make comments (whether positive or negative) where they felt this could improve future course provision. All replies were useful. Most were fairly straightforward; and of course in some cases asked for additional resources (more tutor time, for example, or faster response on assignment marking) that were unlikely to be met without a fundamental change in level of staff provision. Some of the responses were particularly interesting. For example, Figure 1 indicates the response at one overseas site to the question: ‘How much do you feel part of the UK University?’ The positive reply was seen as very encouraging in terms of students’ alignment with the course.

![Figure 1: Number of responses by category to the question: ‘How much do you feel part of the university?’](image)
To a question about the credibility of prior publicity for the course, the response again was fairly positive, as indicated in Figure 2.

![Figure 2: Number of responses by category to the question: ‘Is the course as you were led to believe by the publicity you saw prior to enrolment?’](image)

And finally, one of issues raised related to the perennial question of assigning the proportion of group work to Individual work. One respondent put his concern eloquently: “The grave challenge I faced is the group assignments. Success of team work depends on choosing right members for the team. Everybody just formed teams in the first business school weekend where we didn’t have any idea about each other. The collectivist mentality of the local culture played a negative role in working with assignments. Free-riders carried on with ease at the expense of my own time and sweat ...”

Nevertheless, overall, the third round of surveys (and the two preceding ones) gave a generally positive picture of how the students felt about the course, with some highly complementary remarks being made when students were asked to summarise their general satisfaction with the course. Additional analyses of the survey findings are on-going which will help further improvements to be made.

6. Limitations and reflections on the research

Like all research, this research has a number of limitations. Perhaps the main one was the change in sites being surveyed at each round. As mentioned earlier, pragmatic considerations had led to these changes in survey sites, including the timings of when courses were offered, and suitable occasions on which student surveys could be carried out without interrupting teaching schedules. For this reason, the comparability of responses between survey rounds needs to be handled with some caution. But set against this, in general the courses were being taught to students of a rather similar level across all sites and with similar expectations, such that it is felt that, on balance, useful conclusions could be drawn.

A second limitation was response rates, though these were fairly good for a survey of this kind. It had been decided at the outset not to make the surveys mandatory in order to ensure responses only where students were motivated to respond. But this opened up the possibility, indeed the likelihood, of ‘self-selection’, responses coming from more active students and those with especially good or bad experiences to report. At Oman the questionnaires were mainly on a ‘hand-out and return’ basis and
here the response rate across all three surveys was about 75% for the particular cohort surveyed (totalling typically about 40 students each cohort). But Oman had four such cohorts studying in their different semester of the two year course, so the response rate across all students would fall to just below 20%. There was no reason to think other cohorts would respond to the questions differently, but the fact is that they were not surveyed. At the other sites, the student numbers were smaller (India typically about 30; UK about 13; Germany 9; and Poland 37) such that the response rates were about 60% (first survey) and 25% (second survey) for India, 40% for UK, 60% for Germany, and 25% for Poland.

In terms of continuity of the survey, there were indeed changes in the question sets over time. But this is not thought to be a major impediment to the overall value of the surveys. This was because the questions were largely straightforward, and mostly did not involve a high emotional context, where specific phasing of the question might have affected the answers given. In addition, most of the changes to the question sets were determined by factors such as being no longer relevant (the situation having already changed), or where new questions were designed to measure changes made after the previous survey round.

In summary, common-sense considerations (including directness of the questions, number of students surveyed, and non-mandatory nature of the surveys) indicate that the results are robust, but it has not been possible to quantify this. The surveys will continue, and as more results become available greater effort will be put into ensuring inter-comparability of the survey findings.

7. Conclusions

The paper reports on the design and evaluation of a blended-learning MBA programme provided by a UK university at a number of partner-institution sites around the world. The evaluation was based on a longitudinal study involving a sequence of surveys of students’ perceptions of the course. Findings from these surveys, plus other internal review procedures, were used to make changes in both course content and course delivery approach.

The research is contrasted with much of the research into the evaluation of eLearning courses which has relied on data gathered just once, and where cross-sectional designs have been applied. By contrast, the longitudinal approach employed here has enabled the charting of changes over time, thus enriching the process of course design, and monitoring the changing satisfaction of students and other stakeholders.

Overall, the survey findings indicated a high level of satisfaction with the MBA programme, and this satisfaction increased following the changes made to the programme. In particular, the findings supported the many detailed choices made by both the providing university and the partnering institutions in the provision of structure and content of the blended-learning approach adopted.

The findings also give credence to the view that such an approach is particularly suited to postgraduate-level MBA provision for students currently in management employment, because such students are relatively mature, already business-aware, conversant with information technology, and have access to the eLearning facilities and resources required (Priestman 2010). The findings furthermore support the claim of Gurău and Drillon (2009) that student feedback can provide valuable data to evaluate and improve the functioning and performance of an eLearning system.

Rajasingham (2009) concluded that educational paradigms that challenge conventional teaching methods are becoming increasingly possible with the help of the increasing sophistication in information technology. The authors of the current research recognise that student satisfaction reported for this course emanate in no small measure from design and implementation approaches made possible by this improvement in information technology. Moreover, by identifying areas for course improvement, this research has attempted to implement the concept of ‘evaluation as an instrument of quality enhancement, rather than just quality assurance’, as suggested by Deepwell (2007).

Finally, it is hoped that the outcomes of the evaluation of eLearning in this research have improved not only the quality and effectiveness of this particular programme, but also will provide valuable guideline to help improve the quality and effectiveness of the teaching and learning processes (Phipps, 1999) of global eLearning or blended courses offered by other institutions across the world.
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Scaffolding Teachers Integrate Social Media Into a Problem-Based Learning Approach?

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Abstract: At Aalborg University (AAU) we are known to work with problem-based learning (PBL) in a particular way designated "The Aalborg PBL model". In PBL the focus is on participant control, knowledge sharing, collaboration among participants, which makes it interesting to consider the integration of social media in the learning that takes place. In this article I would like to depart from the use of this pedagogical model, which integrates social media. The article will look at a learning design model, which could be a spring-board scaffolding teachers at AAU in their pedagogical approach to learning design when combining the PBL approach with social media or web 2.0 activities or/and technologies. With regard to the discussions about PBL, three important characteristics of PBL can be extracted; the problem, the work process, and the solution, which can be used to distinguish between various theoretical and practical constructions of PBL – regardless initially of whether it is collaborative or cooperative. The three dimensions can then be thought of as stretched between two ends of a continuum between teacher and participant control. These fundamental questions of ownership and control seem also to be more generally applicable in relation to wider debates about social media and learning. The learning design model is based on the collaborative eLearning design (CoED) method. The CoED-workshop methodology aims to support the design of targeted networked learning. The method scaffold the design work of practitioners and has been developed and tried out in a number of different settings. Drawing on knowledge and theoretical concepts within the fields of design, systems development and collaborative learning, emphasis is on bringing focus and structure to the early stages of the design process. The method aims to develop design specifications and/or early prototypes within a few hours of starting work. In order to achieve one of the objectives of my PhD, I aim to further developing and elaborate on this method, which hopefully will lead to a pedagogical design method scaffolding teachers in their learning designs, taking into account the PBL approach and integration of social media and web 2.0 technologies. This article will be based on theoretical and methodological considerations within PBL, social media and web 2.0 technologies, together with learning designs trying to illustrate a pedagogical design model scaffolding teachers in their learning design when integrating social media and web 2.0 technologies into the PBL approach at AAU. The method has been tried out at the Faculty of Social Science, AAU during Spring 2011 and the article will present some of the preliminary findings in this.

Keywords: social media, web 2.0, PBL, learning design, CoED

1. Introduction

At Aalborg University, we are known to operate within a problem-based learning (PBL) or problem oriented project pedagogy (POPP) approach to what we call “the Aalborg PBL model” (L. Dirckinck-Holmfeld 2002; Anette Kolmos et al. 2004). Originally, this Aalborg PBL model had it historical roots in critical theory and, in particular, in the work of the German philosopher and sociologist Oskar Negt (Negt 1971). Negt's work gained a lot of interest in Denmark and problem oriented project based learning (POPBBL) was developed from this inspiration. It has been expanded in different ways from the early days at the beginning of the 1970s, when it was implemented both at Roskilde University Center (RUC) and Aalborg University (AAU) as a framework for learning. (L. Dirckinck-Holmfeld 2002; Anette Kolmos et al. 2004) It's still expanding in different directions as lots of initiatives are forming new ways of engaging in the PBL or POPP approach. At AAU we are trying to gather all of these experiences and ways of engaging PBL in a PBL Academy¹.

The PBL approach in the Aalborg model is distinguished from the more traditional understanding of PBL with regard to its fundamental principles. The fundamental principles within the Aalborg PBL model, within the theme of a semester, build on the meaning of negotiation in relation to the formulation of an explicit problem and the enquiry into problems. A semester lasts for half a year (5 months approx.), and each semester has a defined theme or framework as part of its plan, in which both course work and project fieldwork have to feature, each accounting for 50% of the allocated time. Furthermore, the courses are intended to underpin the theme or framework of the semester for the students to substantiate theoretical argumentation into their shared project report. The groups are assessed or evaluated on basis on their process and substantiation on theory in the final project.

¹ The PBL Academy at AAU - http://www.pbl.aau.dk
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examination. The final examination at the end of each semester is based on both a group exam and individual exams on the shared project work. The project work and the definition of the problem are built on the students' curiosity and their wanting to find answers to the problems or hypothesis they have formulated themselves within the theme of the semester. The curiosity, wonder and inquiring approaches of the students are important, because they contribute towards a high degree of ownership and engagement in the learning process together with what you might call student control or learner self navigation. In the Aalborg PBL model, the approach is reciprocally binding in that the students in groups define a problem, then undertake research in the problem field and finally prepare a shared report accounting for the findings. Groups are generated on negotiation among the students on topics inside the theme of the semester and further based on shared interest in the problem negotiated. The process of generating the groups takes place among students themselves facilitated by the teachers, and the process often takes one or two days, where topics are presented, negotiated and problems formulated. Groups are often of variable size. In courses PBL is represented in different kinds of activities that to a higher extent are teachers controlled. From this perspective, the Aalborg PBL model can be seen to be very much a learner active and collaborative pedagogy, which requires interdependency between participants in the learning situation, together with motivation, support and facilitation both in project work and in courses from the teachers in the learning process. (Ryberg et al. 2006; Anette Kolmos et al. 2004; A. Kolmos et al. 2008).

The important perspectives in PBL agreed by the authors are, for example, the design of the problem, who formulates the problem and who is responsible for the major decisions in relation to the problem solving process (teacher or participant directed). Also, they highlight the importance of experienced learning, where students build on their own experiences or practices, and the notion of learning through active engagement in actual practices or real-world problems involving research activities, negotiation of meaning, decision-making and shared writing. In addition, some stress the principle of inter-disciplinarity, which is related to the principles of problem orientation, and participant directed processes, as the solution of problems can exceed traditional subject-related methods and boundaries. There is also an argument that group work and collaboration are important principles in supporting the meaning of negotiation in, for example, the Aalborg PBL model, though other authors argue that PBL can be more individualized, but in general they also point to differences in the understanding of collaboration, and the way in which students are mutually interdependent. (L. Dirckinck-Holmfeld 2002; Anette Kolmos & Graaff 2003; Savery 2006; Savin-Baden 2007).

Although the problem-oriented, project-organized learning approach has been successful at Aalborg and, as mentioned above, over years has proved to work well, there are also reservations about the full use of this approach.

1.1 Research objectives

In my research, I would like to bring this into focus by looking at the learning possibilities when integrating social media/web 2.0 technologies and/or activities in a PBL approach. I will claim that social media and web 2.0 provide an interesting perspective, looking at factors such as collaboration, student activity and participation in PBL. During my research, I have found that it is important to scaffold teachers in the design or redesign of learning practices, and, in addition, when integrating social media/web 2.0 into their learning practices.

2. What is social media/web 2.0?

As indicated above, looking at PBL and the possibilities for students being active, participative and collaborative makes it interesting also to look at social media and web 2.0 and I would like to begin by defining web 2.0 and learning in order to identify the crossover between the two. Crook et al. (2008) in a Becta report mention different reasons why web 2.0 technologies could potentially benefit current teaching practices. Firstly, young people are already using web 2.0 technologies in different settings, so far mostly private. Secondly, web 2.0 activities are understood to be important from a theoretical learning perspective (Crook et al. 2008, p.29). Particularly qualities such as the centrality of participation, production, dialog, and collaboration make web 2.0 activities ideal to actively engage learners, individually as well as collaboratively. Thirdly, there is a match between current policy and curriculum goals where terms, such as “enterprise 2.0 reflects web 2.0 technologies” are also important in the modern economy (Crook et al. 2008, p.72). Finally, the user-centered focus of web 2.0 activities supports users in creating and maintaining connections between formal as well as informal learning arenas (Dohn 2009, p.344).
But how do we actually define web 2.0? While a multitude of partly overlapping definitions of web 2.0 exists, I have identified two more overarching perspectives or ways of understanding web 2.0, and ways in which it has been practiced, e.g. Anderson defines web 2.0 as:


(...)

From this definition, web 2.0 is understood as a set of technologies, but also as a range of activities with certain characteristics, therefore one can distinguish between web 2.0 technologies or resources as, for example, blogs, microblogs and podcasts and web 2.0 activities or practices, such as blogging, podcasting, and micro-blogging. This distinction has been further explored by Dohn (2009) who has defined web 2.0 as a range of activities or practices, rather than technologies characterized from issues such as collaboration, distributed authorship, openness, activity, lack of finality, based on the internet, etc. (Dohn 2009, p.345).

With the distinction between technology and activity it is important to emphasize that using a blog, for example, as a technology or resource in teaching does not necessarily make it a web 2.0 activity. Rather this involves engagement with the practices or values mentioned above, and thus entails more than merely employing a particular technology. However, I agree with Dohn that “a web 2.0 activity” is a matter of degree, meaning that an activity does not have to be characterized by all of the points in the list above (except the last one which Dohn argues is a necessary condition (Dohn 2009, p.345).

Dealing with a practice perspective on web 2.0, Dohn stresses that it is not technology in itself, which is important but the skill-relative affordances it poses for the learner. In relation to this it is important to note that skills and affordances develop from the skills of the learner and the practices s/he is already engaged in, and the understandings with which s/he agrees (Dohn 2009, p.347). Consequently, to design web 2.0 mediated learning Dohn argues that one should build on existing practices and skills and make them more web 2.0 oriented (Dohn 2009, p.348). However, there are tensions between educational practice and web 2.0 practices at different organizational levels, which it is also important to address. In an educational practice it is expected that everybody contributes equally in, for example, group work, but in a web 2.0 practice there is an unequal division of labor, and it is possible to be what one could call a “free rider”.

At AAU, where collaborative group work is an important factor in the pedagogical approach, this issue could be of importance in addressing learning design based on web 2.0 technologies. Another tension is assessment; whereas in assessment teachers and examiners are represented, in web 2.0 practices it ought to be the users themselves. It is an interesting thought, but, so far, not really realistic in educational practices. Furthermore, we need to decide on the parameters within which to assess, e.g. product vs. process or participation vs. content. It might, however, be possible to assess both, but it is important this is clearly communicated to the learners.

Overall, one might add that the shift from web 1.0 to web 2.0 within an educational context can be characterized as a shift in participant control in relation to different aspects of the learning activities. Curriculum-based strategies normally designated as teaching, aim to provide the student with a relatively fixed amount of agreed knowledge, with a focus on content, teacher control and instruction. Problem-based strategies normally designated as learning, on the other hand aim to provide the student with abilities to acquire knowledge appropriate to problem solving.

In the Aalborg PBL model the focus is on participant control (Bygholm & Buus 2009), which also could illustrate that a transition from curriculum-based teaching to PBL entails a movement from a teacher-centered approach to a more learner-centered approach (Jones & L. Dirckinck-Holmfeld 2009; Ryberg et al. 2006). Further, this move in many ways could be compared to the conceptual move from web 1.0 to web 2.0, and again some see this as a transition from “users/learners as consumers” towards “users/learners as producers” (Redecker 2009). Conole (2007) identifies this transition as part of three broader shifts, which are related to an emerging interest in the social potentials of technologies, partly due to the emergence of web 2.0 technologies. In essence, this suggests that there are three fundamental shifts: a shift from a focus on information to communication, a shift from a passive to a more interactive engagement, and a shift from a focus on individual learners to more socially situated learning (Conole 2007, p.82).
2.1 Combining PBL and social media/web 2.0 into "web 2.0 mediated learning"

As stated earlier, PBL is a student-centered pedagogy, focusing on students being active and collaboratively contributing to production of knowledge through engaging with real-world problems/cases. Although there are differences in how PBL is carried out in practice, one can also find some general traits which involve research and empirical activities, often in collaboration with peers; i.e. that problems are the starting point for the learning process; that students should build on their own experiences and learn through active engagement primarily within real-world problems (or cases). Numerous PBL scenarios may be developed for different settings. However, one of the central aspects identified in research about PBL, is how power is distributed between teachers and students across three dimensions: the problem, the work process, and the solution (Ryberg et al. 2010). Taking these three aspects into ones reflecting in the design of learning practices scaffolds teachers or course-designers in developing PBL practices, which are congruent with new learning practices and institutional demands.

Some of the core concepts associated with the definition of web 2.0, such as collaboration, participation and sharing, are well aligned with PBL. As stressed earlier, I find it useful to distinguish between web 2.0 as a range of technologies (e.g. blogs, podcasts, wikis) and web 2.0 as particular practices or activities (e.g. blogging, podcasting, collaborative writing). This distinction is emphasized in that employing a web 2.0 technology does not necessarily entail pedagogically innovative web 2.0 practices. For example, a teacher may create a blog and then use it only to disseminate information to students, not allowing students to write or comment. Therefore, web 2.0 learning is not only about using particular technologies, but equally about the degree to which teachers adopt more student-centered, participatory or collaborative practices.

Consequently, it makes good sense to connect web 2.0 with a problem-based approach to learning, but at the same time, new tensions and challenges arise. Particularly questions concerning power distribution between students and teachers become pertinent when combining student-centered pedagogies and web 2.0 learning practices. Glud et al. (2010) undertook some research within web 2.0 mediated learning taking point of departure in the aspect of power in PBL settings and mapped such tensions across four central dimensions, which practitioners can use to reflect on their design and values (see Figure 1):

![Figure 1: Web 2.0 mediated learning tensions between teacher and learner](image)

The line between teacher and learner at each tension illustrate the possibility to slide between these considering the relation of power or control within each of these tensions. Taking these four dimensions into consideration can provoke questions in relation to who controls the flow in the learning process, e.g. should students be self-directed learners, who defines the problem to be investigated, who decides which web 2.0 technologies/activities to use, what is the position on copyright in a web 2.0 sphere, etc.? When adopting student-centered pedagogies and web 2.0 practices, it is increasingly important to reflect and decide on such issues of control or power when designing for learning. These aspects are more often employed in informal learning settings, in intra-organizational training or for purely social purposes. I believe that questions similar to the before mentioned are to be addressed when designing web 2.0 mediated learning environments; different answers may be given depending on the different learning settings and goals.
3. Implementing a Collaborative eLearning Design Method (CoED)

Designing for web 2.0 mediated learning taking into consideration different aspects of control and what kind of web 2.0 based activities and/or technologies could underpin the PBL approach I will claim that some kind of method are needed to scaffold the teacher in their learning design process. As part of my research, I have been conducting a design workshops based on a Collaborative e-Learning Design Method (CoED) inviting teachers for a dialog about web 2.0 mediated learning activities within the frame of PBL and integration of social media/web 2.0 technologies into their learning practices.

The CoED-workshop methodology aims to support a collaborative design process among experts within their different domains, qualification levels and subjects, respectively. Emphasis in this method is on bringing focus and structure to the early stages of the learning design process, scaffold the different domain experts in sharing ideas, knowledge and inspire and further the method aims to concrete develop design specifications and/or early prototypes within a few hours of work (Georgsen & Nyvang 2007; Buus et al. 2010). One notion from experiences among researchers using this method is that the usability of the early prototypes depends, of course, on several factors, as I further will touch upon in this paper, but first I intend to describe the method.

CoED is a common methodological framework drawing on research in three important research fields. “Systems development – because we design (for) information and communication technology” (Georgsen & Nyvang 2007, p.5).

Theoretically, development of the design tool draws on inputs from systems development stressing the importance of working in non-linear ways and rapidly producing tangible designs (Beyer & Holtzblatt 1997; Dahlbom & Mathiassen 1993). “Collaborative learning – because we design for learning and learn in the design process” (Georgsen & Nyvang 2007, s.5).

From the theory on collaborative learning, CoED builds on an understanding of learning as a form of practice, which involves negotiation of meaning, and where active participation becomes critical (Wenger 1998). “Facilitating creative processes – because the aim is to develop something new” (Georgsen & Nyvang 2007, s.5).

Within the domain of facilitating creative processes, the methodology incorporates well-known elements within design and systems development, such as card sorting and future workshops (Kensing & Madsen 1991).

In overview, the methodology takes participants through three phases in the design process which 1) leads to clarification of the philosophical, pedagogical and educational values underpinning the design; 2) assists the participants (learning designers) in choosing the appropriate blend of technologies, learner and teacher activities, and learning materials or resources; and 3) makes it possible to produce rapid prototypes using low tech materials and all within a short period of time.

The CoED design methodology has been developed, used, evaluated and further developed in a variety of educational, institutional and organizational contexts. In expanding the method into different contexts, a range of challenges and issues in relation to further development of the methodology has been identified. Among others the challenges of:

- Adjusting the design tool to different domains;
- Supporting and facilitating the process for groups with an unbalanced mix of pedagogical, technological and domain or content related expertise;
- Successfully communicating the results of the design workshop to relevant actors to enable the developed prototypes to be carried out in the learning practices of participants;
- Challenging the beliefs of both experienced and inexperienced practitioners to pave the way for change; and
- Make sure about testing and designing for sustainability.
3.1 CoED as inspiration for the workshop design

As mentioned in the earlier section above, the CoED method works by leading participants through three phases in the design process. The method will be part in a workshop design; inspire teachers integrate social media/web 2.0 into their learning practice.

Since 2007 the E-learning Unit at AAU together with the IT-department has been in the process of implementing Moodle as a virtual learning environment (VLE) in several departments of the Faculty of Social Science at Aalborg University (AAU). Moodle is a Modular Object-Oriented Dynamic Learning Environment (www.moodle.org), and the possibilities for using Moodle in different learning practices seem interesting. Further Moodle is building on a social constructivist pedagogical approach, which also encompasses in the PBL approach. Moodle also features some web 2.0 technologies such as weblog and wiki technologies. Considering Moodle as a supplementing technological component in challenging the teachers in designing web 2.0 mediated learning, combined with presenting, importing or using other web 2.0 technologies in their learning practices, challenges their designs for learning. Therefore in Spring 2011, an optional design workshop was arranged for teachers interested in challenging their own learning practices. The workshop was inspired by the CoED method as a kick-off, but I think of it more as a process, taking into consideration the issues and challenges identified using the CoED method.

In the following I will describe the intentions within the three phases, and following how I used the method in a design workshop with invited teachers from the Faculty of Social Science at AAU.

In phase I of the design process, the idea is to focus the design activity in relation to the overall approach to and understanding of learning, domain, and technology (Georgsen & Nyvang 2007). In the workshop I, as facilitator will invite different domain experts to present to the participants the key issues in pedagogical design of, for example, web 2.0 mediated learning. This is done to focus the attention on the philosophy of the design, which concerns (Georgsen & Nyvang 2007):

- The understanding of learning (with ICT)
- The understanding of the domain (learning practice), and
- The understanding of PBL and web 2.0 activities and technologies and the role they play in both the design and learning processes together with the continua for web 2.0 mediated learning.

As earlier mentioned, the characteristics of web 2.0 based activities fit well with a learning approach based on PBL. Therefore, the focus in this first phase related to the aim of designing for web 2.0 mediated learning intended to lead the participants to an understanding of PBL and different kind of web 2.0 technologies and activities for them to further exploit these in the actual design. The intention here was to brush up on the Aalborg PBL model and PBL in general, so as to focus on learning. In addition there was a presentation of web 2.0 technologies and possibilities within activities, both experienced and hypothetical, researched and analyzed.

In phase II of the design process, the goal is to discuss and identify the overall values and principles guiding the design by using a card sorting method (Georgsen & Nyvang 2007). One approach is iterations where the participants prioritize pedagogical value cards into groups of: 1) the most important, 2) the important, 3) the less important, and 4) the unimportant. During the iterations of card sorting, it is important that participants have the opportunity to discuss the chosen teaching/learning values by reflecting on questions related to the four continua: the learning process, the motivation, the infrastructure (e.g. the system) and the resources/content. The continua was presented in the first phase, not directly presented to the participants in this second phase, but the intention was that the continua also were built into the design of the particular cards used. In the preparation phase before the workshop I hopefully thought the participants through these discussions would discover the consequences of the learning approaches, while at the same time making it possible to see which dimensions in relation to web 2.0 related to their own learning practices they needed to consider. Moreover, the phase would help the participants sort out contradicting cards. In this way, answering the questions might help focus the process towards choosing the final learning values.

In phase III the focus is on developing a detailed learning design building on the values and principles prioritized in phase II. In this phase the participants are divided into two or more groups or design teams depending on the number of participants. For this phase, there will be a facilitator asking critical questions supporting the group in formulating a design (Georgsen & Nyvang 2007). It is important to
focus on the chosen values and bear in mind the questions relating to the four dimensions (Glud et al. 2010). To guide the dialog with regard to the more detailed design, participants will be working with a set of cards illustrating three factors relevant for pedagogical, technical and domain-related issues: resources, activities and infrastructure (Georgsen & Nyvang 2007, s.11). A considerable proportion of these cards will represent the tensions, concepts and models identified in an earlier project dealing with PBL and web 2.0 (Glud et al. 2010; Ryberg et al. 2010), e.g. possibly “student owns problem” or “teacher owns solution”. Based on these descriptions, designers could work to transform user practices and experiences with domestic and recreational use patterns into new educational practices.

As mentioned one of the challenges identified throughout other projects using CoED are the lack in testing the design and the sustainability of the results gained in the workshop. Therefore, it is necessary to bring the scaffolding of the teachers further in the complexity to transform the developmental ideas established in the workshop into an actual learning practice. This process is not part of the CoED method as such, but it will constitute a maybe essential extension of the method. Therefore regarding my research I extended the method to also deal with the transforming process after the one-day workshop. Following up on the design ideas developed during the workshop and from that start the modifications in the teacher’s individual learning practices.

More specifically, the extension will involve taking part in the process after the one-day workshop by following up on the design ideas or maybe only one particular activity from the learning design developed during the workshop and helping the teachers implement and cope with modifications in their individual teaching practices. This should provide the necessary scaffolding for the teachers.

The empirical investigation in my research tends to utilize data collected whilst following the CoED extended process in both real life and virtual settings. In addition, individual interviews will be conducted; primarily with the teachers, and secondarily with a number of students in order to get their perspective on participating in web 2.0-mediated educational activities.

### 3.2 Preliminary results from the workshop and in the resulting scenarios

The kick-off workshop was established in Spring 2011 and from invitations sent out to teachers (approximately 160 people) at Social Science, AAU twelve people assigned for participation in the workshop, whereas only seven attended on the workshop day. The intention was to promote teacher awareness of web 2.0 activities and facilitate them in such activities into their teaching practice. Participation was voluntary as was participation in the extended process illustrated in Figure 2.

![Figure 2: The flow in the empirical investigation.](image-url)

In the first phase participants were presented to different perspectives and considerations in web 2.0 mediated learning, the four continua, and different web 2.0 technologies. Further they were presented to some web 2.0 based activities and research-based experiences integrating this into a learning practice. The participants all had experience with the PBL approach used at AAU. For the second
phase the participants were divided into four groups during the first iteration on negotiation of pedagogical values and methods and merged into two groups for the second iteration. The two groups from the second phase continued their collaboration in the third phase where they discussed a learning design for an actual course. The result from the kick-off workshop was two different designs based on the same case consisting of existing courses. The designs reused some of the activities already integrated into the existing courses, but also integrated new ideas based on web 2.0 technologies and web 2.0 based activities; like the usage of a blog for students dialog, YouTube for video presentation, students rating each others post or assignments in a forum, and so on.

Based on the dialog and ideas formed at the workshop three teachers assigned for further collaboration on activities based on social media or web 2.0 activities they intend to integrate in their learning practice. From there three scenarios were developed. For my research I was invited to follow all three scenarios in order to further investigate teachers’ use of web 2.0 based activities in educational settings. The first two scenarios were conducted during Autumn 2011 and the third one will be conducted during Spring 2012. Further I was supporting the teachers in different ways with technological issues, pedagogical guidance and presentation of web 2.0 tools for educational purpose. My methodological approach induced within the field of action research (Zuber-Skerrit & Fletcher 2007). The scenarios all take place in a blended learning environment subsidised by the Moodle e-learning platform and where the use of web-based tools are used to complement lecture time.

In one scenario, the teachers seek to integrate a blog into their lectures to support the students in collaborating and sharing work among their groups connected to the lecture content. This is done during the lectures as a learning experience for a final two-day workshop where the groups have to apply different theories to the same case and discuss these theoretical issues on the blog. By contributing their different case analyses to a collaborative platform, the differences between the theoretical approaches (and their practical implications) become perspicuous. Such collaboration potentially is beneficial for all students. The aim of the lectures was to practice such a collaborative approach and thereby support the students in gaining an understanding of what knowledge sharing means. In this scenario, the teachers needed to deal with around 140 students divided into two teams for their lectures. In the theoretical workshop, all students were present in a joint workshop session during a two-day period.

The second scenario actually consisted of two activities in parallel. In scenario 2a, unlimited supervision in relation to a small group project within the course is offered to the students, provided the supervision takes place using a blog/forum/group feature which supports sharing and collaboration among students. The class voted for where the supervision should take place, and the outcome was that a Facebook group was established for supervision. The following was posited by the supervisor/teacher as prerequisites for getting supervision from the supervisor: 1) The students should use the Facebook group created and 2) At least one of the fellow students should try to answer or give good ideas before the supervisor gave his feedback.

Scenario 2b was giving the students a presentation to two web 2.0 tools for sharing and collaboration, which could support them as a whole group and as smaller groups in sharing and collaborating. As part of this scenario, I was asked to give a short presentation on the web 2.0 tools illustrating the ability of integrate and use these in educational settings for collaboration and sharing in project work and lectures. The tools presented were Diigo (a social bookmarking tool) and Zotero (a social reference tool) as two tools among others similar tools, they could benefit from in their collaboration both in courses and project work but also as individuals. This group of students are coming with many different educational backgrounds, as 2/3 of the students are international students attending this master class. The group counts 67 students in total. This course is a five-week intensive course finalised with a group report based on collected data from a questionnaire.

The third scenario deal with students being able to ask questions or comment on theoretical questions and issues coming up during lectures using a same time web 2.0 tool called Etherpad. This activity is going on during the course and gives the teacher a view of where the students have issues related to the theories or methods introduced during lecture. This scenario will as mentioned earlier take place

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2 http://ietherpad.com - is a web 2.0 based tool given multiple people the possibility to edit the same document simultaneously, any changes are instantly reflected on everyone's screen. The tool is to be used as way to collaborate on different kinds of documents, etc.
in a course during Spring 2012, and therefore no further data from investigating this can be presented.

As the collection of empirical data has just terminated which is why only preliminary results are available based on informal dialog with the teachers. From the first scenario the teachers has stated that the setup for this activity only was possible due to the support with the technical issues and the collaboration with the researcher about ways to go about integration of web 2.0 based activities. Time is also a factor to consider when designing the activity, but the benefits seen from a students perspective to some extend compensate for this. In the second scenario the teacher expressed a great satisfaction in the way this activity proceeded, but also stated that for the next setup there needed to be more facilitator engagement by e.g. contributing with methodological and theoretical questions for establishing discussion and dialog in the groups and among the students.

4. Conclusion

In this paper, I tried to raise the question “How can teachers integrate social media/web 2.0 into a PBL approach?” and “What is needed to scaffold teachers in doing this?” focusing on investigating the learning potential as part of my research question. The intention has been to present a design model or method, scaffolding teachers in integrating social media/web 2.0 into their learning practices. I have tried to illustrate and discuss important considerations in the design process, together with arguing that integrating web 2.0 technologies (tools) and practices (activities) into a PBL approach makes good sense, as the main interpretations of social media/web 2.0, highlight more social, student-centered, collaborative and production-oriented pedagogical strategies, which align well with most interpretations of PBL.

One important thing I have identified is the importance of actually making teachers aware of new possibilities in ones learning practices with integration of social media/web 2.0 and the technological challenges teachers face. Further the tension between educational practices vs. social media/web 2.0 practices, which could have a great amount of influence on the design and the use of social media/web 2.0 in a learning practice.

Implementing Moodle at the Faculty of Social Science as its VLE already entailed new learning practices for some teachers and there are already technologies in Moodle supporting web 2.0 activities. However, the teachers do not use these possibilities, which I hoped to challenge further by offering a workshop followed by individual incentives. It is important to scaffold teachers in the learning design, development and implementation of these changes and modifications in their learning practices. Former research and experiences in, for example, using the CoE D method have shown that one hurdle is the successful communication of the results of the design workshop to relevant actors, and the bringing of the design into a sustainable learning practice. I have chosen to elaborate on the design workshop method by doing action research and intervene in the teachers’ integration of web 2.0 mediated learning activities. I follow the process and evaluation of the learning potential in implementing and using social media/web 2.0 by doing interviews and questionnaires. So far only preliminary results are available, but they underpin the fact that teachers need scaffolding when challenging their learning practice into integrating web 2.0 or social media mediated learning activities.

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Personal Devices in Public Settings: Lessons Learned From an iPod Touch / iPad Project

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Abstract: Our paper reports findings from a two-phase deployment of iPod Touch and iPad devices in a large, urban Canadian school board. The purpose of the study was to gain an understanding of the infrastructure required to support handheld devices in classrooms; the opportunities and challenges teachers face as they begin to use handheld devices for teaching and learning; and the opportunities, challenges and temptations students face when gaining access to handheld devices and wireless networks in K – 12 schools. A mixed method approach was used: online survey, monthly professional development activities with teachers, collected samples of lesson plans and student work, and regular classroom observations. Phase 1 findings (exploring only the use of the iPod Touch devices) suggest participants (students, teachers, and IT support staff) preferred a range of devices for a variety of commonplace tasks. They indicated they would select the iPod Touch for recording voices / sounds, listening to podcasts, and playing games. They preferred a laptop for searching the Internet, creating media, and checking email, and they selected paper or traditional options for drawing, reading, and tracking work / maintaining an agenda. Sixty percent had never used the device prior to the project. Despite that surprising finding, 70\% of respondents felt it took less than hour to become familiar with it. However, this question did not probe comfort levels with the syncing / charging, iTunes’ account management side of use, and herein lay a challenge. In order to use personal devices in school settings, the school / district needed to create a common iTunes account and dedicate a computer to sync, share, and organize applications (apps), content, and system settings. This common account formed a “digital commons” of sorts; a place where participants had to negotiate what apps to share and permissions and access protocols. Participation in the commons required an ongoing exploration of what digital citizenship meant in classrooms and how this impacted teacher’s work, parental responsibility and changes in disciplinary approaches for administrators. Year 1 of Phase 1 yielded a wealth of data. Specifically, the iPod Touch devices were well received and well used by the majority of participants in the elementary and junior high settings. The high school students and teachers were more critical, as both appeared to struggle to find educational uses for the devices. Further, high school students initially appeared to “resent” the intrusion of school issued personal devices. Phase 2 continued to work with the Phase 1 participants and added the deployment of the iPad devices in three additional schools. Probably the most interesting finding was the lack of familiarity of these devices by all the participants. We anticipated many would have owned similar devices and be proficient in their use – this was not the case.

Keywords: mobile technology, personal devices, digital citizenship, ICT deployment, ICT infrastructure

1. Introduction

There is so much hype concerning the use of handheld technologies (iPod Touch, iPad, mobile phones, etc.) in schools. “Hyped technology artifacts are distinct from other innovations and product launches because they are surrounded by extravagant publicity” (Hedman & Gimpel, 2010, p. 161). Further, they note that once the “hype declines, the products become part of the normal everyday landscape” (p. 162), and identify five values that underlie consumer choice: functional value, social value, epistemic value, emotional value, and conditional value. Simply put, functional value relates to how an item meets a need; social value relates to the image connected with the item; epistemic value relates to curiosity about the item; emotional value is tied to wanting the item for its aesthetics; and conditional value is related to a specific context or need.

Vendors, such as Apple Education and Microsoft, would suggest that the mere presence of innovative devices and associated software alone could provoke and promote systemic education reform while those critical of the integration of ICT (Cuban, 2001; Stoll, 1995; Schrum & Glassett, 2009) suggest the investment of ICT in schools has been a failure or at least has been met with mixed results. Dexter, Anderson and Becker (1999) state, “Many educators and policy makers believe that technology can be a catalyst for educational reform”. They suggest that the use of technology in classrooms will shift the roles of teachers and students, and cause teachers to act more like facilitators.
Our research findings are not hyperbole and tend to refute Prensky's (2001) notion that children and young teachers (digital natives) can more easily incorporate new technologies into their work and activities. The young teachers involved in both phases of the project did not intuitively understand how or when to use these powerful devices in their work and, ironically, had no prior experience with them before the project began. However, the students and teachers were thrilled at the prospect of having these devices to use and they all bought into the hype of what the devices might actually do. Further, the older teachers in the project were not at a disadvantage using the new technologies and actually tended to make strong curricular links in terms of classroom practice. This was consistent with our earlier findings on generation and career stage with teacher laptop computers in the same school board (Pegler, Kollewyn, & Crichton, 2010).

2. Background

This study was situated in a large, urban Canadian school board. The board has distinguished itself by consistently investing in both its people and infrastructure and exploring innovative methods of teaching and learning. For example, all full time classroom teachers have been provided with laptops and supported by online professional development. The deployment and success of this initiative has been showcased across the province and nationally as well. For the past ten years, continuous, free professional learning opportunities have been embedded in the schools themselves as well as being available in a distributed format through the district's learning management environment. As incentive to encourage teachers to take advantage of these opportunities, the local university has collaborated with the school board in course design and offered graduate credit for the completion of some of the professional development opportunities.

The majority of the classrooms in the school board have interactive whiteboards in addition to a variety of other technologies. All schools are wireless and are in the process of adding an additional network to accommodate students and teachers bringing their own devices into the classroom. In short, the pedagogical and physical environments were well positioned to explore mobile learning options and support ICT enhanced teaching and learning.

The school board assembled an ICT integration team whose primary purpose is to support the meaningful adoption and integration of educational technologies in the classroom. This team works with IT support staff, teachers, and partners from industry and the university to integrate innovative practice with both theory and classroom realities. Typically, when the district considers the adoption of an innovation, such as the iPod Touch or iPad, it crafts a pilot project jointly managed by a researcher from one of the local universities and members of the ICT integration team. This was the case with the project presented here, and the co-authors were research collaborators in both phases of the study.

3. Review of the literature

When Papert (1993, p. viii) suggested a new perspective for education research by “creating the conditions under which intellectual models will take root,” he recognized the computer as “the Proteus of machines. Its essence is its universality.” Now, almost two decades later our research suggests personal, wireless devices might be those nimble, shape shifters, capable of putting opportunity and access into the hands of learners, significantly changing teaching and learning. Further, Papert (p. 4) noted computers could “be carriers of powerful ideas and the seeds of cultural change [further], they can help people form new relationships with knowledge”.

Our study explored how this relationship changes with access to handheld wireless devices, putting access to information and creation right into users’ hands and making the actual process of using the technology easy. Further, it probed the use of ICT to support “personalizing learning - differentiating the curricula, including expectations and timelines, and utilizing various instructional approaches so as to best meet the needs of each individual” (Schmid, 2010). The ability / need to differentiate curriculum is central to personalizing learning as suggested in the literature and mandated by many ministries of education across North America as well as globally. Many educators (Schrum & Glassett, 2009; Biesta & Burbules, 2003) see ICT playing a pivotal role in assisting teachers in this work, and in enabling students to demonstrate their learning in authentic, more meaningful ways.

Inherent in the opening of school networks for personal, mobile devices is the need for users to fully understand acceptable user guidelines and ethical practices. Digital citizenship, as a responsible way of sharing applications (apps) and using school based wireless networks appropriately, is informed by
the work of Ribble and Bailey (2007). They identified nine components of digital citizenship, which are core to professional development activities for teachers in our project and for students and parents in terms of signing “admirable” user guidelines for school and home use of district devices (Richardson, 2009). Ribble (2011) describes the nine components as (1) access to digital content and technology which enables full electronic participation in society; (2) understanding how to buy and sell goods electronically; (3) awareness of how to appropriately exchange digital information, including email, cell phone use, instant messaging, etc.; (4) understanding digital literacy which allows one to use technology comfortably and make appropriate choices as to the right tool for the correct task / activity; (5) understanding the standards / manner of digital interactions – digital etiquette; (6) understanding the legal implications of electronic actions and deeds; (7) understanding one’s digital rights and responsibilities, including privacy and free speech; (8) understanding digital health and wellness and how to protect oneself online; (9) understanding digital security and knowing what precautions are appropriate in an electronic environment. All nine components were introduced to all participants in the project and were the topic of the ongoing professional development sessions.

Recognized ICT standards for students, teachers, and administrators informed a baseline of necessary knowledge, skills and abilities (ISTE, n.d.) required for effective ICT use. The project’s research team worked with participants to meet and exceed these standards as they integrated the devices into their work and activities. Further, understanding mobile learning’s possibilities and challenges in the North American context was framed in part by the work of Shuler (2009). Consistent with international practice, the Ministry of Education in Alberta (the province in which the research was situated) launched a new directive calling for dramatic shifts in existing understandings of the purpose of schools. Based on numerous interviews with stakeholders across the province, the document asserts that schools should be helping students become engaged, ethical and entrepreneurial. In Alberta, the three R’s have morphed into the three E’s, directing teachers’ practice toward innovation suggested in the literature for creativity, ICT adoption, and student directed, inquiry-based learning (Alberta Education, 2010).

We also turned to our own theoretical framework that evolved from our three-year study of a teacher laptop project. This allowed us to draw on our previous work in schools and better understand the impact a teacher’s generational characteristics (Pegler, Kollewyn, & Crichton, 2010), career cycle (Steffy et al, 1999) and technology, pedagogical, and content knowledge (Kohler & Mishra, 2008) has on their ability to feel comfortable with technology and integrate it meaningfully into their teaching. Our work, both in this project and previous research with laptop computers, suggests Prensky’s widely cited notion of digital immigrants / digital natives does not ring true in terms of using digital tools in the workplace. In fact, older teachers, with more pedagogical and subject matter knowledge, tended to adopt technology more meaningfully and with greater sustainability into their teaching than their younger colleagues.

4. Methodology

The purpose of the study was to gain an understanding of the infrastructure required to support handheld devices in classrooms, the opportunities and challenges teachers face as they begin to use handheld devices for teaching and learning; and the opportunities, challenges and temptations students face when gaining access to handheld devices and wireless networks in K – 12 schools. A mixed method approach was used: online survey, monthly professional development activities with teachers, analysis of lesson plans and student work, and regular classroom observations.

Five classrooms from across the district were selected to participate in Phase 1. Schools were chosen based not only on willingness of school administrations, teachers and parents but also on the diversity of the school populations - students’ grade level and their socio-economic backgrounds. In Phase 1, students and teachers in the five project classrooms were given their own iPod Touch devices, one laptop dedicated to the project, a syncing cart for the devices, and a document camera to project the content from the devices.

Teachers were assigned an iPod Touch two months ahead of the distribution of these devices to students. This occurred shortly before a school holiday. The teachers were instructed to familiarize themselves with the devices and essentially play to learn. Prior to starting to teach with the devices, the group met for an inquiry based activity at the local zoo where they spent a day with the research team experiencing the devices as students first, before they were called upon to use them in their teaching. They were provided with training and time to reflect on the potential connection to their
curricula. The teachers were from different schools across the city, and they met monthly throughout the project to share and reflect on their experiences. During these meetings, the researchers addressed emerging concerns and offered just-in-time professional development and support.

A similar approach was used in Phase Two as teachers were given iPad devices and invited to a day at the zoo similar to the Phase One introduction. During this phase, a total of 61 iPads were given to three additional schools, but no peripheral devices were provided. The three schools included in Phase 2 had to apply to the district ICT team to participate, indicating their prior experience with inquiry-based teaching and learning, their commitment to purchase the required peripheral equipment, and their willingness to allow their teachers to participate in the required professional development activities. The research team continued to work with the iPod Touch teachers from Phase 1 during Phase 2. Data was collected during the many visits to the classrooms. Researchers spoke informally with all the participants, observed actually lessons and instructions, asked students to share of their work products, and collected data from online surveys and professional development sessions.

Findings – Phase One: Survey findings suggest participants (students, teachers, and IT support staff – all of whom were issued a device) preferred a range of devices for a variety of commonplace tasks. Table 1 illustrates the preferences by categories. The devices were pre-loaded with apps supporting the various tasks.

Table 1: Preferred devices for completion of common tasks

<table>
<thead>
<tr>
<th>Device</th>
<th>Task</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>iPod Touch</td>
<td>recording voices / sounds</td>
<td>88%</td>
</tr>
<tr>
<td></td>
<td>listening to podcasts</td>
<td>77%</td>
</tr>
<tr>
<td></td>
<td>playing games</td>
<td>63%</td>
</tr>
<tr>
<td>Laptop</td>
<td>searching the Internet</td>
<td>68%</td>
</tr>
<tr>
<td></td>
<td>creating media</td>
<td>64%</td>
</tr>
<tr>
<td></td>
<td>checking email</td>
<td>62%</td>
</tr>
<tr>
<td>Paper or traditional options</td>
<td>drawing</td>
<td>74%</td>
</tr>
<tr>
<td></td>
<td>reading</td>
<td>53%</td>
</tr>
<tr>
<td></td>
<td>tracking work / maintaining an agenda</td>
<td>31%</td>
</tr>
</tbody>
</table>

Sixty percent had never used an iPod Touch prior to this project. Despite that surprising finding, 70% of respondents felt it took less than hour to become familiar with it.

However, this question did not probe comfort levels with the syncing/charging, iTunes’ account management side of use, and herein lays a challenge. In order to use personal devices in school settings, the school/district needed to create a common iTunes account and dedicate a computer to synch, share, and organize applications (apps), content, and system settings. This common account formed a “digital commons” of sorts; a place where participants had to negotiate what apps to share and permissions and access protocols. Participation in the commons required an ongoing exploration of what digital citizenship meant in classrooms and how this impacted teachers’ work, parental responsibility and changes in discipline approaches for administrators.

An outcome of Phase One was the creation of a one-page document (see Appendix 1), based on the research findings, for school principals – Is Your School Ready For Mobile Learning? This document was essential as principals learned about the pilot project and how to introduce handheld technologies in their schools. Further, the hype in the public press and media enticed principals to
believe that iPods and iPads might just be the much hoped for “silver bullet” for school-based technologies.

The document was intended to provide school administrators with useful background information and considerations to inform schools’ decision-makers regarding the use of mobile learning technology. Topics covered in the document included tips and thoughts on instructional practices, infrastructure, requirements, and additional hardware considerations. Specifically, the document encouraged principals to reflect on what place, gap in teaching and learning will these devices meet; and what the fit was with their existing pedagogy and future educational goals. It also asked principals to assess the condition of the school’s network and its ICT support plans. Lastly, it recommended hardware and reminded principals that simply purchasing the devices was only the beginning. Teachers needed to gain mastery in syncing carts, recharging the devices and sharing applications and content. Teachers also needed to learn to use document cameras and other tools to support the use of personal devices in public settings.

Findings – Phase Two: Findings once again suggest participants (students, teachers, and IT support staff) preferred a range of devices for the completion of their everyday tasks – this supported the findings from Phase 1. However, the differences between student adoptions by age level intensified. Students in elementary and junior high settings continued to demonstrate great enthusiasm for the iPod devices. Younger students used various apps to create projects ranging from art activities and video games to multimodal presentations (audio and video podcasts). They described great satisfaction with the instant-on capabilities of the devices, their significant battery life, and the variety of apps.

Senior high students were more critical and less inclined to engage in non-traditional activities with the devices. Primarily, senior high students desired access to their course texts. When they were able to do this, as in the case of the mathematics class using iPads, they displayed great satisfaction with the flexibility of the digital text. They above all appreciated the ability to expand the question response space that allowed them a greater area to apply more complex computations. However, in the second high school social studies class, using iPod Touch devices, there was no digital text available and the students viewed the introduction of the devices into their coursework as extraneous to the “real work” of the course. These were despite continued efforts by the teacher to find supporting apps and develop classroom activities that supported the use of the iPod Touch.

It appears that for both senior high classes, the ability to take the devices home was key to their adoption. Additionally, both groups, iPod Touch and iPad users, reported significant frustrations with the devices until they were allowed to take them home. The students reported that it was important to them to be able to review and retrieve their work in an ongoing way. Nevertheless, high school students saw the devices as primarily a means to connect to the Internet in pursuit of resources. The devices were regularly used as dictionaries and thesauri. This was significant in that students were able to do so in a discreet fashion, using the dictionary app as a less public and more immediate means of gaining information.

Findings – Both Phases: Along with the interesting uses for both the iPod Touch and iPad devices that both teachers and students found, we noticed a significant shift in the roles and responsibilities for teachers, IT support people, and school based administration. The institutional, public deployment and support for iDevices is significantly different from traditional computer lab requirements and even wireless laptop configurations within classrooms and across schools.

Our findings suggest the IT support people and school-based administration must grapple with three significant issues. First, they must establish a digital commons through which the iDevices are synced, powered, maintained, and managed. Second, they must manage the iTunes account that organizes all apps loaded onto individual devices and support the sharing of content. Thirdly, these devices offer teachers greater independence in terms of updates and determining selection of apps (applications) than is traditionally the case.

Establishing a Digital Commons: Our findings suggest that central to the success of the iDevice deployment was the establishment of a digital commons – or central location where all the apps, content, and device management could be organized and stored. Within the Apple environment this is critical, as an iTunes account is the only way to select, download and install applications on individual devices.
devices. “iTunes is a proprietary digital media player application, used for playing and organizing digital music and video files. The application is also an interface to manage the contents on Apple’s iPod and iPhone lines, as well as the iPad” (iTunes, 2011).

In our study, all the iDevices used in a classroom were synced / connected to one iTunes account managed by the individual teacher responsible for the content and application selection. Therefore, an iTunes account needed to be created specifically for that purpose, and we determined that the iTunes account would be loaded on one dedicated computer that served as the digital commons for the teacher, students and devices.

In order to support the iTunes account and to function on the school and district wireless network, the computer had to be re-imaged to allow for multiple user access to a single iTunes instance. This became quite an issue for the IT support people as imaging computers, providing Internet access, creating IT accounts fell within their domain. Administrator access had to be granted to the teachers and this was NOT common practice with the school board. Teachers typically were not able to even download software upgrades or install home printers on school board issued personal laptops.

Teachers needed this level of access to the digital commons in order to download software for the project’s peripheral devices (document camera, etc.) and to host applications required for direct communication between devices and the host laptop. The IT support people and the teachers needed to understand how the general settings and / or restrictive settings could allow or disallow the installation of apps. For example, if the settings were not managed properly, students could access the iTunes’ app store, attempt to crack the password, and if successful, ultimately “lock” teachers out of the iTunes account.

Managing the iTunes Account: The classroom iTunes account was linked to the school’s email address that is an iTunes requisite. This avoided the need for teachers to use their personal or professional accounts for a district project. By using the school email, the school secretary managed and confirmed app purchases from the school budget. This was a successful arrangement as the majority of apps used in the classroom were either free or of nominal cost, and surprisingly; classrooms did not select too many apps during the project. The secretary’s list of purchases was important when iTunes content was inadvertently deleted from the digital commons. The list could then be used to trace purchases and reinstall them. Further, by having the iTunes account attached to the school email account, it ensured that the apps would stay with the school even if the teacher moved to a different location. Interestingly, each school in Phase 1 was given $100.00 to spend on apps. A year later, there is still a large portion of the funds remaining.

Our findings also suggest that teachers have a significantly changed role when using iDevices in their classrooms. Specifically, they have to learn to manage the content and apps within the digital commons and how to maintain the digital commons, itself.

Management and Maintenance of the Commons: The onus for backing up the content in the digital commons fell to the teachers. Individually, they had to determine a system for syncing the devices, ensuring they were charged and ready to go, and that the apps remained on each device. This process required a considerable amount of teacher-time as well as an understanding of how teachers would include it in their daily routines.

Our findings suggest that some apps, for example StoryKit for the iPod Touch and SmartNote for the iPad, required more time to back-up the devices. Further, teachers needed to be aware of content created using productivity apps and consider how to share it for assessment and collaboration.

The teachers found that managing multiple apps and subsequent updates was a rather daunting and time consuming task, but the majority reported they worked through the process and eventually made it part of their daily routine. Also, when iTunes requires an update, teachers discovered that certain apps might need updating as well or they would not function. Unfortunately, awareness of this concern surfaced only when students tried to use a particular app. Periodically, teachers reported that when a new app was purchased, it might be incompatible with the version of iTunes installed on the digital commons – again necessitating a need to upgrade.

Teachers learned that when a device did not function properly, they would restore it from the master iPod or iPad file stored in iTunes. The time saver for the iPods was the use of the Bretford syncing
cart. The laptop hosting the digital commons was attached to the cart that could support 40 devices charging at a time, and in position for syncing and updating if necessary. In Phase 2, when iPads were included in the research, we suggested teachers sync the devices using a 7-Port USB hub. Some teachers conveniently set up a syncing and charging station within a single drawer of an industrial file cabinet.

A persistent challenge for teachers and students alike was how to submit assignments from their devices and how to work collaboratively on projects hosted on multiple devices. Submitting projects was problematic as naming conventions were challenging when going through the digital commons (the iTunes account). Emailing individual assignments, particularly to teachers with multiple grades and classes, was challenging to teachers to manage and mark as often the content was in .pdf format rather than some teachers could mark up or edit. Concerns surrounding protecting student privacy as challenged by email-based apps were also significant.

5. Discussion

The study yielded a wealth of data. Specifically, we learned that the devices were well received and well used by the majority of participants in the elementary and junior high settings. The high school students and teacher were more critical, as both appeared to struggle to find the educational uses for the devices. The search for apps that were perfect matches for senior high curricula was most often fruitless. Further, high school students initially appeared to “resent” the intrusion of school issued personal devices, and were pleased when they could use the device for a specific work task (e.g. reading their text, using a dictionary, or connecting to the Internet for research searches).

In terms of specific recommendations from our study, we are further convinced that educators have to consider a menu of devices and applications for their teachers and students – no single device is the answer to every teaching and learning situation. While obvious, it is important to formalize this observation as many school districts are casting about for solutions to address the costs of evergreening existing computer hardware as well as meeting changing curriculum and educational directions.

A question that haunted us during this research was whether or not these iDevices (both the iPod Touch and iPads) could possibly live up to the media hype? We, too, got caught in the frenzy of being among the first to purchase the iPad when it was launched in Canada; we even considered figuring a way of getting one earlier through contacts in the United States. Hedman and Gimpel’s work (2010) on hyped technologies resonates with us as they note, functional value is the least considered element in adopting hyped technology; emotional, epistemic (curiosity / desire), and social values are the deciding factors. So, after a year of research into the integration of iDevices in the schools, can we say they did live up to their promise – if the following conditions are met:

- These devices need a specific mobile learning oriented infrastructure to support them (wireless network, digital commons, school acceptable use guidelines, consent forms that allow the devices to be taken home, etc.).
- Teachers need to be treated as learners and their learning must be honored and personalized and supported. They need to be introduced to new technologies as learners first, before being called upon to use the technologies in their professional practice.
- That teachers design tasks that are consistent with the curriculum and use the apps and the access to the Internet in integrated and meaningful ways. The majority of students were not interested in simply using the devices; the use had to be tied to the curriculum.
- If older students are allowed to personalize them and take them home (scheduling, personal management, wallpaper, music, etc.) and have access to relevant, course related content such as eTextbooks.

The advantage of iDevices within school environments is their ready access to the Internet and other resources, longer battery life, size, short learning curve, and price point. The disadvantage, or significant challenge, rests in concerns about data retrieval (once content is lost on an iDevice, there is almost no way to retrieve it) and content sharing for collaboration. The framework for the majority of apps export content in a read only (for example, pdf format), which does not allow colleagues to easily continue to work on the content and share it back. Further, the challenges IT support people and teachers face when syncing multiple personal devices to a common hub (the digital commons) can be daunting. This may be addressed with further refinements by Apple to support school-based adoption.
of iDevices. As Koehler and Mishra (2008) have noted, education often pushes technology beyond its functional fixedness and repurposes it to meet its needs. So, at this early stage of their deployment in shared, public settings such as schools, it must be remembered these devices are “I” devices – technologies designed for individual users. By syncing them to a common iTunes account and suggesting others might share that one device, we are repurposing them for uses they were not intended. Since starting our work with the iPod Touch units, we have noted modifications such as improvements to the configuration tools within the iTune’s structure that are helping with multiple device syncing, and more recent developments to support ePub standards.

Despite the promise and ingenuity of the devices, we are left with many questions. Next steps include:

- Continue working with our contacts at Apple to determine ways of making access to the digital commons more seamless
- Continue working with IT support people to determine where student and teacher owned devices fit in the school's digital commons
- Continue working with teachers and students to better understand the pedagogical fit for these devices in the menu of hardware and software available in school to engage students and enhance learning
- Explore whether the Android and LINUX based tablets might not be a better fit for public education because of their more open app development structure, price point, and non-proprietary operating systems.

Appendix 1: Is your school ready for mobile learning?

This guide is intended to provide school administrators with useful background information and considerations that should be part of a school’s decision-making process regarding the use of mobile learning technology. The information in this document reflects the preliminary data from the iPod Touch and iPad research initiatives currently underway in a variety of CBE schools— it does not represent the complete research findings, as these will be published in June 2011.

iPod Touch and iPad2 devices are approved for purchase by CBE schools. Our intent in providing this information is to assist schools who are interested in the possibility of purchasing iPod Touch and iPad devices in the near future. We hope that the information provided will help you bring focus to various considerations prior to the purchase of mobile learning technology and to help to prepare instructional leaders for successful implementation.

Instructional Practice

Like any technology, there are significant implications regarding the need for understanding of how the tool enhances teaching and learning. With your staff, answer what place, gap in teaching and learning will these devices meet? Additionally, in order to determine an appropriate “fit” for these devices in the classroom, teachers are encouraged to work with these devices well in advance of the tools being put in the hands of students. During preliminary work, teachers will familiarize, understand and develop an awareness of the syncing and update process necessary. But more importantly, schools will need to determine how digital citizenship might be fostered and required when using handheld devices in the classroom. Being able to connect, communicate and create with these devices is fast becoming a significant element of digital literacy and a powerful way to support personalization and student achievement.

Infrastructure Requirements

- Network access must only be enabled through the school’s Learner Accessible Wireless Network (LAWN). Off site, the devices can be connected to any (preferably secure) wireless network.
- School plan for accessing iTunes. iTunes accounts should be attached to school email address.
- Re-imaged Apple laptop that permits multiple teacher logins to access the same iTunes account. For initial planning and deployment, this single laptop becomes the “commons” for all devices to sync.
- Student email (CBEMAIL) cannot be configured on the devices.

Additional Hardware Considerations and Delays
Imaging of common machine – preferably a Mac product, and further investments of teacher and/or tech support time for syncing and updating of operating systems and applications on the devices.

Purchase, investigation and learner appropriateness of the individual applications

Export of student created content from a single device (app’s do not have common conventions for the sharing and distribution of content)

Teacher admin privileges on common machine. Some app’s may require 3rd party software downloads – this requires increased attention to the syncing process and download permissions.

Accessories for support of devices-document camera, covers, VGA cables, hubs, syncing carts, dongles

Be aware of new and evolving tools and communications to students and parents

iPod Touch Gen4 and iPad2 has full front/rear facing cameras – this creates both opportunities and challenges for managing media in Windows and Mac platforms.

iTunes frequently requires updates. These updates can be problematic when older app’s are not updated, resulting in app’s no longer loading or functioning as expected

These devices have great potential but have limitations as well. Schools should be considering a menu of devices rather than investing primarily in one device.

Ensure your school’s handbook and technology plans allows for the use of electronic devices during school hours and that teachers understand the implication of this.

References


Using the Artistic Pedagogical Technology of Photovoice to Promote Interaction in the Online Post-Secondary Classroom: The Students’ Perspective

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Abstract: This study explores the effect of the artistic pedagogical technology (APT) called photovoice (PV) on interaction in the online post-secondary classroom. More specifically, this paper focuses on students’ perspectives regarding the effect of PV on student to student and student to instructor interactions in online courses. Artistic pedagogical technologies are teaching strategies based on the arts (Perry & Edwards. 2010). APTs use music, poetry, drama, photography, crafts or other visual media as the basis of teaching activities. Photovoice is the purposeful use of selected visual images and affiliated reflection questions as an online teaching strategy. Social Development Theory (Vygotsky, 1978) and Janzen’s Quantum Perspective of Learning (Janzen, Perry & Edwards, 2011) provide the theoretical basis of the study. The convenience sample included 15 graduate students from the Faculty of Health Disciplines at an online university. Participants completed a 4 month master’s course in which PV was used. Data were collected after final course grades were official. Data were gathered using an online questionnaire based on an adaptation (with permission) of Rovai’s (2002) Classroom Cohesion Scale (CSS) and Richardson and Swan’s (2003) Social Presence Scale (SPS). A follow-up focus group with 6 of the original 15 participants was held. Quantitative and qualitative data were collected. This paper focuses on findings from the quantitative data with supportive qualitative comments. Data analysis of the quantitative data takes the form of descriptive statistics. Data analysis of the qualitative data used NVivo software. In sum, the majority of respondents did find that PV had a positive influence on course interactions, but also on their sense of community, comfort in the educational milieu, and on how well they got to know themselves, other learners, and the instructor. Questions for further research are posed.

Keywords: online education, eLearning, artistic pedagogical technologies, photovoice, social development theory, quantum perspective of learning

1. Introduction

This purpose of this study was to explore graduate students’ perspectives regarding the effects of the artistic pedagogical technology (APT) called photovoice (PV) on interactions in online post-secondary classrooms. Of particular interest was the viewpoint of learners regarding if, and how, PV influenced interaction among students, and between students and instructors, in an online course they had recently completed. Artistic pedagogical technologies are teaching strategies that draw from the arts (Perry & Edwards, 2010). APTs use music, poetry, drama, photography, crafts or other visual media as the foundation for student activities. Photovoice, an example of an APT, is the purposeful use of selected visual images and affiliated reflection questions as an online teaching strategy.

This paper includes a review of literature regarding interaction in online courses, focused on both why interaction is considered important and how it can be facilitated by instructors. What is known about why art-based teaching strategies facilitate interaction and build community is discussed. Vygotsky’s (1978) Social Development Theory (SDT) and Janzen’s Quantum Perspective of Learning (Janzen et al., 2011) are described. The study methods are articulated and findings presented. Further, the findings are explored in the context of the theoretical foundations of this paper. Succinctly, the majority of respondents did find that PV had a positive influence on interactions, but also on their sense of community, their sense of comfort in the educational milieu, and on how well they got to know themselves, other learners, and the instructor.

2. Literature review

Interaction among participants in an online course is important to create optimal educational experiences. Online teaching approaches that treat students as “isolated learners passively receiving the theories, concepts and ideas” are not effective (Green, Edwards, Wolodko, Stewart, Brooks, & Littledyke, 2010, p. 258). To be successful, online teachers need to use strategies that promote
interaction among participants, creating quality learning environments through the development of virtual learning communities (Vitale, 2010; Darrington, 2008). These social interactions form a pivotal base for effective learning processes (Green et al., 2010). For example, Hessler and Humphreys (2008) demonstrated that active and collaborative online course interactions led to more student effort and satisfaction with the learning experience (2008). Levine (2005) states, that interaction involves communication which is motivating to participants thus enhancing learning. Holmberg (2007) emphasized that development of personal relationships, which evolve from interaction, promotes student motivation and achievement of learning outcomes.

Interactions in online courses include interaction among students, and between students and the instructor. Garrison and Anderson (2003) noted that interaction between the instructor and student in particular enhances the effectiveness of the online learning environment and leads to higher student performance and satisfaction. Appana (2008) and Gallien and Oomen-Early (2008) echo this finding and add that meaningful student-teacher interactions in online courses also improves student grades. Richardson and Swan (2003) found that students' perceived learning, satisfaction with instructors, and perceptions of social presence were all highly correlated. Brooks-Young (2010) explains this, at least in part, by saying that "well-designed online courses support frequent one-to-one interactions between students and teachers", promoting learning that is student-centered” (p. 10).

Not all online interaction whether student-student, or student-teacher, is of equal quality. Green et al. (2010) point out that a more authentic from of interaction results in more meaningful learning. To these researchers authentic interaction involves learners feeling “purposefully engaged” in the online learning environment because they choose to be rather than because they have been directed to participate (p. 258). In other words to be effective, interaction needs to be encouraged and facilitated rather than dictated by the teacher to be authentic.

2.1 How to heighten effective interaction

Researchers agree that the teacher is responsible (at least initially) for creating opportunities for interaction and communication among classmates and between students and the instructor (Vitale, 2010; Green, et al., 2010). What teaching strategies are effective for engaging students and enhancing interaction in the online class? Vitale (2010) suggests, that “Well-planned and defined discussion questions help students to understand the course content, especially the application of new knowledge to clinical practice situations” (p. 550). Vitale emphasizes that clear course engagement strategies are foundational to building an online learning community. Evans and Campion (2007) support careful instructional planning to create a learning environment where interaction and community building occur. Young (2006) suggests quality online courses provide meaningful examples, have learning activities that students find motivating, and are taught by instructors who are enthusiastically engaged in promoting interaction and student learning.

In other words, online educators intentionally create opportunities in course design and though instruction that facilitate the desired outcomes of meaningful interaction and a learning environment where individuals share knowledge and support one another in knowledge construction (Green, et al., 2010). Hong and Sullivan (2009) urged us to rethink the design of instructional activities, supporting the effectiveness of teaching activities that are more emergent, self-organising, and less pre-defined. Jones, Warren, and Robertson, (2009) point to rapport as one of the most important features of human interaction and community building that has implications for teachers who seek to enhance interaction in online courses. Tickle-Degnen and Roseenthal (1990) define rapport as the experience of being in sync with the other person. Hutchins (2003) singled out rapport between participants in online courses as important to effective educational environments and Izard (1990) emphasized the dynamic nature of rapport as it usually develops over time in relationships.

Mak and Yeung (1999) showed that rapport is as important in online communities as in face-to-face situations. Rapport is established and developed in online educational classes when individuals become acquainted and engage in personal inquiry (Jones, 2001) and participate in “well-wishing and social support” (Yungbluth & Bellino, 1996, p. 12). In a sense, rapport is developed through social interaction, and interaction furthers the development of rapport. Further, rapport is helpful in establishing effective learning communities. A cycle is established when online courses are well designed and taught effectively.
2.2 The role of arts in facilitation of interaction and community

Using the arts as part of teaching strategies in not new. Educators have used music, painting, dance, and literature to enhance learning in various courses from math to science (Holmes 2002; Eccles & Elster, 2005; Clarke & Widdicombe, 2002). These investigators stress that the arts as an educational tool facilitates students making an emotional connection to course content, caters to a variety of learning styles, and increases student achievement (Holmes, 2002; Eccles & Elster, 2005). A study at Queens University involving 6,700 students found arts-infused teaching methods had a significant effect on academic achievement in math with students scoring 11 percentile points higher (Upitis & Smithrim, 2005). Further Upitis, Smithrim, and Le Clair, (2001) showed that students not only perform better academically, they and the teachers were more energized and engaged, when arts-based teaching strategies were part of course design.

Perhaps positive effects of art-infused teaching strategies can be explained by their effect on rapport, interaction, and community building. Art moves individuals to take a wider view, looking at multiple facets and dimensions of concepts. Learners move away from breaking knowledge into discrete elements, perhaps resulting in more analytical assessment and thinking. This broader view also prevents learners from looking at learning as a checklist or assembly-line of tasks. In thinking broadly, deeply and holistically learners are stimulated to think creatively, critically, and analytically about course content. Learners may be triggered to interact with others, sharing insights and comparing analyses. Connectedness, interrelatedness, and integration may be outcomes when arts are the foundation of teaching strategies. These outcomes have potential to promote interaction, build rapport, and help development of a sense of community (Eccles & Elster, 2005). As Clarke and Widdicombe (2002) conclude, the arts as a component of teaching strategies engages students totally, “not just with pen and pencil, but also with imagination” (p. 45).

2.3 Artistic pedagogical technologies (APTs)

APTs are a category of teaching strategies founded in the arts (Perry & Edwards, 2010). The commonality of APTs is that they all use some element of drama, music, visual art, or the literary help students learn. APTs are optional, non-graded, learning activities used in online courses. There are many APTs. For example APTs related to drama include online role-playing and movie analysis. APTs that emphasize music can involve a course theme song, while teaching strategies that focus on the literary include story-telling, story-writing, and parallel poetry. Photovoice is an APT that uses visual images. Photovoice was originally a participatory action research method employed by Wang (1999) and Wang and Burris (1997). Perry and Edwards adapted it to become an APT and used it in online graduate courses (2006; 2010). PV uses visual art in the form of specifically chosen digital images. Each image, chosen by the instructor, corresponds with a course theme. An image is combined with a reflective question and shared with online learners. Learners view the image and post their responses to the question in an online discussion forum. An example of a PV activity used in a course on leadership is an image of a band conductor leading a large ensemble. (See figure 1) The reflective question reads, “What leadership style would be most appropriate in this situation?” The student responses to the image exhibit their knowledge of leadership literature related to contingency theory but their responses are also rich with clues about their values, biases, personal history, and priorities in relation to leadership and followership.

2.4 Social development theory

The first conceptual basis for this paper comes from Vygotsky's Social Development Theory (SDT) which is a foundation of constructivism (1978). SDT arose from Vygotsky’s psychological and educational theories in the early 20th century but initially did not gain acceptance in Vygotsky’s native Russia due to ideological repression (Davydov & Kerr, 1995). Gorbachev's perestroika (reorganization), where “democratic, social, economical and political [reformation also] demanded” educational reform, paved the way for Vygotsky’s work to have greater influence (p.12). Through a group of Soviet scholars who adopted and further developed his theories in the early 1970’s, SDT along with its constructivist underpinnings, became and remains currently embraced as “the leading metaphor of human learning” (Lui & Matthews, 2005, p. 386).
Vygotsky, proposes five basic tenets which shape SDT: (1) the purpose of education is to develop the personalities of human learners, (2) the “creation of the conditions for discovering and making manifest the creative potentials of students” is a paramount focus of pedagogy, (3) students progressively “master a variety of inner values” through pedagogy and “personal activity,” (4) authentic pedagogy espouses guidance and direction rather than force or dictation, and (5) pedagogical methods which are most effective focus on individuals rather than on student collectives (Davydov & Kerr, 1995, p. 13).

In SDT, social interaction and meaningful relationships are linked to learning (Kim & Baylor, 2006). Full cognitive development requires social interaction. In the words of Vygotsky (1987), “every function in the cultural development of the [learner] appears on the stage twice, on two planes. First, on the social plane, and then on the psychological; first between people, and then inside the [learner]” (p. 145). Thus the collective activity of the learners, through interaction and collaboration, becomes internalized in individual learners (Davydov & Kerr, 1995). Through this interaction new “potential” is acquired for relationships which further influence the social and cultural connections which are made by individual learners (Vygotsky, 1987, p. 191).

Succinctly, Vygotsky (1978) focused on the connections between people and the sociocultural context in which they act and interact in shared experiences (Crawford, 2001). Social interaction is a critical component of situated learning in which learners become involved in a “community of practice” which embodies certain beliefs and behaviours to be acquired. Through meaningful social interactions learners become fully engaged in the culture and function of the learning community.

2.5 Quantum perspective of learning

The second conceptual basis for this paper comes from Janzen’s Quantum Perspective of Learning (QL)(Janzen et al., 2011). Recognizing that contemporary learning theories which have evolved since Skinner’s (1954) behavioralism all have axioms, Janzen developed QL in partial response to Dewey’s 1876-1877 essays which call for a bridging perspective (Eastman, 1976), and in an attempt to explain why arts-based teaching strategies such as APTs (Perry & Edwards, 2010) are effective. QL takes the more salient features of various learning theories and builds upon them in an effort to better explain learning in a technological age (Janzen et al., 2011).

While current popular learning theories such as Siemens’s (2006) connectivism suggests that learning is the process of making connections, QL proposes that everything that exists is already connected. Learning becomes the process of discovering those connections. Providing students with the means
and opportunities to discover those connections becomes the task of educational institutions and instructors (Janzen et al., 2011).

QL employs exchange theory and utilizes selected principles from quantum mechanics or quantum holism in physics (Bohm, 1971, 1973) and applies the principles to learning (Janzen et al., 2011). QL posits that learning and learning processes mimic the behaviours of electrons in quantum holism. Four of the similarities between QL and quantum holism are waves and particles, superposition, entanglement (Pribram, 2006), and quantum memory channels (Krestchmann & Werner, 2005). Distilling these principles, QL accepts that everything is connected, entangled and in constant communication from the largest of structures in the cosmos to the smallest of structures in sub-atomism. This communication, connection and entanglement include the processes of learning in the temporal world.

QL suggests that learning is multidimensional, occurs in multiple planes simultaneously, and is holistic/holographic in nature (Janzen et al., 2011). Further, the potential to learn is infinite. Learning is believed to be best achieved in quantum learning environments where students, instructors, technologies, and environments are integrated in a posture of holism.

Quantum learning environments are living systems (Janzen et al., 2011). These environments grow, transform and adapt with input and output from each of the core components of that environment (student, instructor, technology and environment). In QL, interaction is a key component of the total quantum learning environment. Interaction, as it is invited and celebrated from a multitude of sources, becomes a hallmark of QL.

3. Study methods

The authors completed a large study of the effect of the APTs on graduate students and instructors from a Canadian online university. The purpose of the research was to increase our understanding of how APTs influence the online post-secondary classroom. Ethical approval for the study was granted by the Research Ethics Board of the host university. This research report focuses specifically on selected data related to the student perspective. The instructors’ perspective is reported elsewhere.

3.1 Sample

Study participants included a convenience sample of 15 students who had just finished an online graduate course that used APTs (including PV) as teaching strategies. Two of the study courses were called Teaching Health Professionals and the third course named Organizational Theory. Three different instructors each taught one of these courses. All instructors were doctorally prepared, experienced online educators, and aware that they were involved in a research project. The students in the study courses were not aware that they were taking a course that was part of a research project until after grades were finalized.

All students who completed one of the three courses involved were contacted via email by the research assistant (RA) at term end. The email from the RA invited them to contact her via email if they were interested in participating in the study. Potential participants were given clear indication in the invitation email regarding what would be asked of them in terms of participation. The RA obtained informed consent from 15 from a total of 64 potential participants. One study participant had only completed one online course (the study course) and 14 participants had completed two or more online courses including the study course. Participants were from various Canadian provinces. All participants were completing a master’s degree in nursing, health studies, or a nurse practitioner program.

3.2 Data collection

All student participants completed an online questionnaire that assessed their perspectives regarding the effect of PV on the educational environment in the online post-secondary class they had just completed. The questionnaire, using a 5 point Likert scale, was adapted (with permission) from Rovai’s (2002) Classroom Cohesion Scale (CSS) and Richardson and Swan’s (2003) Social Presence Scale (SPS). The questionnaire was prepared using SurveyMonkey and collected qualitative and quantitative data. Completed questionnaires were sent electronically to the RA. Submissions were coded by the RA and all identifiers were removed.
Questionnaire respondents were asked if they would be willing to participate in a follow-up focus group. The purpose of the focus groups (moderated by the RA and held via teleconference) was to provide data to illuminate the questionnaire responses. The moderator initiated the discussion by posing general questions, and composed probes to gather data. Six of the original 15 respondents participated in the two focus groups. The focus groups each lasted approximately 45 minutes and the RA made written notes regarding key statements during and immediately after each focus group meeting.

While the quantitative data from this questionnaire are the primary focus of this paper, quotations from the open-ended question on the questionnaire and from the focus group analysis are integrated into the findings section to provide additional insight.

3.3 Data analysis
Data analysis included descriptive statistical analysis of the quantitative data from the questionnaire. Additionally, the qualitative data from the focus group notes and questionnaire were analyzed using NVivo software.

3.4 Study limitations
The sample size was small. The findings are not intended to be generalized.

4. Findings
The majority (12/15) of the respondents had completed the course called Teaching Health Professionals. The remainder of the study participants were students in the Organizational Theory course. All participants were taking all of their courses in their master’s program online. Most of the participants (93.3%) had taken two or more online courses including the study course. The study course was the first course for one participant.

In response to the question that asked if PV had a positive influence on their learning in the course, 16.7% marked strongly agree, 41.7% agreed, and the remainder of respondents (41.7%) neither agreed nor disagreed. The majority of the participants (58.4%) did find that PV had a positive influence on their learning. Participants remarked that seeing how the “individual perspectives varied” provided them an opportunity to see “something different and [from a] different angle” which enhanced their learning.

When asked if online education is an excellent medium for social interaction as demonstrated by PV, (33.3%) were neutral. The majority (67.7%) were positive. Specifically, 6/15 students agreed and 2/15 students strongly agreed that PV demonstrated online education was an excellent medium for social interaction. PV was seen by participants to “allow for more personal interaction than in the other discussion forums” and they commented that PV provides “social interaction that perhaps wouldn’t be there at all without the PV tool.”

Students were asked if PV enabled them to form a sense of community online. Again the majority of respondents (50%) were neutral, but this time 1/15 students (8.3%) disagreed indicating that PV was not helpful in the formation of an online community. On the positive side, 33.3% agreed with the statement and 8.3% strongly agreed for a total of 5/15 students who did find that PV helped with community formation in their online course. PV was found by one participant to create a “voluntary” and “warm sense of community.” Further, according to students this sense of community “provided an outlet to get to know people and their perceptions.” One participant said PV facilitated the experience of “online presence” of classmates. PV was seen as a way to “get to know someone without the...scholarly talk.”

A more general question that asked if students in online courses which have learning activities encouraging interaction are more likely to form a sense of community netted no neutral responses. A large majority (91.7%) agreed or strongly agreed with this statement. Only 1 student disagreed. One participant commented that “it was a better experience than in some in-person classes,” while another stated that the “informal...sense of community...came from a more personal place.”

When asked if they felt comfortable interacting with other participants in PV, again a large majority (75.0%) agreed. A further 16.7% strongly agreed that they felt comfortable for a total of 91.7% on the
positive side. One participant was neutral and no respondents disagreed or strongly disagreed with this statement. One participant noted that in PV activities, “You do feel like you are having sort of an informal chat.” The words “informal” and “chat” connote comfort.

The statement that read, “My point of view was acknowledged by other participants during PV,” again elicited a strong positive response with a total of 75% (9/15) indicating that this occurred. More specifically, 1/15 strongly agreed and 8/15 agreed that their point of view was acknowledged by others during PV learning activities. The remainder of respondents 3/15 were neutral on this point with no students marking a negative response. One participant felt that acknowledgement was both implicit and explicit saying, “I did feel that my POV [point of view] was acknowledged in that course.... Maybe it wasn’t so much a formal recognition, as much as just the fact that people shared their own responses.... Sometimes it was just about the sharing without needing the responses.”

Participants were asked if they came to know themselves, other students, and the instructor through PV. Several participants (5/15) were neutral while 5/15 agreed that they did get to know others through PV. Further 2/15 (16.7%) strongly agreed that PV helped them get to know course participants. There were no negative responses. It seemed getting to know the instructor better was especially valued by participants as they were able to make “connections” with the instructor and engage in “communication... in a meaningful way.” Instructors were felt to become more “authentic” and “real” to learners because of PV. Students commented, “it was just like [we] were with a class in a classroom setting.” Respondents noted that through PV triggered interactions they began to “see the more informal side of the other participants and... [get] to know them more as people.”

The tenth question asked students if they were able to form distinct individual impressions of some course participants by their PV comments. No respondents marked disagree or strongly disagree. Approximately twenty seven percent (4/15) of participants were neutral on this point, and the remainder (66.7%) either marked agree or strongly agree indicating that they were able to form distinct impressions regarding people in the course through their PV responses. As one student said, PV provided “a nice outlet to get to know people and their perceptions of different things.” Students contended that they “got to see more of the person as opposed to another scholar.”

The last question asked if the respondent felt the learning in the course was positively influenced by PV. One person marked disagree indicating that PV did not have a positive influence on learning. Six of 15 respondents marked neutral while 41.6% gave a positive response. Of the positive responders 4/15 agreed and 1/15 strongly agreed that PV positively influenced their learning in the course. One participant wrote that PV created “an ‘aha’ moment” for her and that this laid a foundation for her to “interact” in a meaningful way with others in the course. Participants predominantly saw PV as an “opportunity” which allowed them to “integrate and apply course content more effectively.”

5. Discussion

As noted earlier, Social Development Theory (SDT) upholds social interaction as the primary route to cognitive development (Vygotsky, 1978). Further, social immersion and collaboration become the vehicles for meaningful relationships and learning (Kim & Baylor, 2006). Vygotsky’s STD proposes that individuals “do not adapt to their world, but collectively transform it and through this transformation, also change themselves” (Vianna & Stetsenko, 2006, p. 85).

PV used in these courses seemed to have a positive effect on social interaction with a majority of respondents indicating that they found it an excellent medium for achieving this purpose. When learners were asked directly about this possible effect of PV on their online course most agreed or strongly agreed that it did positively influence social interaction. Additionally in the focus group data, interaction emerged as a key concept.

The findings may offer insight regarding how interaction is facilitated by PV. A question was asked regarding the students’ perceptions of a link between interaction and community formation in online courses and the largest majority agreed that this link exists. When questioned further, 41.6% attributed PV with helping enhance community. Perhaps PV does assist learners (at least some learners) in interacting in a meaningful way with the result being the possibility of community formation.
For Vygotsky, social interaction consists of many processes including cooperation, collaboration, problem solving, conflict management, and communication (Vianna & Stetsenko, 2006). Further, social interaction is felt to come full circle as “learners jointly engage in activity, discourse, and reflection” (Yilmaz, 2008, p. 169). Through these processes learners “collectively transform” their online milieu and their individual and collective social worlds (Vianna & Stetsenko, 2006, p. 85). In PV learning activities, these processes could be reflective of the formation of community. PV discussion forums potentially act as microcosms for that community development. This construct is supported by Vygotsky’s SDT where the “classroom” acts as a “microsociety” (Yilmaz, 2008, p. 169).

This transformation and development of community, achieved by social interaction (Vianna & Stetsenko, 2006), is also consistent with QL. Janzen et al., (2011) suggest that the learning environment itself can be transformative as learners interact with each other, technology, instructors, and the actual environment. PV provides the environment, while social interaction is indicative of the interface between students, their instructor and technology. In PV these four QL facets (environment, students, instructor and technology) are all present. This combination of the four facets could contribute to the strength of the communities which are formed. Further, SDT sees these communities [and the individual members of these communities] not as “separate entities, but instead belonging together and interpenetrating each other” (Vianna & Stetsenko, 2006, p. 89).

Connections made through PV were a primary finding from the qualitative or focus group data analysis. In order for individuals to make connections they need to become acquainted with one another, to establish rapport (Tickle-Degnen & Roseenthal, 1990). The findings indicate that the majority of participants thought PV helped them get to know more about themselves and others in the course community. When they knew more about each other it created the possibility of rapport development as students might potentially discover they were in sync on certain ideas or issues.

Discovering more about self and others is also consistent with QL. The processes of discovering, and subsequently the application of those connections to one’s own world, are felt to be two of the primary foci of learning (Janzén et al., 2011). This learning exists in a trajectory where the discoveries of connections are constantly being made. The connections between self and other are mediated, enhanced and operationalized through connections that are provided by technology and the environment. These connections according to Janzen et al. (2011) contribute to holistic learning and the creation of total quantum learning environments. These total quantum learning environments, in Vygotsian terms, exist “where all... factors exist in interdependency and form... organic wholes [or] unified wholes... and become the source of growth and change for each other (Lui & Matthews, 2005, p. 397).

When individuals incrementally discover who they are and how others fit into their self-concept and self-knowledge, learning may be influenced on a greater scale. This is supported by Vygotsky’s notion that “knowledge is not directly transmittable from person to person, but rather it is individually and idiosyncratically constructed or discovered” (Lui & Matthews, 2005, p. 387). PV may be a catalyst to this learning or discovery about self and other.

On a similar topic, the majority of study participants also responded that PV helped them to form distinct individual impressions of people in the course. This is also assurance that PV aided participants in getting to know each other. With this foundation of familiarity, developed in part by what was shared in PV, it may have been possible for community members to form connections with one another. These connections potentially promoted the experience of community.

Connections made need to be nurtured in order for them to develop further. QL suggests that quantum learning environments, such as in the environment and resultant community which PV can create, are not static in nature (Janzén et al., 2011). These environments grow, transform and adapt as do the individuals who interact within them. This growth or transformation requires nurturance and purposeful on-going interaction. Without interaction and the further discovery of connections, these environments instead of fostering connections and growth, wither and eventually cease to purposefully exist outside the immediate context of learning (2011). The on-going discovery of connections throughout the course trajectory creates opportunities for those connections to exist beyond the confines of the course itself. New PV learning activities are offered weekly, facilitating the on-going discovery of connections throughout the duration of the course.
In QL, those connections, expressed in terms of infinite potential, have the possibility of existing and thus influencing individuals on a more holistic level. For Vygotsky, the very potential of students or learners is linked to “creative potentials” where there is constant interaction between student, environment and instructors (Davydov & Kerr, 1995, p. 13). In SDT, “collective” connections are felt to be “always larger than the total sum of individual persons” (Lui & Matthews, 2005, p. 392).

These connections can be carried forward into an ever enlarging awareness of the giant webs of connections that exist within human existence (Janzen et al., 2011). If everything is connected, entangled and communicates in a posture of holism, the connections that can be nurtured by PV may also have the capacity be carried onward. PV presents a milieu where nurturing connections can result in a growing sense of community, self, and other.

There is some indication from the responses to the question related to point of view being acknowledged by others that indicates respondents might have received affirmation and encouragement from classmates and or the instructor. A large majority of respondents did experience acknowledgement of their contribution to PV which could be a sign that connections were established, and it was likely that if the acknowledgement was ongoing throughout the course, connections might have been gradually strengthened.

Maslow (1948) identifies the need for acceptance as a precursor to self-actualization. With this in mind, acknowledgement or encouragement could be considered as necessary elements of creating connections. Further, motivation as described by Maslow (1950), is the determination of feeling accepted which capitalizes upon “the full use of… talents, capacities, [and] potentialities” (p. 150). This can result “in an ongoing process in which one’s capacities are fully, creatively, and joyfully utilized” (PMC, 2009, para. 1). These findings are consistent with QL where potentialities have the capability for infinite development (Janzen et al., 2011). The initial creation of a single connection with another student or their instructor, when co-occurring with acknowledgement or encouragement, can create the necessary conditions for continued strengthening of connections. As subsequent connections are made with multiple students throughout the course in the context of PV, students create webs of connections which can foster stronger links within those connections.

PV may represent a safe place to develop those stronger connections. The PV environment has been explored previously as an environment which supports authentic voice, interaction and arises as an authentic medium for that expression (Janzen, Perry & Edwards, 2011). The authentic and intuitive inquiry that PV encourages, may additionally act as a medium to form connections in the PV environment. This may be realized through the processes of ongoing support and encouragement, which allows presentations of a variety of simultaneous lenses or worldviews by participants (Netzer & Mangano Rowe, 2010). As a result, students may be able to explore and “disclose their assumptions about a topic with honesty, integrity and authenticity” (pp.141-142). This may ultimately strengthen interaction and foster a deeper sense of connection. In terms of Vygotsky's SDT, truths expressed enhance connection and “make [and give] sense [and meaning] to the community” (Yilmaz, 2008, p. 168).

Did the arts-infused teaching strategy of PV help to facilitate the occurrence of interactions, formation of connections, development of rapport, and/or emerging of communities? As discussed in the literature review it is possible that the art aspect of the PV teaching strategy did promote creative thinking and instil energy, emotion, and enthusiasm in the group. If this occurred then rapport, interaction and community building might have been positively impacted. This is an area for further study.

In QL, Janzen et al. (2011) suggest that arts-based teaching strategies are representative of one of the most salient methods of enacting growth or learning in not only individual students but in all participants in a total quantum learning environment. PV could qualify as a total quantum learning environment which is represented as a living system (Janzen et al., 2011). If interactions, connections, rapport, and the sense of community all contribute to the living system’s sustainability, then it is posited that the environment experiences positive growth and development. Within the QL context, PV may support a growing and developing environment which in turn may enact growth in those participants who interact with that environment. Creative teaching strategies, which include arts-based teaching strategies, have the potential to “increase energy, compassion, an enhanced self-
understanding and insight” (Lane, 2005, p. 123). This can result in an environment which can facilitate and celebrate “shared understandings” (Freshwater & Stickly, 2004, p.800).

Finally, the part the teacher plays in making APTs effective merits further research. As indicated in the literature review, researchers agree that the teacher is responsible (at least initially) for creating opportunities for interaction among course participants (Vitale 2010; Green, et al. 2010). We do not know from the limited findings what role the instructor plays in facilitating interaction, connection, and community in the online course. In relation to specific online teaching strategies like PV is it important how the teacher introduces and supports the activity? Does the way the teacher engages with PV influence the positive outcomes of this strategy?

Social Development Theory may help explain why social interaction among course participants, precipitated at least in part by PV, helped students get to know one another. When students became acquainted, and comfortable in the online classroom, connections could be made. It is possible that connections could give rise to meaningful relationships. The majority found these connections/relationships beneficial to their learning as Kim and Bayer (2006) suggest.

The Quantum Perspective of Learning (QL) adds additional insights to the research findings. Holistic environments such as PV may represent total quantum learning environments where students, technology, and instructors are linked to the environment itself (Janzen et al., 2011). These environments may give rise to communities which are strengthened and enhanced through the discovery of connections which also may enrich learning.

6. Conclusion

This paper explored graduate students’ perspectives regarding the effects of the APT called PV on interaction in the online post-secondary classroom. Literature related to the role interaction plays in online teaching and learning, as well as discussion of how art-infused teaching strategies may enhance interaction, provided the foundation for the presentation of study methods and findings. SDT helps explain why social interaction triggered by PV is important to creating positive online learning environments. The effect PV has on the creation of total quantum learning environments was explored. These environments may give rise to communities which are strengthened and enhanced through the discovery of connections which also may enrich learning. Most participants in this study concluded that PV had a positive influence on interactions, the sense of community, their comfort in the online classroom and on their self-awareness and on their relationships with other learners and the instructor.

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References


Implications of the Social Web Environment for User Story Education

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Abstract: In recent years, user stories have emerged in academia, as well as industry, as a notable approach for expressing user requirements of interactive software systems that are developed using agile methodologies. There are social aspects inherent to software development, in general, and user stories, in particular. This paper presents directions and means for incorporating the Social Web environment in user story education. In doing so, it proposes a methodology, SW4USE, for such integration. SW4USE consists of a user story process model, USPM, and Social Web technologies/applications that can contribute to the execution of the steps of USPM. A collection of scenarios of use, for both teachers in their classroom lectures and students in their team-based course projects, are presented, and potential learning outcomes are given. The ephemeral and essential challenges in the realization of SW4USE, particularly those related to quality, are highlighted.

Keywords: agile methodology, collaboration, dissemination, process model, user requirement, Web 2.0

1. Introduction

The discipline of software engineering advocates a systematic and disciplined approach towards the development and evolution of software systems. It addresses a number of concerns, including appropriate development of software requirements. The user stories (Cohn 2004) reflect a ‘lightweight’ approach to user requirements (Maiden, 2008) of interactive software systems, especially those that are developed using certain agile methodologies (Highsmith 2009).

In the past decade or so, software engineering education (SEE) is increasingly being viewed as integral to computer science and engineering education at institutions around the world. In particular, user stories are being introduced in software engineering-related courses at Universities (Bunse, Feldmann and Dörr 2004, Müller 2004) and professional training centers.

In recent years, the Social Web, or as it is more commonly referred to by the pseudonym Web 2.0 (O’Reilly 2005), has emerged as a notable member of the technological environment surrounding SEE, in general, and user story education, in particular. It is interesting to note that, although mutually-independent, agile methodologies and the Social Web have co-evolved.

This paper views education as multi-dimensional and, in that context, aims to highlight the potential applications of the Social Web environment in user story education. In doing so, it rests upon and extends earlier work (Fancott, Kamthan and Shahmir 2011).

The rest of the paper is organized as follows. In Section 2, the necessary background for later discussion is provided and related work is presented. This is followed in Section 3 with the description of SW4USE, a methodology for integrating the Social Web environment in user story education. Next, in Section 4, the implications of SW4USE for teachers and students are provided. In Section 5, directions for future research are outlined. Finally, in Section 6, concluding remarks are given.

2. Background and related work

This section outlines the necessary background on user stories and the Social Web, and situates software engineering students with respect to technology. In doing so, it also highlights related work.

2.1 An overview of user stories

A requirement is an expression of a problem that a (software) system, to be developed, is intended to solve. An agile requirement is a requirement for a software project based on agile principles and practices. In this paper, an agile requirement is considered synonymous with a user story.
The origin of the notion of a user story can be attributed to Extreme Programming (XP) (Beck 2000). It has since then been adopted by other agile methodologies including Scrum (Schwaber and Beedle 2002) and User-Centered Agile Process (UCAP) (Beyer 2010).

In general, a user story is an informal statement that can be expressed as a structured narrative. This statement includes a role, a goal, and a specific value to the role. For example, consider the following user story statement:

[US-1] A job seeker can search the HRIS for employment opportunities.

Then, ‘job seeker’ is the role, ‘(to) search the HRIS’ is a goal, and ‘(to be able to find) employment opportunities’ is the value.

A user story statement can be associated with a number of other elements to enrich the description and thereby be useful for different stakeholders. These elements include those related to meta-information. For example, a user story statement is usually associated with estimate and priority so as to be relevant to project managers, and equipped with acceptance criteria so as to be relevant to customers/users.

A user story book is a collection of all user stories for a specific software project. It can be expected that a user story book typically consists of several user stories corresponding to different services that an interactive software system offers.

A user story card is an index card on which the entire user story is expressed. Initially, paper was used as the sole medium of choice for user story cards. However, as management, in general, and dissemination and presentation, in particular, of a large number of user stories becomes important, electronic ‘cards’ are increasingly being used.

2.1.1 Significance of user stories

The following characteristics make user stories unique among the different approaches for specifying software requirements:

- **Communication.** The user stories, from elicitation of information from customers/users, emphasize verbal communication. This can lead to an improvement in the relationship between software engineers and customers/users (Alexander and Maiden 2004) from conversing and listening to each other. This, in turn, could eventually contribute to building necessary mutual trust.

- **Comprehension.** The user stories, from the absence of technical terminology in their statements, aim to be comprehensible to customers/users. This is important as the development of software requirements of many interactive systems involves technical as well as non-technical stakeholders.

- **Collaboration.** The user stories encourage collaborative effort in human-centered approaches to the development of interactive software systems. For example, participatory design is such an approach. This is done by engaging customers/users as active participants in the software process.

- **Calculation.** The user stories can be used to make estimates of size and duration of a software project that, in turn, can be used as input for short-term planning (Cohn 2005). It is known that the estimates of size and duration of a software project are useful if they are available as early as possible in the software development life cycle.

- **Conciliation.** The user stories can act as ‘bridge’ towards reducing the classical chasm between software engineering and human-computer interaction. The disciplines of software engineering and human-computer interaction have essentially evolved independently. The impact of this compartmentalization has not necessarily been positive. In recent years, especially since the increasing acceptance of agile methodologies, it has been realized that a harmonization of the two disciplines is necessary, even mutually beneficial.

2.1.2 Significance of user story education

There are number of reasons for paying special attention to user story education.
The landscape of industrial software development has changed, and continues to change, since the introduction of agile methodologies about a decade ago. It has been shown in a number of surveys that XP and Scrum are currently the two most widely deployed agile methodologies in industry. The user stories are intrinsic to both XP and Scrum.

SEE needs to be mindful of such variations in industry and, to remain relevant, academia needs to reflect and respond accordingly. This position of ‘realism’ is supported by a number of current approaches to software engineering pedagogy (Navarro and van der Hoek 2009). Indeed, software engineering programs in a number of Universities have been moving in the direction of including user stories as part of their curriculum.

2.2 The new generation of software engineering students

The body of students in software engineering, as in other disciplines, is neither homogeneous, nor static. There are a number of catalysts that have led to behavioral changes (Fogg 2003) in software engineering students over the years, and the one that is especially relevant to this paper is technology.

A digital native is a person who was born at the time digital technologies were taking shape and/or has grown up with digital technologies (Palfrey and Gasser 2008). The period in question is 1980 or later. The digital technologies include those that underlie the current non-stationary computing devices, and those that are related to the Internet, in general, and the Web, in particular. The defining characteristics of digital natives (Bernsteiner, Ostermann and Staudinger 2008) include the following: avid users of notebook computers and/or mobile devices, well-connected to each other via distributed computer networks, and rely more on electronic rather than other means of information.

The new generation of software engineering students consists of digital natives. The Social Web is increasingly intrinsic in the daily lives of digital natives. It is likely that the Social Web technologies will become ‘transparent’ to this new generation of students, and the use of Social Web applications will come naturally. The domination of the Social Web in the daily activities of these students, inevitably, has implications for SEE.

2.2.1 Digital natives, technological determinism, and software engineering education

In education, there are number of arguments against technological determinism, a reductionist theory that presumes technology as the basis for all human activity. In particular, there is objection to assertions such as the following: it is the absence of technology that is the root cause of an educational problem, that the presence of a certain technology will solve an educational problem, and so on.

However, the rise of digital natives may change this traditionally held view. The number of software engineering students that are digital natives is not likely to decrease in the future. Furthermore, at any given time, SEE should be sensitive to the hardware and software technologies being used by the students. It is in the interest of practitioners of SEE to embrace, rather than resist, technological changes, especially if the changes originate from the community they intend to serve. In other words, digital natives may change the perception of technological determinism in education, in general, and SEE, in particular.

2.3 A perspective on the Social Web

The Social Web is the perceived evolution of the Web in a direction that is driven by ‘collective intelligence’, realized by information technology, and characterized by user participation, openness, and network effects (O’Reilly 2005).

This paper distinguishes between concepts, technologies, and applications related to the Social Web. They can overlap but they are not pairwise synonymous. For example, syndication is a concept, Really Simple Syndication (RSS) is a technology, and an RSS reader is an application.

There are both prospects and concerns associated with a commitment to the Social Web.
2.3.1 Prospects of committing to the Social Web

The following are primary factors that have brought the vision of the Social Web to a mainstream realization:

- **The Enablement of a Many-To-Many Communication Paradigm.** The convergence of social and technical networks has created unprecedented potential for many-to-many communication among people. It has opened new vistas for collaboration and participation. For example, the Social Web, by necessitating collaboration among people with diverse backgrounds, has the potential to reduce the apparent ‘compartmentalization’ in cultures, including the SEE community.

- **The Broad Availability and Affordability of the Underlying Computing Devices.** The availability and affordability of an appropriate computing device by a person is a necessary condition for accessing the Social Web. In the last decade, there has been an influx of computing devices such as notebook and tablet computers that provide more choice for the consumers in a number of ways. For example, the underlying characteristics of these devices, such as physical size, options for data input/output, screen capabilities, memory, disk space, and processing power, vary considerably. The cost of these devices has also, in general, reduced over time.

- **The Maturation of the Information Technology Infrastructure.** The Social Web can reuse the basic distributed networking infrastructure, including the necessary protocols and addressing schemes, established during the evolution of the Web. The technologies in form of languages for information description, such as markup languages, and information processing, such as scripting languages, have remained relatively stable.

- **The Availability of Technological Implementations as Open Source.** The availability of an open environment in form of open source software (OSS) and open content has played a critical role in the success of the Web, and the same applies to the Social Web. These include, but are not limited to, an increasing number of implementations for LAMP (an abbreviation for Linux, Apache, MySQL, and PHP, each of which is an OSS), Asynchronous JavaScript and XML (AJAX), and Ruby on Rails. This is important for the development of small-to-medium size projects with budgetary constraints. Indeed, there are a number of such projects in the works listed at Go2Web20 (http://www.go2web20.net/).

- **The Awareness, followed by Immense Interest and Significant Participation, by the Public-At-Large.** The Web provides limited opportunities for interaction and participation: the communication is largely unidirectional and users are merely receivers. In contrast, the participatory nature of the Social Web has been a major attraction to the general public. Like electronic mail in the past, there are a number of general-purpose Social Web applications with a relatively low learning curve, which are inviting to those that have minimal technical background. In particular, the Social Web applications such as the Delicious, Facebook, Flickr, Twitter, and YouTube have set the precedence for others to follow.

The aforementioned factors have made students ‘first-class’ active participants, rather than being mere passive observers, in the use of the Internet for education. They have also helped level the playing field for students by lowering the financial entry barrier.

2.3.2 Concerns of committing to the Social Web

There are a number of ephemeral and essential concerns stemming from a commitment to the Social Web. A subset of these concerns is inherited from the legacy of the Web. The following are some of the essential concerns:

- **Stability.** Many of the current Social Web applications are 'social experiments', available only as Software as a Service (SaaS). These services do not always come with an a priori guarantee of longevity or persistence. For example, a service available at one time may be discontinued at a later time. The discontinuation of the Google Notebook (http://www.google.com/notebook/) is a case in point. The organization that owns a Social Web application could be acquired by another organization, after which the application may significantly change its mission, and therefore the functionality it offers.

- **Multiplicity.** There is currently no single Social Web technology/application that satisfies all, or even most, of educational requirements. This situation is unlikely to improve in the foreseeable future. Therefore, a dedicated commitment to the deployment of the Social Web in SEE, in general, and user story education, in particular, necessitates the use of multiple Social Web
technologies/applications. This, in turn, has non-positive indirections towards course administration and learning curve.

- **Quality.** There are a number of quality attributes of a Social Web application, each relevant to some stakeholder. The three different but related quality attributes, especially relevant to a user of Social Web application, are credibility, usability, and accessibility. The credibility of information is an overarching concern for both Web applications, in general, and Social Web applications, in particular. It becomes especially relevant in education if such applications are being relied upon for teaching and/or learning.

The ISO/IEC 9126-1:2001 Standard defines usability as “the capability of the software product to be understood, learned, and attractive to the user, when used under specified conditions.” Figure 1 shows a subset of attributes of usability, namely understandability, learnability, and operability. The issue of the usability of Social Web applications is especially relevant to this paper as usability is related to learning. The Social Web applications have made some inroads in supporting usability. However, a number of usability-related challenges remain. There is currently no user interface standard for Social Web applications. Indeed, the structure and behavior of Social Web applications for the same domain may vary significantly. These factors do not contribute favorably to learnability.

The ISO 9241-20:2008 Standard defines accessibility from a usability viewpoint as “the usability of a product, service, environment, or facility by people with the widest range of capabilities.” There are unresolved accessibility issues pertaining to Social Web applications. For example, in order to function properly, the current Social Web applications, including the ones covered in this paper, require relatively high-speed Internet connection and the support of latest technologies such as most recent versions of Adobe Flash and ECMA Script.

![Usability Diagram](image-url)

**Figure 1:** A subset of attributes in a model for usability that have implications towards education

### 2.4 Related work on software engineering education and the Social Web

To the authors’ knowledge, there does not appear to be any substantive work relating user stories and the Social Web. However, there have been a few initiatives towards integrating the Social Web environment in SEE.

The uses of Wiki for teaching software engineering have been reported (Decker et al. 2007, Gotel et al. 2007, Parker and Chao 2007). In particular, it is pointed out that Wikis can be used for publishing and sharing course material, and for managing software process artifacts. However, the correspondence to any teaching strategy or learning theory is unclear.

The usefulness of next generation of social software in engineering education has been demonstrated via the introduction of an application named eLogbook (Gillet et al. 2008). In doing so, the limitations of conventional computer-supported collaborative learning (CSCL) are pointed out. However, the treatment of Social Web technologies is largely one-sided, and eLogbook is not yet mature and its relationship to other social software and technologies is unclear.

Finally, SW4SE2, a methodology for integrating the Social Web environment in SEE, has been proposed (Kamthan 2009). It is concluded that the assortment of technologies and applications underlying the Social Web environment have a number of prospects for SEE. They can provide new opportunities for collaboration between teachers and students, and for collaboration among students;
can create new possibilities for authoring and sharing software project artifacts; and so on. SW4SE2 consists of the following steps: (1) Deciding the Scope of Software Engineering Knowledge, (2) Adopting a Learning Theory and a Teaching Strategy, and (3) Selecting and Applying Suitable Social Web Technologies/Applications to Software Engineering Educational Activities. SW4SE2 has been extended in the direction of different kinds of possible collaborations in SEE (Kamthan 2011).

3. Integrating the Social Web environment in user story education

This section presents SW4USE, a methodology for integrating the Social Web environment in user story education. SW4USE builds on the experience of SW4SE2, and consists of the following sequence of steps:

- Deciding the Scope of User Story Knowledge.
- Selecting and Applying Suitable Social Web Technologies/Applications to the Activities in the Development of User Stories.

3.1 Deciding the scope of user story knowledge

There is support for software requirements in both the Curriculum Guidelines for Undergraduate Degree Programs in Software Engineering (Software Engineering 2004) and the Curriculum Guidelines for Graduate Degree Programs in Software Engineering (Graduate Software Engineering 2009). In Software Engineering 2004, as well as in Graduate Software Engineering 2009, there is mention of agile methodologies, but no explicit mention of user stories. There is currently no ‘standard’, body of knowledge, or reference model for user stories. However, in recent years, user stories have garnered increasing attention, and literature on it continues to grow (Cohn 2004, Cohn 2005, Leffingwell 2011, Monochristou and Vlachopoulos 2007). These previously mentioned references could be used as a basis for user story knowledge for undergraduate and graduate courses.

If the development of user stories is to be effective, it needs to be carried out systematically (Fancott, Kamthan and Shahmir 2011, Kamthan and Shahmir 2010). For that, a user story process model (USPM) is adopted and followed. The mandatory steps of USPM are Planning, Meeting, Authoring, Reviewing, and the optional step of USPM is Publishing. Figure 2 summarizes USPM. USPM is interspersed, iterative, and incremental. There are a number of activities in each step, details of which are given later.

![Figure 2: A feasibility-sensitive model for a user story process](image)
There is a need to foster a social environment in the development of user stories at several different levels. A user story is a result of collaboration and negotiation among stakeholders. A user story needs to be shared with and reviewed by stakeholders other than the author. A user story at some point is designed (and implemented); however, if the design is deemed infeasible, then the user story may need to be revised by its author in collaboration with the designer.

3.2 Adopting a learning theory and a teaching strategy
The two theories of learning on which pedagogical strategies are being modeled today are objectivism and constructivism, each of which has a place in SEE (Hadjerrouit 2005).

For example, a classroom use of Social Web technologies/applications in SEE could be more objectivist than constructivist where the educator plays the role of an ‘instructor’. A project use of Social Web technologies/applications in SEE could be more socially constructivist than objectivist where the educator plays the role of a ‘guide’.

3.3 Selecting and applying Social Web technologies/applications to the activities in the development of user stories
In software development, the relationships among people and the relationships between people and products (software project artifacts) have conventionally been through separate mediums. The Social Web integrates multiple mediums, and provides a unified platform for these relationships, which are relevant to the development of user stories. Figure 3 illustrates this phenomenon.

![Figure 3: The evolution of mediums for relationships in the development of user stories](image)

The Social Web technologies/applications that are suitable for use both inside and outside the classroom need to be selected. The criteria for selection can include relevancy to the domain (user stories), affordances towards education (undergraduate and/or graduate, as necessary), maturity, cost, and stability. Table 1 lists a sample collection of Social Web technologies/applications relevant to USPM.

The purpose of including an item in the list of Table 1 is awareness, not advocacy or endorsement. There is no claim of completeness of this list. It could be noted that the use of these technologies/applications is subject to license, and these technologies/applications are prone to
evolution in a number of possible directions without any a priori guarantees. A comparison of these technologies/applications is beyond the scope of this paper.

Table 1: A mapping between the set of USPM activities and the set of Social Web technologies/applications

<table>
<thead>
<tr>
<th>USPM Activity</th>
<th>Example(s) of Social Web Technology/Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning</td>
<td>Doodle, Google Calendar</td>
</tr>
<tr>
<td>Meeting</td>
<td>Evernote, Microsoft Office OneNote, UberNote</td>
</tr>
<tr>
<td>Authoring</td>
<td>bubbl.us, Google Docs, Wiki</td>
</tr>
<tr>
<td>Reviewing</td>
<td>Creately, Gliffy, Google Docs, MockFlow, Wiki</td>
</tr>
<tr>
<td>Publishing</td>
<td>Google Docs, Syndication (Atom, RSS), Wiki</td>
</tr>
</tbody>
</table>

4. Implications of SW4USE

This section presents scenarios for both teachers and students, as they relate to the user story education based on the Social Web.

4.1 Implications of SW4USE for teachers

The Web, in general, and the Social Web, in particular, can aid user story pedagogy in a number of ways that may be planned or improvised during the class. To create better understanding of a new topic such as user stories, a teacher may place it in context of other closely related topics such as use cases, or while going through a specific user story statement, a teacher may wish to explore certain terms in that statement. For example, in case of [US-1], the meaning of HRIS (that is, human resource management system) may not be evident to the students. In such cases, resources external to the discussion, such as documents, images, or Uniform Resource Locators (URLs), could be pointed out during the class.

A teacher can also show a part of the dynamism or temporal behavior underlying an agile methodology, in general, and the user story process, in particular, through an animation or a video available elsewhere on the Internet. It is also possible to incorporate external perspectives on a topic by supplementing lectures with video presentations given by others, perhaps by other teachers or book authors. Indeed, there are a number of Social Web applications, such as YouTube, that archive and broadcast dynamic, multimedia information, including video presentations.

There is a variety of information that is generated during a development process. Kanban Board is a tool for visualizing such information from different viewpoints. Figure 4 is an abstraction of a Kanban Board, illustrating the different states in which the user stories are in at a specific point in time.

Queue (3) | Development (5) | Realized (4)
---|---|---
| Designed | Implemented | Tested

Figure 4: An abstract, simplified Kanban Board illustrating the temporal dynamics of user stories for a given iteration.
4.2 Implications of SW4USE for students

There are a number of reasons for including a project component in software engineering courses. The students are supposed to simulate, at least in part, the current state-of-the-practice of software engineering, especially in industrial settings. They are also supposed to develop knowledge and skills involved in solving a non-trivial problem, working both individually and collectively.

This section focuses only on the concerns of user story education that emanate from the realization of software projects in courses. The user stories are especially suitable for software projects that are based on the underlying philosophy, principles, and practices of agile methodologies.

4.2.1 Planning

In planning, there are aspects specific to USPM, the Social Web, and learning.

**USPM Aspect:** In this step, the resources necessary for authoring user stories, including personnel, means for describing a user story, knowledge on the quality of user stories, and tools for authoring and managing user stories, are identified and selected. The schedules for meeting, authoring, and reviewing are also decided upon.

**Social Web Aspect:** In setting-up meeting(s) among students, or between students and ‘users’, accommodating the preferences of each participant can be challenging. The responsibility of finding common date(s) and time(s) often rests solely on the person setting-up the meeting. The logistics of the conventional process can also be unnecessarily time-consuming. The use of Social Web applications such as Doodle (http://www.doodle.com/) and Google Calendar (http://www.google.com/calendar/) can facilitate the arrangement of such meeting(s). These applications have a number of features, including calendar sharing by the participants. Figure 5 illustrates a snapshot of a meeting being scheduled using Doodle to discuss the development of user stories between students S1 and S2, and potential ‘user’ U1.

![Figure 5: A collaborative environment being used to schedule a meeting to discuss user stories](image-url)
Learning Aspect: The development of tacit knowledge on planning is important for software project management. The students can learn how to negotiate time and place for meetings, how to organize themselves for a successful meeting, how to estimate and allocate resources, how to develop mutual trust, and so on.

4.2.2 Meeting
In conducting a meeting, there are aspects specific to USPM, the Social Web, and learning.

USPM Aspect: To author the initial set of user stories, a workshop lasting about an hour or two is convened by selected members of the software project team. The ‘user’ suggests something that he/she thinks that the software system should do. The members of the software project team take those suggestions into consideration in drafting user stories. For the sake of creating a ‘team memory’ and for reflection, it may be useful to take notes during a meeting and/or record minutes of the meeting. These can be shared with the participants upon conclusion of the meeting.

Social Web Aspect: The activity of taking notes during a meeting is individual. However, it can be useful for the participants to share their notes at the conclusion of a meeting. For taking and sharing notes, there are a number of Social Web applications including Evernote (http://www.bubbl.us/), Microsoft Office OneNote (http://www.microsoft.com/onenote/), and UberNote (http://www.ubernote.com/).

Learning Aspect: The software project team meetings create opportunities for students to learn how to manage time, how to verbally articulate ideas to others (and do so convincingly), how to rebut gracefully, and so on.

4.2.3 Authoring
In authoring user stories, there are aspects specific to USPM, the Social Web, and learning.

USPM Aspect: The software project team selects a specific user model and authors all user stories related to it. The cycle repeats until all user models are exhausted. The user stories are subsequently annotated. In particular, the user stories are identified and prioritized. The result of authoring is a collection of user stories for the current iteration.

Social Web Aspect: There are a number of general-purpose Social Web applications such as Google Docs (http://docs.google.com/) that can assist in authoring user stories.

In collaborative approach to authoring user stories, students often need to engage in brainstorming. There are a number of approaches for brainstorming, and mind mapping is a graphically-oriented approach to realize it.

A mind map is a diagram that represents goals, tasks, or other concepts linked to and arranged radially around a central theme or an idea. It is used to generate, visualize, and organize ideas, and as an aid to understanding, problem solving, and decision making. The students can share these mind maps over the Web and, depending on the permissions, read and/or edit others’ maps.

For creating and sharing mind maps, there are a number of Social Web applications including bubbl.us (http://www.bubbl.us/) and Mindomo (http://www.mindomo.com/). Figure 6 illustrates a snapshot in time of a mind map, thereby reflecting work-in-progress. In it, four ‘stakeholders’ (students and ‘users’), each represented by a unique color, are in a brainstorming session on the properties of a candidate user story. The ‘bubbles’ reflect respective inputs by ‘stakeholders’.

Learning Aspect: The creation of mind maps encourages thinking, instills creativity, and necessitates collaboration, all of which are an imperative for successful software development. The skills necessary to adequately express software requirements are acquired after a lot of practice (Kovitz 2003), regardless of the language used for stating the requirements. The user stories provide a good entry point for students to learn how to express user requirements in a natural language such as English.
4.2.4 Reviewing

In reviewing user stories, there are aspects specific to USPM, the Social Web, and learning.

**USPM Aspect:** The candidate collection of user stories is prone to evolution for a number of reasons. A user story is reviewed for quality assessment (Wake 2002). If a user story is considered relatively large for the current iteration, it needs to be split; it may need to be reprioritized; and so on.

A user story is also designed (and implemented). However, if the prototype suggests that a user story is deemed inappropriate (say, is unacceptable by a user, or is unimplementable for technical or social reasons), then it must be revised. It is also possible that a user story is rejected after a review.

**Social Web Aspect:** There are a number of Social Web applications such as Creately (http://creately.com/), Gliffy (http://www.gliffy.com/), and MockFlow (http://www.mockflow.com/) that can assist in collaboratively creating both low- and high-fidelity prototypes. These prototypes can also be shared with others.

**Learning Aspect:** From participating in a review, the students can learn the need for USPM to be iterative, how to reflect and improve upon their own work, and how to be patient and respectful of each other’s work.

4.2.5 Publishing

In publishing user stories, there are aspects specific to USPM, the Social Web, and learning.

**USPM Aspect:** The user stories need to be published for their subsequent use by others in the software project team. The publication of user stories is also useful for courses that expect team presentations at the conclusion of each major phase of the software development process. The inclusion of meta-information such as unique identifier, author name and contact information, date and time of publication, and version information, become especially relevant in this step.

**Social Web Aspect:** It is possible to use a Wiki system for user story cards, and use the projects in the Wikimedia Foundation (http://wikimediafoundation.org/) for support as, for example, shown later in Figure 9.
There are several open source flavors of Wiki available today, addressing different target groups and organizational needs. Most flavors of Wiki, including MediaWiki (http://www.mediawiki.org/) and TWiki (http://twiki.org/), can be easily acquired, installed, and administered under commonly-deployed computing platforms. If outsourcing is an option, there are organizations such as Wikispaces (http://www.wikispaces.com/) that provide Wiki-related services and support for educational institutions.

The need to locate relevant information effectively becomes a concern as the number of user stories (and, therefore, the size of user story book) grows. There are different means of finding information on the Social Web, one of which is the use of *folksonomy* (or social tagging). A collection of semantically-related tags, forming a tag cloud, is of special interest. There is support in certain Wiki systems for including tag clouds. Figure 7 illustrates the use of social tagging in general in the context of user stories. The domain-specific terms can serve as source for tags in a tag cloud, and electronic user story cards can serve as destinations.

![Figure 7: An abstract tag cloud for user story cards](#)

**Learning Aspect:** The need to publish can help students learn how to communicate and disseminate user stories for the consumption by others. In doing so, they can also learn how to use and manage certain tools needed for the purpose, which may also be useful for their future careers.

4.2.6 Relationships of user stories to other software project artifacts

In general, a user story does not exist in isolation. The students can get an appreciation of the user story ecosystem (Kamthan and Shahmir 2010) by looking at the relationship of a user story to other software project artifacts, specifically, user models and glossary.

**User Stories and User Model.** There are different types of user models (Junior and Filgueiras, 2005). The ones appropriate for user stories are user role and persona: a user role is abstract and a persona is concrete. The name of a user role constitutes the role name in a user story statement. The goal and value correspond to that of the persona. Figure 8 shows these relationships. The user stories and the user models can reside on the same or different Social Web applications, such as Wiki, in which the user stories can point to user models via the use of hypertext.
User Stories and Glossary. It is known that text written in a natural language such as English is prone to misinterpretations by its readers. For example, misinterpretations can arise due to the presence of homonyms, metonyms, neologisms, polysemes, and synonyms. The presence of a software project glossary can help towards reducing the potential for misinterpretation in user stories. For example, as shown in Figure 9, an abbreviation or a domain-specific term in a user story card could point to the glossary for clarity and disambiguation. This glossary could consist of terms and definitions from publicly available Social Web applications, such as Wiktionary, or other projects in the Wikimedia Foundation.

Figure 9: A collection of user story cards residing in a Wiki environment

5. Directions for future research

There are a few anticipated directions in which SW4USE can be extended. In this section, these topics are introduced and discussed briefly.

5.1 Evaluation of SW4USE

Table 1 and the coverage of Section 4.2 imply that the mapping between the set of USPM-related activities and the set of technologies/applications is many-to-many. In such a case, it can be useful to assess the degree of usefulness of each technology/application.
To do that systematically requires commitment to some form of empirical evaluation (Juristo and Moreno 2001). The instruments suitable for such an evaluation in an academic setting include experiments and surveys, although each has its own advantages and disadvantages. The tools suitable for such an evaluation include those being used for learning analytics.

5.2 Reusable experiential knowledge for SW4USE

The reliance on knowledge elicited from experience and described appropriately can be useful in education, as it has been in other disciplines. In recent years, such reusable experiential knowledge has been made explicit in a variety of ways, including pedagogical patterns (Sharp, Manns and Eckstein 2006), in general, and e-learning patterns (Garzotto and Retalis 2009), in particular. A pattern is usually referred to by its name. For example, names of patterns relevant to Section 4 include TEACHING FROM DIFFERENT PERSPECTIVES, STUDENTS DECIDE, and CO-WORK.

If learning theories and teaching strategies form a theoretical basis for education, then patterns contribute towards a practical framework for education. The use of an appropriate collection of patterns could lend a structure to user story education empowered by the Social Web, both inside and outside the classroom. It may also lead to new educational problems, new experiences in solving those problems, and the ‘discovery’ of new patterns. Therefore, interplay between SW4USE and pedagogical patterns serves as a potential avenue for future research.

5.3 User stories for Social Web applications

The students registered in software engineering programs are uniquely positioned with respect to the Social Web. They can not only be ‘consumers’ of Social Web applications, but also contribute to the development and/or improvement of these applications.

For example, software engineering students could express the user stories for new Social Web applications or, elicit the user stories for existing applications by means of reverse engineering. In fact, a user story management system (USMS) is a suitable candidate for such a Social Web application.

In other words, as shown in Figure 10, there is a symbiotic relationship between user story education and the Social Web, of which one direction is explored in this paper. These possibilities lead to new topics for course projects, but also raise new anthropological, sociological, and technical concerns relevant to SEE. For example, as per Section 2.3.2, understanding and assessing the issue of quality of Social Web applications can serve as a topic of study in a course on software quality or software measurement. Thus, further investigation in this direction is of research interest.

Figure 10: A model for a relationship of mutual benefit between user story education and the Social Web environment

6. Conclusion

The Web has fundamentally changed the practice of SEE, both inside and outside the classroom. Yet another technological revitalization of SEE is inevitable and, the Social Web is a natural candidate for
it. The new generation of software engineering students, and the nature of user story development, provide a suitable platform for exploring the educational possibilities that the Social Web offers.

The Social Web, as this paper illustrates through SW4USE, lends new vistas for user story education. The teachers can use the Social Web for communicating the user story knowledge better and making the sessions more interactive, perhaps even more appealing. The students can use the Social Web for carrying out USPM in their software projects in a manner that is aligned with the anthropological, sociological, and technical aspects of agile methodologies, in general, and user story development, in particular. SW4USE is an initial step, and can be strengthened further by empirical evaluation and incorporation of pedagogical patterns.

It follows from TRIZ, a theory of inventive problem solving, that more of something desirable also brings more of something less desirable, or less of something else also desirable. A commitment to a technology/application has both short-term and long-term impact on cognition and behavior, some of which may be unfavorable and their effects may be irreversible. For example, one such induction of concern is the potential for dependency. The Social Web is relatively new, and its technological infrastructure is currently in a state of flux. Therefore, a cautious optimism in a commitment of the Social Web environment to SEE, in general, and user story education, in particular, is desirable.

References


Collaboration Creation: Lessons Learned From Establishing an Online Professional Learning Community

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Abstract: This paper describes the design, implementation, evaluation and further refinement of an ELGG-based social networking site to support professional development activity, project group and special interest groups, and the discussion and sharing of educational experiences and resources across Edinburgh Napier University in the United Kingdom. Beginning with a short overview of what online institutional communities might offer in sustaining good learning, teaching and assessment practice in-house, this paper then describes the rationale for and development of Edinburgh Napier Education Exchange (ENEE). The subsequent evaluation undertaken employed a mixed method approach involving online questionnaires and individual interviews with users of ENEE, and took place between January and April 2011. The evaluation had a twin focus on use and perceptions of ENEE in general, and how ENEE was beginning to be used to provide additional support opportunities for a diverse group of educators studying on Edinburgh Napier’s online distance learning MSc Blended and Online Education (MSc BOE). Overall the evaluation highlighted a range of ways in which ENEE was proving effective particularly in helping users to ‘keep abreast’ of educational practice across the institution, as well as in supporting small groups dedicated to specific purposes and activities. On the less positive side, the evaluation highlighted a number of issues and challenges around ease of use, engaging in ‘multiple spaces’, and achieving ‘critical mass’ in meaningful use. These findings pointed towards a number of enhancements that were implemented over summer and autumn 2011, and the nature of these recent post-evaluation changes to ENEE and the MSc BOE group space are detailed in this paper.

Keywords: social networks, staff development, collaboration, social presence, lessons learned

1. Introduction

Learning communities and communities of practice (Lave and Wenger, 1991) are attributed with making learning more efficient and effective, not least through supporting the individual to move from a novice to increasingly expert position over time. Due to their distributed online nature and asynchronous communication features, online networking tools have become central to supporting the activity of formal and informal learning communities and can be very effective in allowing for what Lave and Wenger term the process of “legitimate peripheral participation” where by new members can observe and learn vicariously before becoming an increasingly active contributor as their knowledge and confidence grows.

Online social networking tools also offer clear advantages for the sharing of expertise and ideas amongst busy, time-limited professionals. This potential has attracted increasing interest within education as a means to support new teacher development, continued professional development including mentoring initiatives, and for the sharing and dissemination of good practice beyond departments and disciplines (Schlager and Fusco, 2003; Oradini and Saunders, 2008). Sherer al (2003) discuss the role online communities in Universities can play in providing a “catalyst for faculty development,” and explain how in a sector that is increasingly characterised by rapid change, increased accountability and economic strains, the academic community can be supported through online communications-based technologies to help redefine teaching, learning, research and professional development (p. 185-184).

In 2009, as part of wider initiatives in facilitating the sharing of good practice, the Edinburgh Napier Education Exchange (ENEE) was developed using the ELGG platform to establish a social networking site for professional development purposes. ENEE was operated on a beta testing basis throughout the first half of 2010 and was made fully operational later that year. Between January and May 2011 an evaluation was conducted to gauge the effectiveness of ENEE in facilitating effective cross-institutional collaboration and communication, both in general and in relation to a particular use group.

This paper discusses the development of ENEE and this evaluation, which concluded in April 2011, with a focus on three key areas. The first concerns the general use made of ENEE in terms of small group work and establishing and sustaining the work of Special Interest Groups in particular aspects

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of learning, teaching and assessment. The second aspect focuses on the use of ENEE on Edinburgh Napier’s MSc Blended and Online Education (MSc BOE), a fully online programme for education professionals who are interested in learning more about technology-enhanced learning. Here the focus is on how the ENEE is enabling the MSc BOE community to ‘open up’ their collaborations across the programme and provide a greater sense of belonging to an online programme community. The third area of focus is on the post-evaluation changes implemented within ENEE in general and the MSc BOE group space it hosts.

The aim of this paper is to highlight what worked well during the initial fully-operational implementation of ENEE, the challenges identified during evaluation and how we sought to address these challenges in the refinements made to ENEE and the MSc BOE group space in the subsequent period to October 2011.

2. Original development rationale

Beyond the general rationale outlined, the need to develop ENEE arose through feedback from staff development workshops highlighting the requirement for post-workshop support and finding ways to take forward projects based on newly learned skills around specific aspects of learning, teaching and assessment. There was a clear need for one space where cross-faculty colleagues could communicate, share and manage projects, and there is good evidence to suggest that in terms of enabling meaningful collaboration amongst staff that have had a chance to forge some kind of learning ‘connection’ (e.g. through attending a staff event together or being colleagues) then institutional online communities can be a powerful enabler (Ardichvili et al, 2003).

The 2010 Managed Learning Environment survey at Edinburgh Napier also underlined the desire for a resource to allow student collaboration out with module and School boundaries and it was felt ENEE could serve as a testing ground for a similar student platform.

3. Overview of architecture

ENEE is built on the open-source system ELGG. The site template, customised by the ENEE project team and the home page layout are shown in Figure 1.

![Figure 1: The ENEE home page](image)

Five different collaborative systems were initially examined, with the functionality of each system (which included Joomla, Wordpress and Sharepoint) matched to the ideal requirements that were
identified. As a result of this iterative process, ELGG emerged as the best match to these requirements. One of the primary advantages of ELGG was the ‘groups’ tool which allows users to create and join self-contained group areas for specific collaborations (see Figure 2). User authentication was later added as a required feature due to the amount of spam users infiltrating the system. This led to the original ENEE installation requiring every member to be manually approved by one of the ENEE administrators.

Figure 2: An example of an ENEE Group

4. ENEE usage analysis to March 2011

4.1 Users

Figure 3: The growth of users since the ENEE’s inception
At the time of the evaluation, concluding in Spring 2011, ENEE had 182 registered users. Most are Edinburgh Napier staff, alongside a small number of invited participants from other institutions. Registrations, as shown in Figure 3, have grown steadily throughout the past year.

4.2 Types of activity

Figure 4 shows the growth in activity on ENEE and displays total blog posts, bookmarks, pages, discussion posts and uploaded files present on the site over time until around Spring 2011.

![Growth of individual ENEE activities](image)

**Figure 4**: Growth of ENEE resources and activity over time

This graph shows gradual growth interspersed with spikes in activity related to short-term projects or workshops. It shows a different trend to the user growth graph in that it demonstrates acceleration in use since around November 2010. This may suggest a critical mass having been achieved which, as will be illustrated further on, is now sustaining increased use of ENEE up to the current point in time.

5. General evaluation

5.1 Survey summary

The aim of the general survey that was administered during the evaluation was to gather information on how people were using ENEE during the initial period of implementation, the features that they found most valuable, how they planned to use ENEE in the future, and to gather data on ease-of-use.

The general survey for the evaluation remains available online at:


The survey garnered a reasonable response for an online questionnaire. A total of 46 responses were received from a population of 159 ‘active users’ (determined as being those users who have gone beyond simply registering as a member of ENEE), therefore giving a response rate of 29%.

5.2 How ENEE was being used

The first part of the general survey concentrated on how people were using the site. This began with a question asking, “How often do you use the ENEE?” Those who used ENEE often (at least twice per week on average) made up over a fifth of the sample, but those who used ENEE less than once per
month comprised half. This suggested a core of engaged users, but that the majority weren't engaging regularly.

**Figure 5:** Pie chart showing how often users log on to the ENEE

Participants were also asked how many groups they were involved with as member or creator. Most of the interaction on ENEE occurs within group areas, which are the only place that offer discussion forums. Therefore, use of groups was felt to be a good indication of general engagement. Also, creating a group demonstrates a higher level of engagement; the desire to form an area to engage others.

85% of users stated that they had joined at least 1 group, with only 15% not having joined a group as of yet. This suggested that groups were being viewed and experienced as an important tool, and that most users desire an area to collaborate with others on areas of common interest.

However, a small number of the more active users seemed to be responsible for the creation of groups, with only 22% of the sample indicating having created any groups. This is common in many online communities, where a small number of users often contribute a large amount of the total content.

How the ENEE was being used in terms of tools and benefits is shown in Figure 6. This data confirmed group discussion as one of the most useful tools, chosen by 43% of respondents. The second most popular activity was ‘keeping up with current university activity’ around learning, teaching and assessment. This was a little unexpected at that early stage in the life of ENEE, as, at the time, ENEE did not represent a particularly comprehensive cross-section of University activity. However, this shows how important this function was, and will continue to be, and echoes previous work indicating that simply ‘keeping up to date’ with others’ good practice is one of the most valuable aspects of belonging to online communities of educators (Sherer et al, 2003; Schlager and Fusco, 2003).

The groups tool features third in this part of the survey. Given that this is, as has been mentioned, a key indicator of engagement, this is encouraging to see.

An interesting outcome from Figure 4 is the limited use of content sharing tools, such as file storage, pages or blogs, and the minimal use of messaging tools. This suggested that academics simply want their own online space for communication and collaboration, while file or content sharing are relatively unimportant for now. This may change in the future as staff become more alert to the range of activity ENEE can support.
How ENEE is being used (tools, features and general benefits) | Count | % of respondents |
--- | --- | ---
To read or contribute to discussion forums within groups | 19 | 43%
Keeping up to date with teaching and learning activities currently happening within Edinburgh Napier | 17 | 39%
Providing a shared collaborative space for groups that involve internal and external members | 13 | 30%
For the sharing of education resources | 12 | 27%
Use of the group tool as an online presence for projects or initiatives (excluding Teaching Fellow Special Interest Groups) | 10 | 23%
Administrative file sharing (e.g. project documents and policies) | 6 | 14%
Maintaining a personal or project related blog | 5 | 11%
Use of the group tool to provide an online presence for Teaching Fellows Special Interest Groups | 5 | 11%
Media sharing (e.g. images, audio) | 3 | 7%
Creation of web pages | 2 | 5%
Instant communication (e.g. The Wire instant messenger) | 2 | 5%

Figure 6: Which tools are being used on the ENEE

5.3 Usability

While the rationale for using ELGG to host ENEE was driven mainly by a pedagogic and staff development perspective, part of the reason for choosing ELGG was the simplicity of the platform. However, a large number (40%) found ENEE less than easy to use, suggesting only adequate general usability.

This was a valuable insight and was taken to suggest that more user documentation was required, at least as part of a solution to improving usability. The lack of engagement suggested by earlier data could feasibly be due to low usability and lack of guidance, therefore an easy way to increase engagement may be to increase the ease of use of ENEE through good ‘point of access’ guidance.

In response to the question, "Are there any features of the ENEE that you find particularly difficult to use?", illustrative comments received included “involving external members seemed [difficult] - I think you needed to give them access, then I had to respond to a different email”; “finding the group page that you are enrolled on and where the resources are”, and “a quick guide to ‘getting the most from ENEE’ might help [including] audio, Camtasia, and screenshots”. These comments highlight certain areas of the platform which cause difficulty, but also indicate general use is problematic. Logging on is a basic process, but that it was considered difficult for some is an important area to address through better documentation or system adjustments. There was also some confusion around how the platform functions, as enrolling internal and external members is in fact the same basic process.
5.4 Future use of ENEE

The final section of the general survey addressed future plans of those users who participated in the evaluation. As Figure 8 shows, a large number planned to increase their use of ENEE in future, with 48% of users definitely planning to build on their use ENEE. 35% of users indicated that they may do so.

When those in question were asked how they may make further use of ENEE in the future, typical comments put forward included: “to keep up with learning and teaching developments at Edinburgh Napier”; “make more use of the communication tools”; “developing more group spaces to support academic staff development”; and, perhaps tellingly, “I think we’re only just tapping in to the potential of ENEE to create groups and support projects that are cross-institutional in nature”.

Figure 7: Usability results

Figure 8: Do users plan to make more use of the ENEE in future?
Comments here affirmed many of the aims of ENEE, and hopefully suggest at least some users intend to build more fully on the benefits offered. Post-evaluation, we are starting to see further evidence of this.

5.5 Interviews

Five in-depth interviews with pro-active users of ENEE (two who had used the platform to support particular group activities and three who were participants on the MSc BOE) were conducted to provide further insight into issues addressed through the general survey. They were conducted as semi-structured interviews in accordance with the method advocated by Barnard (1988), and focused around broad questions on use, ease of use, benefits, engaging colleagues, and how the institution could best take forward ENEE. For those on the MSc BOE, specific questions on the use and value of the MSc BOE group space were asked.

In terms of use and ease of use, the biggest problem emerging was around navigating the ENEE and locating particular resources of interest. When clicking the group menu option the user is initially faced with a page showing the most recent activity from groups across the site. Unless the group you are interested in has been very active recently, it is unlikely to appear in this list. It is possible to click a link to access a complete list of groups, but one interview participant described the recent activity tab as “unintelligible” and described how they and others immediately gave up on that page. The alternative way to access a group involved visiting the user’s dashboard to find their own list of groups. This tool only lists groups for which the user is a member, and so doesn’t help participants locate new groups.

A related problem here seemed to be a lack of understanding of the dashboard - a customisable screen on which the user can place a number of notification boxes which will inform the user of new content. For example, the user can place a blog notifier on their dashboard which will then display all recent blog updates from everyone or their ENEE ‘friends’. None of the five interviewees, all quite experienced users of ENEE, knew that this was possible. This only came to light through watching one interviewee demonstrate the difficulty of accessing her groups, thus showing the value of user testing via task monitoring in the future. This could be carried out easily using testing approaches that have been shown to require only five participants to be effective (e.g. Virzi 1992; Neilson, 2000).

A further difficulty in terms of general usability concerned the process of joining ENEE. One interviewee termed site sign-up as an “application process” and described this as a “barrier” to many users. This is mainly attributable to the manual verification process that was put in place due to early ‘spam’ intrusions by external users. The participant stated that for one particular group of 22 users, 4 or 5 completely failed to access to the site. Again, this is where user testing is necessary in the future to determine exactly where difficulties lie in key processes, although the process itself (as indicated later) is now simplified as a result of the evaluation interviews.

In terms of benefits, the interviews underlined some interesting perspectives and experiences in using ENEE. One was around the sense of social presence afforded by ENEE, and the improved engagement it brings. The use of avatars throughout the site was pinpointed here. Avatars are uploaded by users after creating their profile and consist of a small picture of the user, or a representative image. Whenever a user interacts with the site, e.g. writing a discussion posting, then their avatar appears beside that item both on summary activity lists and the item itself. This results in a dashboard containing dozens of small avatars accompanying the relevant content, and users come to recognise people very easily when they contribute new material. One participant described the process of creating a new group and experiencing a “wonderful” feeling when a picture appeared in the member list displaying a real smiling face. It seems then that ENEE’s format is particularly suited to creating that sense of social presence thanks to the prevalent avatars, which is something to maintain and build upon. It also suggests that the kinds of features and activities which promote a sense of social being and belonging in online learning, and which we know are critical to engagement, satisfaction and retention in online courses (Rovai, 2003; Rovai et al 2005), are just as important for social awareness and integration in online professional networks.

The second main area of benefit highlighted was the creation of valuable reusable resources as a result of online activity in ENEE. One participant discussed having run a number of short-term, focussed activities using groups on ENEE that involved group members researching material, creating resources and then posting them in the group space. This was obviously very useful for the...
group participating, but the interviewee described how that group space remained as a permanent resource for others, containing well-researched information on that particular subject. Others can potentially then join that group, carry on earlier discussions, explore outputs, and develop it further if they so wish.

This result is something which could turn out to be of great benefit. The general survey showed that 43% of users use the discussion tool within groups, 30% use the groups as a general collaborative space, and 22% use the groups as a base for projects or initiatives. This means a great deal of material is being created and will be created in the future, hopefully contributing to a rich and ongoing developmental resource for Edinburgh Napier’s staff and external users of ENEE to draw usefully upon.

The final major theme emerging from the interviews was that of user engagement. Several participants mentioned the phrase ‘critical mass’ (the tipping point at which online activity encourages others to engage) and how they feel this is more easily achieved in small groups carrying out focussed tasks. This is opposed to larger, more broad-ranging groups that seemed to be less active, possibly due to lack of focus or inertia. A related practical consideration regarding critical mass was the request for e-mail notifications following the posting of any new content on the site. One interviewee described how it would be much easier to be timely in their responses if they were informed as soon as a new item was created in her group. This chimes with insightful comments by other interviewees regarding long-term engagement which could be very useful to the development of the ENEE. Several interviewees stated that there was an overarching problem of “multiple spaces” and that “it’s not a simple matter to add a new one”. Staff at Edinburgh Napier currently work across a number of informational, social and collaborative spaces including email, the staff intranet, Sharepoint for departmental work, and now ENEE for university-wide collaboration. Interviewees explained that users struggled to keep up with the existing spaces, even before ENEE became available. This is exacerbated by the disconnect currently affecting ENEE in that it isn’t connected to existing university systems, requiring a new username and password.

The result of this multiple spaces issue is that often, even with the best of intentions, users do not check ENEE for many days at a time which can sometimes hamper sustaining a timely dialogue and the achievement of the critical mass mentioned earlier. The suggestion of email notifications is one possible solution to this problem. A more pro-active alternative would be an integrated informational and collaborative area which would collate input from email, the intranet, departmental sites and ENEE on one page, in much the same way as the internal ENEE dashboard does. This would require closer integration of ENEE with other university systems, but, according to the interviewees, this would be a valuable move indeed.

6. Key lessons learned from a general evaluation of ENEE

In establishing and evaluating ENEE we found ELGG to be an appropriate platform on which to base an institutional online social network-based community of educational professionals. Many of the tools inherent within ELGG, particularly the group tools and resource sharing features, lend themselves well to meaningful collaboration and sharing around issues relating to learning, teaching and assessment. However the findings of our general evaluation suggest that while comparatively easy to use alongside other social networking platforms, not all aspects of ELGG were intuitive to users. Much more guidance and instruction was required by users new to the ELGG system than had been anticipated, and this is likely to be true of any community built on the ELGG system in future.

7. Post evaluation modifications

Following the results of the general ENEE evaluation, and through general issues that also recurred within the evaluation of the MSc BOE group space, two main areas of work were identified where immediate gains could be made. These were the areas of documentation and of user authentication.

7.1 Documentation and Guidance

It became clear through the survey and interviews detailed above that many elements of the ENEE were quite confusing to new users. Having an area of the site described as ‘unintelligible’ was quite a surprise to the project team considering ELGG was chosen due to its inherent usability.
To combat this, new documentation and guidance was produced to introduce new users to the site. This documentation was created in the form of screencasts - recordings of a tutor's screen narrated with audio instruction - in order to provide a modern, media-enhanced form of instruction, commensurate with the ethos of the ENEE as a whole. In addition, the combination of audio and visual elements of instruction has been found by Mayer (2001) to aid in instructional effectiveness thanks to a multi-modal delivery method which utilises both modes of a learner's working memory. Five tutorial videos were created in total introducing the user to the basic functions of the ENEE. This included signing up to the site, a general tour of its features, and using the ENEE groups. It was hoped that these videos would serve as a central resource to overcome the common barriers found by many novice ENEE users.

7.2 User authentication

One barrier to entry for many new ENEE users which was considered worth investigating was the initial site registration. Many users were being put off by the sign-up process which, at the time of the survey and interviews above, involved being manually approved by the site administrators. As has been mentioned, this caused a significant amount of confusion, particularly when involving non-Edinburgh Napier staff. The plug-ins required to facilitate this method also utilised an automatic authentication method in the form of a 'type what you see' question at the bottom of the form, commonly called a Captcha. This tool had been reported to cause problems on some isolated systems, not allowing completion of the form. The combination of these problems prevented some users from engaging with the site at all.

Due to the large problem with spam users on a publicly available site such as this, some method of authentication was still required, but it was obvious that manual authentication was not working.

It was decided to implement a manually programmed solution whereby the registration form would only accept .ac.uk email addresses. This was considered to be very secure as only trusted users would have access to an .ac.uk email address, and the downsides of excluding non-academic users was considered worth the ease of use of the solution. This meant that anyone with an .ac.uk could very quickly and easily register for the site and begin using it immediately, thus overcoming all of the current registration barriers. In the rare case that a non-academic user was required to register we
could manually enter their email address, the process not taking much longer than the current manual authentication method.

7.3 Initial modifications results

The two enhancements detailed above have now had around 3 months to bed in, having been implemented in late July. Figure 10 shows the user registration pattern up to present.

![ENEE User Growth Since Launch](image)

**Figure 10:** Continued growth in registrations for ENEE up to November 2011

The change is not dramatic, but it seems that there is an upturn in registrations, disregarding the vertical jumps due to individual projects, since these enhancements were put in place. This will require further investigation, however, as a number of variables could come into play in this measurement.

8. MSc blended and online education

As part of the ENEE evaluation, a focused evaluation of the MSc BOE programme cohort’s group space was undertaken to provide an early insight into how effective ENEE may be in supporting students and tutors on taught programmes. At the time, the MSc BOE was the only taught programme using ENEE.

The MSc BOE is a fully online distance programme for lecturers and other education professionals. It has been running successfully since 2007 and currently has around 60 professionals from across mainland Europe and beyond enrolled as participants. The nature of the programme is reported elsewhere (Smyth, 2009). In relation to ENEE, the MSc BOE sought to use the platform to establish a ‘programme wide’ community space that would allow participants to get a greater sense of who was on each module, share news and resources across module groups, access live and recorded Guest Expert webinars, and provide a blogging space for reflective writing projects. The overall aim was to promote a greater sense of belonging to a programme community, rather than groups being segregated within module specific silos in the VLE, and to extend the excellent peer-peer support seen in modules across the whole cohort.

8.1 Use and perceived value of the MSc BOE group

The MSc BOE group on ENEE was introduced in February 2011. Of the 50 students and 4 tutors on the programme at the time of the evaluation, 33 in total (29 students and 4 tutors) had joined the group space. Of the 29 students, 9 participated in an online survey of use and impact and 3, as indicated, participated in the individual interviews as part of the overall evaluation of ENEE. The online survey is available at:

While we are drawing here from a small sample, around a third of student members of the MSc BOE group, we can see in Figure 9 a clear value being placed on accessing information about who is on the programme (via the Who’s who pages, and group members area), and in accessing information about and participating in the live Guest Expert webinars that are linked to from within the MSc BOE group. The value of this sense of community is not to be underestimated in terms of student support gains, and 7 out of the 9 participants agreed with the statement ‘Having the MSc BOE group space promotes a greater sense of belonging to a programme-wide community’. Six also agreed that ‘Having access to the information and resources provided in the MSc BOE group space is contributing positively to my experience of being a participant on the programme’.

<table>
<thead>
<tr>
<th>MSc BOE group feature or use</th>
<th>Very valuable</th>
<th>Valuable</th>
<th>Not sure</th>
<th>Has limited value</th>
<th>Of no value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Who’s who page for your current module</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Who’s who pages for other modules</td>
<td>2</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Information about previous Guest Expert sessions</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Access to recordings of previous Guest Expert sessions</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Information about upcoming Guest Expert sessions</td>
<td>4</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Participation in live Guest Expert sessions</td>
<td>5</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Discussion forums (to read)</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Discussion forums (to contribute)</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Group blog</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Group bookmarks</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Group members area (to view and read profiles)</td>
<td>2</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Friends feature (to 'friend' other group members)</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Mail feature (to mail other group members via the Education Exchange)</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Figure 11: Perceived value of MSc BOE group features

While some value was being placed on the general discussion forums (which were used to share information covering things like upcoming events and new publications), it is clear that not all of the respondents valued access to these forums for reading or contributing. As one participant commented in relation to levels of participation within the group discussion boards, “Perhaps it is not yet clear if the BOE Group space is something informal or should be thought of as an official part of the course. This is perhaps partly why contributions are lacking”. This is a fair comment, and in what is already a busy online programme with much academic and peer support activity taking place within module sites, the legitimacy and potential of the MSc BOE group on ENEE may not yet be fully understood or appreciated by students or staff. Echoing findings from the general evaluation, we need to also acknowledge that the challenge of ‘multiple spaces’ may be exacerbated in a fully online distance learning course.

As one of those less enthusiastic about the use of ENEE for the programme commented, “It’s a real problem to have two virtual spaces, the VLE and the ENEE. I’m sorry, but there’s no way I can keep up with two, it’s just too much with the other professional places I have to go to”. However, there was certainly evidence to suggest that the early signs for introducing the ENEE to the MSc BOE programme were promising, and that the way forward may be to embed effective use of ENEE from the outset of the programme for the next intake: “If this group space had been available three years ago when I started on the MSc BOE I would have used it much more. I am currently very busy with
my dissertation, however if I was just entering the programme and was completely new to the programme and Edinburgh Napier I would have really appreciated and used such a space”.

9. Key lessons learned from evaluation of MSc BOE group space

Echoing both the general evaluation of ENEE and similar work summarised earlier in this paper, the ‘keeping abreast’ of others and their work was the most valued aspect for those on the MSc Blended and Online Education. Participants were able to get a greater sense of who else was on the programme, and for some this was at least starting to contribute to participants feeling a greater sense of belonging to a programme-wide online community rather than being ‘silied’ into module groups within the institutional VLE (which is perhaps one of the key barriers to community building within online distance programmes).

While a lack of clarity around how ENEE complemented formal course spaces on the MSc BOE led to some uncertainty about ENEE’s role and value, a critical point was raised around the potential to clarify the role and purpose for new participants coming onto the programme in the future.

10. Post evaluation modifications to MSc BOE group space

With the above in mind, the post-evaluation enhancements to the BOE group space were deliberately focused on strengthening the content and features that would foster a greater sense of who was within the programme community, and what was happening across that community. A number of refinements were also made to the information made available, both within module spaces in the VLE and on the BOE group space itself, concerning the intended purpose of the BOE group space.

Figure 12 provides an indication of the information offered on the group’s home page about how the group could be used, and also illustrates some of the new pages created. These include a ‘BOE role call’ page listing every student on a module for that trimester in one listing, organised by modules. A similar page is used to provide a list of current and recently completed MSc BOE projects, which we know anecdotally has already proven useful and motivating for a number of participants now at the stage of planning and embarking on this final stage of the programme. A number of activities on the MSc BOE involve maintaining project and reflective blogs, including blogs used for assessment on particular modules, and the ‘BOE Blog Roll’ page has been created as a means to link to a range of these project blogs as additional resources that could support participants in tackling particular projects as well as creating and maintaining their own blogs if they are new to this kind of activity.

![Figure 12: Re-designed MSc BOE group explaining purpose of group](image-url)
While participants on the MSc BOE often create blogs using tools such as Wordpress, we are seeing an increasing number of participants now choosing to create their blogs within the BOE group space. This seems to be partly due to established students becoming more comfortable and familiar with the ENEE and BOE group space, and partly as a result of embedding an introduction to ENEE and the BOE group within the start of the programme itself. For those who started on module 1 of the MSc BOE in September this year, specific induction activities involving joining ENEE, setting up a profile, and requesting to join the BOE group space had to be undertaken as part of the week 1 orientation.

Further new features introduced post-evaluation include a programme Twitter feed that is embedded on the home page of the BOE group space (Figure 13), and all module sites within the VLE.

![Figure 13: New pages feature within MSc BOE alongside feed to programme-wide Twitter updates](image)

This is not used routinely, as regular updates come via various other means within the modules themselves, but is instead used in a targeted way specifically for programme-wide short announcements as and when these need to be communicated across the programme. Those who follow the MSc BOE programme on Twitter will receive these automatically, but by embedding the feed within the BOE group space and the institutional VLE all participants will receive the updates regardless of their use of twitter.

Finally, the way in which the BOE group space was beginning to prove useful during the initial period of implementation has also led the programme team to identifying a range of other ways in which the ENEE can be used to extend and ‘open up’ activities previously only available to those on the MSc BOE programme. This has included the recent online ‘writing for publication in technology enhanced learning’ initiative (Write-TEL) that supported a range of Edinburgh Napier staff and external participants in writing up a TEL initiative for publication (Figure 14). It also includes the current TEL-Connect series of online webinars, based on the guest expert online seminars used on the MSc BOE but opened up (via ENEE) to anyone who is interested in participating.

11. Conclusions

In a relatively short time, from initial scoping through to implementation and evaluation, we have been encouraged by the potential of ELGG as a platform to support an online professional community of educators within Edinburgh Napier. Particularly encouraging is that the original rationale for establishing ENEE has been borne out by the growing number of staff (internal and external) who are creating or joining groups, and the features within ENEE that they are finding useful. This extends in many key respects to the MSc BOE group space, the use of which is confirming that ENEE can play a role in supporting student as well as staff groups and which may provide a useful template that programme leaders of undergraduate and postgraduate programmes within the University may find useful to adapt.
Figure 14: The ENEE is now supporting staff development activities developed from the MSc BOE

The danger remains of participants struggling to cope with ‘multiple online spaces’ when faced with using a resource like ENEE alongside other internal and external means of online communication and collaboration, and of learning to use rich environments like ELGG in order to engage with the networking spaces they provide the technical platform for. Some of the improvements introduced post-evaluation, particularly around sign-up and through the provision of interactive tutorials, will hopefully help address at least some of the challenges faced by those who took part in the evaluation.

Another key lesson learned, through the BOE group space evaluation, lies in clearly communicating the purpose of groups and community spaces established within a resource like ENEE and where they differentiate in their purpose from the other institutional and external spaces we may require staff and students to use and engage with. There was a strong sense from the general evaluation that small groups with a clear focus around a narrow set of clear shared objectives were proving to be the most effective and productive in ENEE, and there are lessons learned in all of this to take forward in further developing ENEE to support staff development, resource sharing and, over time, formal learning and teaching activities.

The ‘holy grail’ of allowing a single sign-on which accesses ENEE and all University online resources, all within a properly integrated environment will, however, very likely remain a key desire on the part of users. This will, however, remain a difficult technical challenge for Edinburgh Napier and other institutions to resolve short-term.

References


Correlating Questionnaire Data With Actual Usage Data in a Mobile Learning Study for High School Mathematics

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Abstract: A mobile learning research project was conducted in Trinidad and Tobago to determine if mobile learning can assist high school students in learning mathematics. Several innovative techniques were used in this research to address the problem of high failure rates of mathematics in high schools in the Caribbean. A mobile learning application was developed based on a subset of the high school mathematics curriculum used in the English-speaking Caribbean. Game-based learning, personalization and multiple learning strategies were used in conjunction with mobile learning to assist students in improving their performance in mathematics. Three evaluation studies were conducted with the mobile learning application. During the studies, usage data was captured automatically by the system and this was used to determine the extent to which the students actually used the mobile application. At the end of each study, a questionnaire was used to capture student opinions of the mobile learning application. Questionnaire data is based solely on student responses and there is no guarantee of its accuracy and reliability. This paper focuses on the responses of the students to the questionnaire and seeks to determine if the usage data can increase the reliability of the questionnaire data. It summarizes the behaviour patterns of the students gleaned from the usage logs and compares this to the students’ responses to the questionnaire. Generally it was found that the students’ responses agreed with the usage data, though there were occasions when the responses diverged.

Keywords: mobile learning, learning mathematics, high school mathematics

1. Introduction and background

The high failure rates of mathematics in the Caribbean reveal that many students have difficulties with mathematics. This is a major problem since mathematics is a necessary prerequisite for students to progress in education and employment. High school students in most Caribbean countries prepare for the Caribbean Examinations Council (CXC) mathematics examination. Table 1 shows the pass rates for CXC mathematics for the period 2004 to 2009. It reveals that at most 47% of the students have passed mathematics in the Caribbean. This statistic highlights the fact that there is a need for more innovative learning solutions to assist students with improving their mathematics skills.

Table 1: CXC pass rates for the 6 year period, 2004-2009

<table>
<thead>
<tr>
<th>Year</th>
<th>Month</th>
<th>Total % of Students Passing Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>Jan and June</td>
<td>45%</td>
</tr>
<tr>
<td>2008</td>
<td>Jan and June</td>
<td>47%</td>
</tr>
<tr>
<td>2007</td>
<td>June</td>
<td>34%</td>
</tr>
<tr>
<td>2006</td>
<td>June</td>
<td>35%</td>
</tr>
<tr>
<td>2005</td>
<td>June</td>
<td>39%</td>
</tr>
<tr>
<td>2004</td>
<td>Jan and June</td>
<td>46%</td>
</tr>
</tbody>
</table>

One potential solution is mobile learning. Mobile learning is the exploitation of ubiquitous handheld technologies, together with wireless and mobile phone networks, to facilitate, support, enhance and extend the reach of teaching and learning (m-learning.org, 2011). Mobile learning is expected to be motivating and offer the advantages of learning anywhere and anytime. The main reason for choosing mobile learning in our research is its popularity especially with young students today. Almost every person in Trinidad and Tobago owns at least one mobile phone. The cost of mobile devices and calling rates are quite affordable and the mobile infrastructure in Trinidad and Tobago is well established resulting in most people acquiring mobile devices with improved features every year. A similar situation exists in other Caribbean countries. Mobile devices offer advantages such as the...
opportunity to learn anywhere and anytime and self-directed learning. Our research attempts to harness the potential benefits of mobile devices to provide a learning platform which targets poor performance in high school mathematics.

This paper provides an overview of the mobile learning system developed in our research and the evaluation studies conducted with this system. However, its main goal is to compare students’ responses on a post-test questionnaire to their actual usage of the mobile application. In particular, the paper seeks to answer the following research questions:

- Why are students’ perceptions of mobile learning technology important?
- What is the value of comparing usage data to students’ responses?
- What does the comparison reveal?
- Can questionnaire data be relied upon?

2. Literature review

Mobile learning in past years has proven to be successful in many different contexts and with various target groups. Faux et al. (2006) reported on a study where primary school students showed improvements in literacy after using PDAs. Cook et al. (2007) reported on a mobile learning study where 73% of the students thought it was important to learn anytime and anywhere. Attewell (2005) indicated that learners were excited to use the mobile devices, a large percentage of them showed improvement in reading and mathematics skills and it helped build their self-esteem and confidence. Benta, Cremene and Padurean (2004) presented a multimedia mobile learning application that combined the advantages of text, images, and audio. They stated that the mobile device captured the students’ attention very quickly and they found it useful. Chu and Liu (2007) conducted evaluations that revealed that students thought it was useful to use mobile devices for learning English. Conway-Smith (2010) reported on a study using mobile learning in South Africa where the results revealed an overall increase in mathematics scores by 3.36% in 18 weeks.

Sharples (2003) describes a system called HandLeR (Handheld Learning Resource) which attempts to put education at the fingertips of students through their mobile device. He reported that the students were excited about owning a piece of cool technology. The study indicates that the use of the mobile devices increases retention and motivation. Valk, Rashid and Elder (2010) conducted a survey of several mobile studies undertaken in developing countries. They reported on one study conducted in the Philippines where the results of the experimental group were only marginally higher than the control group. They reported on another study conducted in Mongolia which revealed an 18% increase from pre-test to post-test performance. There was also a study conducted in rural India which resulted in an average increase of 20% from pre-test to post-test scores.

Shin et al. (2011) investigate the effect of game technology on elementary students learning mathematics. In this study, students who played technology-based arithmetic games outperformed students who played paper-based arithmetic games. Franklin and Peng (2008) presented a mobile learning study for learning mathematics in which iPods were used to help middle school students learn algebraic equations. Videos were provided for students to learn beyond the hours of the classroom. Liebenberg (2008) presented a J2ME application called MOBI for learning mathematics. It addressed some of the challenges posed to mathematics education in South Africa. The application allowed the student to listen to podcasts, view multimedia content or even chat with other students via instant messaging. It offered assessment tools with corrective components. A mobile mathematics study called MoMath (MoMath 2010) in South Africa for mathematics showed that the use of the mobile devices increases retention and motivation. Improvements in students’ end of term tests results have also been seen. Project K-Nect (2008) targeted secondary at-risk ninth graders, helping them to focus on increasing their mathematics skills through mobile smartphones.

The literature on mobile learning documents students’ usage and perceptions of mobile learning. It reports that some researchers used the mobile device as an organizer to assist learning; some used SMS (text messaging) for learning while others developed dedicated learning environments on the mobile device itself. Projects in which the existing features of the mobile device were used for learning, reported that students were excited to use the mobile device for learning. For example, McFarlane, Roche and Triggs (2007) reported on a Becta mobile learning project where the students responded enthusiastically and the teachers indicated that students studied without even being
asked. Perry (2003) reported on another Becta ICT Research project where students were excited and highly motivated when they got PDAs to use for learning. Cook et al. (2007) presented a mobile learning study which required students to gather data using photos and video clips. The results of this study indicate that the students were very task-focused and the mobile phone motivated them to get high grades.

Attewell (2005) conducted a mobile learning study for learning literacy and numeracy and the learners were excited to use the mobile device. Hartnell-Young and Heym (2008) conducted research to determine if there was a positive side to mobile phones in secondary schools. Their findings revealed that students enjoyed the mobile learning and were motivated. Kadirire (2007) used instant messaging for creating collaborative and interactive learning. The students became engaged in course material outside the classroom which motivated them and improved their self-confidence. Most students valued communication with peers and they developed a sense of community. Valk, Rashid and Elder (2010) reported on a project that used a module created for learning English and was tested with a group of bank tellers and restaurant servers. The participants agreed that this method of learning was helpful to them. Valk, Rashid and Elder also reported on a study which explored the effects of mobile learning. However, results indicated that there was no improvement in performance and students were concerned about the challenges of the small screen of the mobile device. This study gives an example of negative responses from some learners. It was suggested that perhaps this method of learning was not suitable for all learners.

Games are extremely popular with every age group. As part of this mobile learning study conducted in secondary schools, a survey was done in Trinidad and Tobago with over 120 students. It revealed that 89% of high school students play computer games at least once a week. Most students enjoy playing games. The data based on student opinions indicated that they are willing to use gaming for learning and some even prefer mobile games. This data is confirmed by many reports from different countries. Hashim et al. (2007) presents the results of a survey conducted at the University of Malaysia comparing the use of mobile games to other digital games. It reveals that 54% of the respondents preferred playing mobile games. A BBC report by Pratchett (2005) provides some statistics on gamers in the UK. 92% of 11-15 year olds play games at least 3 times a week. 48% of 6-65 year olds are heavy gamers, meaning they play at least once a week and at least 82% of individual’s age 6-24 play games.

3. Design and implementation

A mobile learning application was developed offering the learner multiple strategies for learning mathematics such as game-based learning and personalized recommendations. The application was designed to complement the mathematics classes that students normally attend at school. It focused on a subset of the CXC mathematics curriculum dealing with algebra. Specifically, the application targeted topics in algebra such as factors, directed numbers, simplification of expressions, factorization, and equation solving. Algebra was chosen as the main topic for this study since it is one of the most difficult topics in high school mathematics.

The learning strategies used in the application were Lessons, Examples, Tutorials, Quizzes and Games. The students can choose to use a text-based Lesson, review a worked Example of the problem, try a Tutorial or Quiz, or play a learning Game. Figure 1 shows a screenshot of one of the Tutorials and Figure 2 shows the Simplify Terms Game. The Example feature offers the learner a worked problem with the freedom to manipulate the numerical values which causes the solution to adapt to suit the new values. This gives the learner the ability to dynamically modify the example. The other learning features are intended to help the learner to review the curriculum items targeted by the application. The Tutorial feature consists of three main parts, each displayed in a separate screen. The first part offers a brief explanation of the topic, the second part provides a worked example and the last part generates a question for the student to attempt.

The Game feature was created to encourage students to practice the targeted mathematics skills. This is important since practice has been identified as one of the most important steps in learning a mathematical skill. MobileMath has seven games. A game was created for each topic targeted. These include a Finding Factors Game, a Directed Numbers Game, a Simplification of Expressions Game, a Factorization Game and a Solving Equations Game. The objective of each game is to help the students improve a certain skill. The Factors Game allows the students to practise with factors while the Directed Numbers Game allows them practise with directed numbers. Each game is implemented
in such a way as to ensure that if the student plays, he or she is practising that particular skill. The *Simplification of Expressions Game* requires the player to sort X-terms from the Y-terms as they drop in from the top of the screen and add the new value to the corresponding X or Y term. The *Factorization Game* requires the player to select two terms from the given set: a number term and an algebraic term. The *Solve Equation Game* is made up of four equations and a probable solution for each one. One column of the set is shuffled and the player has to put them back in the correct position.

![Tutorial feature](image1)

**Figure 1**: Tutorial feature

![Game feature](image2)

**Figure 2**: Game feature

The mobile learning system comprises mobile phones used by students, a Web server, and Internet connectivity via a cellular network. A student logs into the application using his mobile phone and proceeds to use the different features of the application. On exit, all scores awarded and usage data are sent to the Web server via the Internet. The Web server also supports a *GPRS game* and a *chat feature*. It keeps track of data on student usage of the different features. GPRS stands for General...
Packet Radio Services which is a wireless based communication service which allows connection to
the Internet for mobile phones and computers. The GPRS and Bluetooth capabilities of the mobile
devices allow collaboration among students while they play the games and also allow them to discuss
mathematical problems with classmates. This gives students a chance to learn from each other.

Two main forms of data were collected to be used to evaluate the effectiveness of mobile learning.
Data was collected by the mobile device on each student’s usage of the application and a
questionnaire was used to gather the students’ perceptions of using mobile learning for mathematics.
Table 2 shows some example questions from the questionnaire used.

<table>
<thead>
<tr>
<th>Type of Questions</th>
<th>Strongly Disagree [1] [2] [3] [4] [5] Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>General questions based on the application as a whole</td>
<td></td>
</tr>
<tr>
<td>1. The mathematics games and learning activities on the phone were easy to use. [1] [2] [3] [4] [5]</td>
<td></td>
</tr>
<tr>
<td>3. I found it useful that I can learn mathematics on a phone anywhere and at any time. [1] [2] [3] [4] [5]</td>
<td></td>
</tr>
<tr>
<td>4. A phone with similar games and learning activities can be beneficial to me in other subject areas. [1] [2] [3] [4] [5]</td>
<td></td>
</tr>
<tr>
<td>Feature based questions</td>
<td></td>
</tr>
<tr>
<td>7. I would like to use the Lesson feature in future to study mathematics. [1] [2] [3] [4] [5]</td>
<td></td>
</tr>
<tr>
<td>8. I found the Lesson feature easy to use. [1] [2] [3] [4] [5]</td>
<td></td>
</tr>
</tbody>
</table>

The first section of the questionnaire was designed to get a general idea of what the students thought
about using the mobile application. This section attempted to get an idea of what the students thought
of using this technology for the first time for learning mathematics.

The second section of the questionnaire focused on getting feedback from the students, based on
each feature of the mobile application. Since the application consisted of several screens, screen
shots were used to remind the students of the feature in question. The Likert scale was used to make
it easy for the students to respond to each question since they simply had to circle a number to
represent their response. It also promotes a more accurate response from the students since they
have a range of options.

The mobile learning application collected data based on each student’s usage as they used each feature. The date and time of each use, the length of time and the number of times each feature was used was captured. Data on which options were selected by each student was collected in an effort to
determine if they used the recommendations made by the mobile application. All scores in each game
and the quiz were recorded. This data was sent to the server via a GPRS connection. The mobile
devices used by the students had an unlimited GPRS connection. However in the event that the
connection went down, the data was stored on the mobile device and sent to the server when the
connection became available again. The data collected was analyzed at the end of the study to
determine how much the students used the application and how they performed on the assessment
features.

4. Evaluation

Three evaluation studies were conducted to determine the effectiveness and usability of the mobile
learning application. Approximately 20 students participated in each study; thus, the sample size was
almost 60 students. In the first study, the students used mobile learning without encouragement or
interference from the teacher. In the second study, support and encouragement were provided by the
teacher, in the form of text messages and classroom meetings. The students of Study 1 and Study 2
had been taught algebra in a previous term at school and they used mobile learning to determine if
their performance would improve. The students of Study 3 learned algebra during the study for the first time. They were taught in the classroom and used mobile learning as a support tool to augment their study of algebra. The objective of Study 3 was to determine how mobile learning would impact on students who were learning algebra for the first time. This study consisted of an experimental group and a control group. Pre-tests and post-tests was conducted to evaluate if there were any difference in student performance and questionnaires were completed in order to gauge students’ opinions of the different features of the mobile learning application.

The results of Studies 1 and 2 revealed that there were statistically significant improvements in students’ performance after using the mobile learning application. In Study 1 the mean value of the pre-test was 55.1 and the mean value of the post-test was 63.5, showing an increase in average performance. A 2-tailed significance t-test revealed a value of 0.025 implying that there is a significant difference between the pre-test scores and the post-test scores. In Study 2 the mean value of the pre-test was 30.7, while the mean of the post-test was 40.9 showing an average increase in performance. The 2-tailed significance t-test revealed a value of 0.001 implying that there is a significant difference between the pre-test scores and the post-test scores (Kalloo and Mohan 2011b).

However, in Study 3, the students of the experimental group did not perform any better than the students of the control group. In Study 3, the experimental group obtained an average score of 48.8% while the control group obtained an average score of 49.5%. The data also showed that the students who passed the post-test scored an average of 63% and the students who failed scored an average of 34%. It also shows that the students who passed the post-test used the mobile application 22% more and 63% longer than the students who failed (Kalloo and Mohan, 2011a).

This paper gives an analysis of the students’ responses to the questionnaire in all three studies and it compares this to the actual use of the mobile learning application by the students.

5. Students’ perceptions and usage of the mobile learning system

There are various attributes of a learning tool which can contribute to its success, such as being fun, having games, being visually appealing and using animation. However, before trying to evaluate why the learner finds it appealing, it is essential to first evaluate if they found it appealing at all. The learner’s perception of the learning tool is extremely important in the evaluation process and ultimate success of the tool. If the learner does not perceive it as beneficial, this can impact negatively on its success. The questionnaire data can be used to provide valuable data with regard to learner perceptions. The difficulty lies in getting an accurate account from the learner of their perceptions. When interviews and questionnaires are used there is always the possibility that the responses are not truthful or accurate. Verifying that the responses are accurate is essential before it is further developed.

A questionnaire is a research tool designed to obtain information from individuals based on specific information. It can cost effectively gather information in a particular format, making it easy for the user to enter the data and remain anonymous. However this method of collecting research information can have some disadvantages, for example the individual has little motivation to complete the questions honestly and meticulously. Even though it may not be possible to verify the questionnaire data to 100% accuracy, other data gathered in the study may be able to add credibility to the responses.

In our research, we consider it beneficial to compare the questionnaire responses to the usage data because:

Usage data can prove that the user actually used the system, implying that they are qualified to accurately answer the questions because they have some degree of experience using the application: For instance if an individual is answering questions based on a specific method of learning then he or she can only respond to the questions accurately if her she has some experience with this learning method. The server data proves that the students used the mobile application and it illustrates how frequently they used it. This data can substantiate the questionnaire responses verifying that they were well qualified to respond to questions.

Usage data can verify responses to some of the questions such as how often they used the system: The data can also verify the user’s truthfulness in at least some of the questions. The questionnaire asked questions such as “How often did you use this feature?” Since the usage data collected
contained this information, it could be verified if the user was being honest. Figure 3 shows a sample of the questionnaire issued to the students. The first question for instance can be verified by the usage information collected. Therefore if it is determined that the user answered most of the verifiable questions accurately then the likelihood of the unverifiable questions being answered accurately is greater.

<table>
<thead>
<tr>
<th>FEATURE OR GAMES</th>
<th>Picture of the Feature</th>
<th>How often did you use this feature?</th>
<th>Liked this feature</th>
<th>Found this feature useful for learning mathematics</th>
<th>Found this feature easy to use</th>
<th>Would like to use this feature in future to study mathematics</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>GAMES</td>
<td></td>
<td>1. Several times a day</td>
<td>1. strongly disagree</td>
<td>1. strongly agree</td>
<td>1. strongly agree</td>
<td>1. strongly disagree</td>
<td></td>
</tr>
<tr>
<td>SOLVE EQUATION GAME</td>
<td></td>
<td>2. Once a day</td>
<td>2. disagree</td>
<td>2. agree</td>
<td>2. agree</td>
<td>2. disagree</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Several times a week</td>
<td>3. uncertain</td>
<td>3. uncertain</td>
<td>3. strongly agree</td>
<td>3. uncertain</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Once a week</td>
<td>4. agree</td>
<td>4. uncertain</td>
<td>4. uncertain</td>
<td>4. strongly agree</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Never</td>
<td>5. strongly agree</td>
<td>5. strongly agree</td>
<td>5. strongly agree</td>
<td>5. strongly agree</td>
<td></td>
</tr>
</tbody>
</table>

Figure 3: Sample from questionnaire

6. Results

Students’ Perceptions on Frequent Use of Features and Possible Future Use

Figure 4 displays two sets of data on one graph using primary and secondary vertical gridlines. The primary gridline is the vertical axis on the left and the secondary gridline is the one on the right. The primary gridline represents the percentage of students who indicated in the questionnaire that they used the application several times a week. The secondary gridline represents the average frequency of actual use based on the server data. This graph shows a comparison of the server to the questionnaire data. It illustrates that 65% of the students agreed that they used the Game feature several times a week. The actual server data reveals that on average they used the Games at least 5 times. The point, at which the line graph ascends, represents the alignment of the server data with the questionnaire responses. An example of this is the games data in Figure 4.

Figure 4: Comparison of questionnaire responses and server data on actual frequency of use

Figure 5 compares the student responses to the question about using the application in the future with the server data on usage of the application. The primary gridline represents the percentage of students who indicated in the questionnaire that they would use the mobile application in the future. The secondary gridline represents the average usage per student based on the server data. The questions based on the students’ potential use of the application in the future can be corroborated by the server data. Figure 5 shows that 70% of the students claimed that they would use the application in the future, if given the opportunity. The line segment in Figure 5 shows that the students actually used the Games several times a week as claimed.

Figure 5: Comparison of questionnaire responses and server data on actual frequency of use
Figure 4 shows that 79% of the students stated that they used the Quiz feature several times a week. The server data shows that the students on average used the Quiz feature 1.6 times per week. Figure 5 shows 81% of the students agreed that they would use the Quiz feature in the future. Figure 4 shows 64% of the students stated on the questionnaire that they used the Tutorial feature several times a week. The server data illustrates that the students actually used this feature on average 2.9 times per week. Figure 5 shows 79% of the students stated that they would use this feature in the future. Figure 4 shows that 77% and 66% of the students claimed that they used the Lesson and Example features several times a week respectively. However, the usage data shows that the application was not used several times a week. 75% and 82% of the students agreed that they would use the Example and Lesson features respectively in the future if they were available.

Students’ Perception of Each Feature

Figure 6 is a bar chart which uses two vertical gridlines to compare questionnaire data and server data. The primary and secondary gridlines represent questionnaire and server data respectively showing a comparison of the two. It shows the student responses when asked questions (displayed next to the graph on Figure 6) based on each feature. 77% and 71% of the students responded positively to the questions asked on the Lesson and Example features, respectively. (Note that the term “responded positively” is used if a student either agreed or strongly agreed to a question.) However, server data reveals that these features were used minimally per week on average shown by the line graph on Figure 6.

Figure 6: Comparison of usage of the application to questionnaire responses based on each feature

An examination of the Tutorial, Quiz and Game features reveals that the percentage of students who responded positively to the questions based on each feature was 70%, 82%, and 70.6% respectively (Figure 6). The server data shows that the usage was far greater for these three features than the others.
**Students’ Perception of Each Game**

Figure 7 shows server data and questionnaire data based on each individual game. The questionnaire data is the percentage of students who responded positively to the questions (displayed on the side of the graph in Figure 7) for each game shown on the primary gridline. The server data shows the length of time on average which each student used each game in minutes and is shown on the secondary gridline. Figure 7 illustrates that the students used each game at least 4 minutes which was more than some of the other features.

![Comparison of Responses (Questions Based on Each Game) to Server Data (Duration of Actual Usage)](image)

*Questions Asked for Each Feature*
- I liked this feature.
- I found this feature useful for learning mathematics.
- I found this feature easy to use.
- I would like to use this feature in the future to study mathematics.

**Figure 7: Comparison of server data and student responses based on each game**

**Students’ Perception of the Whole Application**

Table 3 shows the responses to questions based on the usefulness of learning anytime and anywhere with mobile learning; how easy it was to use the mobile application; and, if they preferred mobile devices over a PC for learning mathematics. 93% of the students agreed that they found the mobility of learning useful and 81% found it easy to use. 52% of the students stated that they preferred mobile devices for learning as opposed to the PC. The table illustrates that, on average, the students used the application 35 times and 154 minutes for the three week period. 32% of the students used the mobile application longer than the average student and 37% used it more often than average. The students participating in the mobile learning experiments had the option of entering their geographic location each time they logged on to the system. If the student chose not to enter a location then by default there was no location set. Figure 8 shows server data based on the location from where the students used the mobile learning application. The questionnaire data reveals that the 66% of the students stated that they used the mobile learning outside of their homes. The data shows that whenever the students specified a location, 99% of the time the mobile learning application was used outside of their homes.

**Table 3: Questionnaire and server data**

<table>
<thead>
<tr>
<th>Questionnaire Data</th>
<th>Server Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>I found it useful that I can learn mathematics on a phone anywhere and at anytime</td>
<td>Agree and Strongly agree % Average per student Percentage of students who used app more than average</td>
</tr>
<tr>
<td>The mathematics games and learning activities on the phone were easy to use</td>
<td>81% Duration of system use in minutes 154 32%</td>
</tr>
<tr>
<td>I prefer using a mobile phone as opposed to a personal computer for learning mathematics</td>
<td>52% Frequency of use of mobile application 35.8 37%</td>
</tr>
<tr>
<td>The mathematics games and learning activities on the phone helped to improve my</td>
<td>82%</td>
</tr>
</tbody>
</table>
Questions

If I use the mathematics games and learning activities on a phone for a longer period of time, it can help me improve my skills

Agree and Strongly agree %

88%

A phone with similar games and learning activities can be beneficial to me in other subject areas

86%

Table 1: Questionnaire data versus server data for perceived usefulness of mathematics games and learning activities

7. Discussion

Students' Perceptions on Frequent Use of Features and Possible Future Use

Figure 4 illustrates that the server data supports the questionnaire data for the Games feature. It suggests that the server data is in alignment with the questionnaire responses which indicate that the Games feature was used several times a week. Figure 5 shows that the students were familiar enough with the Games feature to respond to the games questions on the questionnaire accurately. This adds credibility to their responses based on the Games feature. The server data reveals that since the students used the application frequently they are more likely to use it in the future than students who did not use it for the evaluation study. Data from Figures 4 and 5 illustrates that the students did not use the Quiz feature as much as the Game feature; however, the data confirms that the Quiz feature was used to a reasonable extent, giving credibility to the responses made by the students. Figure 4 show that the students' responses confirm that they used the Tutorial feature several times a week. Figure 5 provides evidence which adds credibility to the questionnaire responses for the Tutorial feature. Data from Figure 4 does not support the results obtained by analysing the questionnaire responses based on the Lesson and Example features. This evidence suggests that the responses for the Lesson and Example features cannot be relied upon. Since the data shows that the students did not use the Lesson and Example very much in the three weeks, their responses lack credibility for these features.
Students’ Perception of Each Feature

Figure 6 shows that the usage data does not support the claims made on the Example and Lesson features on the questionnaire. According to the responses, the students found it easy to use, they liked the features, thought it was useful, and agreed they would use it in the future; however, they did not use it very much. Therefore this data implies that the responses based on the Lesson and Example features cannot be relied upon. Figure 6 highlights the fact that the students used the Games, Tutorial and Quiz features more than the Lesson and Example features implying that the student responses for some questions were more reliable than others and they were better prepared to answer these questions since they were familiar with the features.

Students’ Perception of Each Game

Figure 7 was based on each individual game. This figure was generated from the server data and reveals that the students used the Games more than the other features, which gives some credibility to the questionnaire responses based on the Games. Other questionnaire data reveals that 68% of the students responded positively to the following statement “I enjoyed the learning Games more than the other learning activities”. This data is supported by the server data which reveals that the students used the Games more than the other learning activities. Figure 7 highlights the fact that they used the Simplified Expression Game the longest thereby confirming their questionnaire responses based on this game.

Students’ Perception of the Whole Application

Table 3 reveals that the students used the mobile learning application a significant amount of time for the three weeks, suggesting that their responses to the questions based on the application as a whole were generally reliable. Figure 8 provides evidence that the students made excellent use of the mobility of the application since they used it away from home most of the time. This highlights an important advantage of using a mobile device as opposed to a PC for learning mathematics.

When comparing the server data to the questionnaire responses, the server data on actual usage confirmed the questionnaire responses. There were two cases involving the Lesson and the Example feature where the server data did not match the students’ responses. However, it is unclear what may have been the reason for the inflated responses. It may have been that the students forgot, did not keep an accurate account of how much they used it or perhaps did not feel comfortable being completely honest. On the other hand, the usage data for the Game feature actually shows that the students used the learning games more than they thought. This is an interesting result and seems to suggest that students underestimate the time spent on learning activities involving games. Perhaps this suggests that the students did not accurately keep track of their usage. This is a very positive indicator for using more games in mobile learning.

Since the usage data verified the questionnaire responses for three out of the five features then it can be concluded that the questionnaire data is valid for more than 50% of the application content. Therefore this analysis adds credibility to the questionnaire data. Thus, it is reasonable to accept the results that at least 80% of the students thought that the application was easy to use, it can help improve their skills and that it was useful to study anytime and anywhere.

The comparison with the server data adds value to the questionnaire data. Therefore the results of the mobile learning study are supported by both substantial server data and questionnaire data. Students’ perceptions are very important to the success of any new learning technology. The results indicate that the server data is generally in agreement with the students’ perceptions of the mobile learning application. These results are very significant to the field of mobile learning.

Figure 9 is a visual representation of the comparison of the questionnaire data and server data. It suggests that in cases where the server data is relevant to the questionnaire data, a comparison can be made. If the comparison reveals that the server data supports more than 50% of the questionnaire data, this suggests that the questionnaire data is fairly accurate.
8. Conclusion and future research

This paper focuses on the student responses to using a mobile learning application for high school mathematics. The students’ opinions on mobile learning are essential to the success of this method of learning mathematics. The students’ opinions are collected via a questionnaire. The reliability of the questionnaire data can be improved by obtaining other sources of information to corroborate the data. In this research, the responses to the questionnaire were analyzed and compared to the actual usage data which was collected by the system. The usage data is compared to the students’ responses in order to determine the degree of accuracy of the questionnaire responses.

Some of the other features were used just as much or even more than the students claimed. An example of this is the Games feature. The data indicates that the students’ responses for the Game feature were more credible than that of the Lesson and Example features. The students’ responses on the questionnaire and the usage data from the server both indicate that the students used the Games feature of the mobile learning application the most. Thus, including more game-based learning in future mobile learning applications may be a good strategy. Studies to improve the learning games so that they are more attractive, motivating, interactive, and fun are likely to have a great impact on the effectiveness of future mobile learning applications.

The data indicates that even though the Lesson and Example features were not used a lot, they were still used to some extent. This suggests a need for an optional feature to allow the reviewing of the main concepts of each topic while the Games could be the main focus of the learning application. The data also indicates that the students used the Tutorial feature several times a week. This is another learning strategy worth exploring in future research. An analysis of why the student chose this feature over the Lesson and Example may provide interesting insight which can be used in future mobile learning development.

The majority of the students who participated in the three evaluation studies generally responded positively to the mobile learning application. The students came from many districts and high schools throughout Trinidad and Tobago. This mobile learning study is the first of its kind in Trinidad and Tobago and the results suggest that mobile learning for mathematics may be beneficial for high schools in the Caribbean and elsewhere. However, more development and experimentation is required before definitive statements can be made.

Generally, the usage data confirms the credibility of the students’ responses. However, there are a few cases where the usage data indicates that the students used certain features less than reported...
on the questionnaire. This data adds credibility to the findings of the study presented. This approach can be beneficial to other research studies by providing a method to verify or add credibility to questionnaire data in a similar manner, if the appropriate usage data is available, strengthening the results presented. This is seen as essential as students’ perceptions are critical in the success of such learning tools.

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References


The Global Classroom Project: Learning a Second Language in a Virtual Environment

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Abstract: This paper reports the progress of a pilot project exploring the integration of a collaborative virtual learning environment (Second Life) with the instruction of English courses at Lingnan University in Hong Kong. An educational partnership was developed with two TESOL teacher-training courses at Texas A&M University in the US. The project enrolled over 200 participants, with about half from each participating university. Coordination of online activities was done using the Moodle learning management system. A large non-traditional language learning facility was developed in the Second Life virtual environment in the style of a 1950's American diner on a private island, complete with Cadillac booths, traditional diner booths and tables, and outdoor campfire settings to facilitate conversational groupings. Both IM typed chat and VOIP voice interactions were explored inside the virtual environment. Student behavior observed during the study indicates the conditions which result in the most productive interactions, and also highlights several key problem areas which must be addressed before successful interactions can be achieved. This paper presents a process which has been developed and trialed, and the plans at Lingnan University to adopt it on a wider scale to support the development of language skills.

Keywords: collaborative virtual environment, language learning, ESL, educational partnerships

1. Background

English language acquisition is viewed in Hong Kong as a prerequisite for attending a university in the West, for entry into high-paying occupations, and as an important part of globalization and international communication. This emphasis on language learning has resulted in a wide range of language-acquisition activities, from the traditional English course taught in a classroom to more media-savvy methods such as typed instant message (IM) chats and Skype web cam interaction with native English speakers.

Ho (2006, p. 7) views the criticism of second language learning in a traditional classroom as fueled by the "general perception...that students remain orally incompetent despite being structurally knowledgeable in the second language". He expresses "a desire for teaching environments where a lot more attention is paid to active and engaging teacher-student and student-student interactive behaviour". In a recent JISC study De Freitas (2008) states how this challenge to the norms of education offers a direct challenge to our understanding of how we learn. Instead of traditional knowledge acquisition, she sees educational advantages in the social interaction offered by role plays and real-world practical engagements.

Mishan (2007) notes that online chat is not traditionally viewed as a component of English language study, but that it offers insight into the use of informal language and a conversational manner. This communication technology has resulted in the development of a specific dialect and interactive patterns: abbreviations and intentional misspellings (i.e. "thx" for "thanks", "ttyl" for "talk to you later"), and emoticons (i.e. :) and ;( ) add emotional inflection. Because most people cannot type quickly, brevity is the main driver and a simple syntax is the norm. While the simple syntax aids the second language learner, the prevalence of abbreviations and codes may confuse the "newbie" to IM chat.

However, examples of innovative practice using virtual language-learning environments include several from the EU consortium: the NIFLAR (Networked Interaction in Foreign Language Acquisition and Research), the AVALON (Access to Virtual and Access Learning live O’Nline), and the "Talk with Me" project. The University College Dublin initiated the Asimil8 project (now RendezVu); the Electronic Village Online is a professional development project and virtual extension of the TESOL convention; Avatar Languages uses a combination of Second Life, Google Docs, Skype, and an online whiteboard; EduNation was created by Consultants-E and provides training in Second Life (SL) with an emphasis on language teaching and learning. Talkademy is another example of a language school using the SL virtual environment for its classes. The British Academy has a large and successful presence in SL, with over 1000 students from 12 different countries. Kirriemuir (2008, p. 58) states that "roughly
three-quarters of UK universities are estimated to be actively developing or using Second Life at the institutional, departmental and/or individual academic level”.

The LanguageLab project is perhaps the most well established virtual world language school, and has built a complete English city on its SL simulation. LanguageLab students are fully immersed in real-life scenarios such as going to a grocery store or visiting a doctor or lawyer for consultation. This concept of immersion is key to the development of student engagement with the educational context. Reyes and Vallone (2008, p.21) define immersion as a hands-on learning scenario where the instruction is embedded in the context and plenty of educational support is provided. They posit that this component of educational support delineates immersion from submersion, where no teacher support is provided and the environment is “linguistically insensitive and culturally non-responsive”.

2. The global classroom project

In Oct 2009 the Teaching and Learning Centre (TLC) at Lingnan University in Hong Kong proposed to develop and integrate a virtual world teaching resource into the curricula. The purpose of this proposal was to fund the creation and maintenance of a virtual educational space to support innovative teaching practices and active student learning. The TLC would facilitate the training of instructors and teaching assistants to providing support for teaching and learning activities using the Second Life virtual environment, and work with the teaching staff to undertake an evaluation of efficacy and student enjoyment of learning in a virtual environment in order to provide further advice for other university programs.

In February 2010 Lingnan University approved the development of a virtual world teaching resource for undergraduate studies. The two-year project includes the purchase and setup of a private educational space using the Second Life virtual technology, and the development of educational environments in that space for integration with course instruction at Lingnan.

This study is an investigation of the factors that impact on changes to the motivation and engagement observed in the use of a collaborative virtual environment (CVE) in educational settings. Recognition of these factors should guide the development of generalizable strategies for optimizing the use of a CVE in outcome-based education, and ultimately the instructional design required to successfully incorporate a CVE into outcome-based curricula. This investigation of instructional design which includes the integration of a collaborative virtual environment should yield valuable insight into the future of blended and distance learning applications.

3. Setting up the virtual learning environment

Working in conjunction with the Centre for English and Additional Languages (CEAL) department, the TLC developed the Global Classroom language-learning activity as an Independent Learning component of the CEAL English as a Second Language (ESL) first-year courses. Students are given a wide range of activity choices for their Independent Learning component, which makes up 20% of their course grade.

A collaborative partnership was set up in early 2010 with an instructor at the Texas A&M University (TAMU) in the US. In two TAMU courses the students were studying how to Teach English as a Second or Other Language (TESOL), and the instructor wanted them to work directly with foreign ESL learners to create a more authentic learning experience. This partnership between ESL and TESOL courses offers a natural synergy for both sides, where both the native English tutors and the English-learning students can benefit from the natural-language interactions enabled by the SL technology to converse in a fully immersive virtual environment.

Two private educational islands were purchased from Linden Labs on the Second Life (SL) grid, and set up for educational use. When the Visual Studies department heard about the project, they proposed integration with instruction on two of their courses. Therefore, a design contractor was hired to create a rainforest simulation on Lingnan Homestead Island, and this was well received by the Head of the Visual Studies department and their participating students. On the main Lingnan University Island, several outside designers contributed to the development of a large language-learning facility to host inter-cultural collaborative activities: the Caddy Shack (Figure 1).

It has the look and feel of a 1950s-era American diner, with a large bar and restaurant seating area, rotating dance floor, and 12 classic convertible Cadillac cars (Figure 2).
These cars have been modified so that the front seat faces the back, and a diner table inserted between them, to create a conversational "booth" designed to seat 4 avatars (inspired by the Jack Rabbit Slims diner in the movie Pulp Fiction). Selected booths have also been fitted with adjacent TV sets, which can be used to display anything available on the Internet, including YouTube videos, music, artworks, etc, as a tool for stimulating conversational interaction (Figure 3). This display of "shared media" can be controlled and viewed by all of the avatars in the area. The use of shared media requires the Second Life Viewer 2, a second generation application similar in operation to a browser. Each booth has been placed on a land parcel which blocks sounds from entering or leaving, providing
protection from outside noise interference (music and other voice conversations), and privacy for those conversing inside. These booths are designed to support voice conversations using the VOIP technology built into SL, which works in a fashion similar to Skype.

The rest of Lingnan University Island surrounding the Caddy Shack diner has been developed with interesting elements which hopefully attract the students to spend some time exploring the environment with their conversational partners. Features include a beach with surf and two dolphins, a meadow with three horses which can be ridden, a jet-ski "rezzer" which can create multiple jet-skis on demand for touring the islands, and a large carousel. Scattered around the coastline are a dozen campfires, each of which offers four or more seats and audio privacy for voice conversations (Figure 4). The neighboring Lingnan Homestead Island has another dozen campfires, and a large erupting volcano. Each term the Homestead is "terra-formed" by Visual Studies students doing individual design projects, so this area always offers something new to see and experience.

Three assistants were trained to support the Global Classroom students in the use of the Second Life technology: an undergraduate, a graduate, and a research assistant in his mid-forties. None of these assistants had backgrounds in language instruction: they were hired to support the project coordinator in the technology training at the hands-on workshops. Although an introductory session was held to present the virtual environment to the Lingnan CEAL instructors, only one instructor set up an avatar and he never participated in a workshop training session (virtually or physically). Even the TAMU instructor could only attend less than half of the workshops: the 6am start time in the US presented a difficult obstacle to regular participation.

The Global Classroom consisted of a series of hands-on workshops held two or three times a week at language computer labs from 7 to 9pm, over the months of September and October in the 2010/11 school year. The Second Life viewer application has been installed on these language lab computers, and each workstation has a combination headphone / microphone set up to support voice interaction. The SL software is also available to students as a free download application from the SecondLife.com website, which can be installed and operated on student-owned computers if they meet the hardware requirements. While perhaps half of the students have laptops or desktop PCs of sufficient graphics capability to operate SL at their homes, most of the Lingnan students have reported that the Internet broadband communication provided in the university dormitories is not sufficient to provide an acceptable SL experience.

When students self-select to participate in the Global Classroom as an Independent Learning language learning activity, they register for workshop seats on the associated Moodle course, which also details the lightly structured language-learning activities expected at the workshops. After creating
a free SL avatar account, students are trained in the basics of movement, navigation, interaction with the virtual environment, and communication. Students from TAMU also receive basic SL training from their instructor in Texas, and are given the link to the location of the Caddy Shack on Lingnan University Island within the SL virtual grid. Students are trained in the skills required to post documentation of their language-learning activities on discussion forums, including screen captures of encounters with their online language-learning partners and the resulting typed chat dialogue. This documentation is then available for final upload onto their e-portfolios for assessment of their Independent Learning activity by their CEAL tutors.

Figure 4: A beachside campfire gives students a quiet place for private chats

4. Preliminary observations

A total of 65 CEAL LCE101 students chose the Global Classroom as their Independent Learning activity and attended one or more workshops training them in the use of SL for communication. About 10% of those students also logged into the virtual world outside of the workshop hours for additional exploration and interaction. They interacted in the virtual environment with an approximately equal number of American students enrolled in two TESOL courses at Texas A&M University in the US. Their collaboration was facilitated by a Moodle discussion forum where TAMU students could post their availability and intended times of in-world virtual attendance during the workshops. A total of 53 TAMU students posted on this discussion forum at least once, with the top 10 most active students posting a total of 50 requests for meeting times. Over the five Global Classroom workshops, the average workshop attendance was 13 students. Participating students were trained how to display their online interactions during each workshop by posting screen snapshots of avatar interaction and IM chats on Moodle discussion forums. Of the 65 students who attended one or more workshops, 46 students posted their interactions on the Moodle forums, which is about a 71% participation rate. Table 1 shows that a total of 27 students posted on at least one workshop forum, a core group of 5 or 6 students posted on four of the workshop forums, and 2 students posted on all five forums. At workshop #5, the focus was getting their activity documented on their Mahara ePortfolios, so most of the attending students skipped the intermediate step of posting on the Moodle forums.

Table 1: Chart of student participation on Moodle forums which display screenshot of avatar interaction and IM chats.

<table>
<thead>
<tr>
<th>Workshop forum</th>
<th>Number of Students posting</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>27</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
</tr>
</tbody>
</table>
5. Analysis

Figure 5 shows how the majority of the attending students participated in only one workshop, but a core group attended and posted their activity in most of the workshops offered.

![Global Classroom workshop forum participation]

We interpret this participation pattern to indicate that of the total group of students intrigued enough by the idea of language learning in the virtual environment to attend at least one workshop, about 20% of that group were engaged enough to attend almost all of the workshops available to them.

6. Discussion

The most popular area on Lingnan University Island for individuals to meet and mingle was the facility designed for language-learning: the Caddy Shack. Here the students can simulate the social activities of serving and drinking various beverages, dancing, playing mahjong and billiards. Within the Caddy Shack, the most popular socializing area was the round patio tables near the front door, which each have four chairs under an umbrella (Figure 6). These chairs were the easiest for new users to navigate their avatars towards and then activate the sit function.

Just about the time of the Global Classroom workshops with CEAL students, a new version of the Second Life viewer was released with built-in translation capabilities, powered by Google Translate. This allowed the Lingnan students to get the typed chat presented simultaneously in both English and Chinese text! (Figure 7) Because it was so new it was not fully explored, but the few students that tried it found it to be a very useful supplement to the chat communication medium.

The Cadillac diner booths (made to resemble classic convertibles) in the Caddy Shack received consistently good feedback for interesting novelty. The students liked the way they achieved acoustic isolation from other Voice users, and the four-seat capability successfully limited the group size to more intimate conversations. New users, however, often encountered difficulty in using camera controls to successfully look down into the car seats and then activate the sit function.
Figure 6: Hong Kong English 101 students using both audio (green arcs above the avatar indicate voice transmission) and chat in a discussion with US TESOL students

Figure 7: The new automatic machine translation of chat may prove to be a tremendous boon to language learners using the virtual environment

Other popular meeting areas included the campfires along the beach, and the rainforest simulation. The most popular non-language activities included dancing on the Caddy Shack rotating dance floor, riding the virtual horses in the meadows (Figure 8), and racing the virtual jet skis around the island.
This rich environment offers a wide range of virtual activities to stimulate possible conversational scenarios between language learning partners.

**Figure 8**: Riding horses is a popular activity on the Lingnan University Island in second life

Of the workshops, the highest rated in terms of enjoyment was the field trip to other Second Life simulations, such as a Bronx ghetto in New York city (Figure 9), Mauritius Island, the pyramids in Egypt, and Paris in 1900 (Figure 10). These trips provided a range of novel experiences which are typically not available to most students: living homeless on the street, driving a horse-drawn carriage, going for a ride on a giant dodo bird, and posing for snapshots atop the Great Sphinx of Giza. The virtual environment can expose the students to unique experiential learning activities which motivate student engagement and stimulate conversational interactions.

**Figure 9**: The field trip to the Bronx ghetto was a very novel experience for both the US and Hong Kong students, here the Hong Kong instructor (MrK Kas) suddenly takes part in the role play as a homeless man sleeping on a mattress in an alley, while the US-based TESOL instructor (Magic twins Littlebird) looks on in surprise
Figure 10: Here the students drive a horse-drawn carriage around the streets of Paris in 1900. Other favorite activities in this simulation were parachuting off the Eiffel tower and participating in the acrobatic circus!

During the workshops, the Global Classroom students expressed a high level of enjoyment using the virtual environment for their language-learning activities.

Examples of student feedback to answer the Moodle discussion question: What did you find interesting / enjoyable about the virtual world?

Sep 16, 2010 - "I have found many friends to chat with such as Davix and Light. We introduced ourselves to each other and talked about our hobbies. I think the topic of riding horse inside room is interesting, because it is difficult to do in so small room. I find this Second Life is so interesting and useful for independent learning. I like talking to new friends, walking around and swimming under the water."

Sep 17, 2010 - "We chatted about how to use Second Life and shared our feelings about SL. We all thought it interesting to chat with others through this new platform. We really appreciate it."

Sep 20, 2010 - "In my first vision of second life, I experienced the Lingnan island, saw a lot of friends there. I talked happily with Shylock and many other fellow students. What's more, I talked with one from Texas. I hope that I will have more opportunities to communicate with American friends."

Sep 24, 2010 - "Today, I experienced what really Second Life is. And had a really happy talk with Khloe, Jing and Beth. We talked about the weather, President Obama, our spare time plan, and Khloe's family. We used voice to speak, so it was great to talk rather than just type. In the end, MrK took me on a flight, and it was really cool!"

Oct 8, 2010 - "Today I met many new friends in SL. It's quite cool and I chatted with one girl from US. She just one year older than me. We all like the American show Friends. And we went to many places such as Paris together. We all enjoy the trip very much. After that I went to a island and walked all around, I flied again and went to a waterfall with Cristine."

Oct 14, 2010 - "Today I chat with Chelsea Kulbaba and Kirsti Oodies who are all Texas A&M ESL graduate student-teachers. I chat with them by using the chat board and microphone since they also need to hand in a physical evidence to prove that they
actually talk with a Hong Kong student. They would like to be a kindergarten teacher because they love kids and school themselves. Also, being able to teach kids through 6th grade so they are hard-working to study just like I prepare my mid-term examination. I enjoy talking with them because their sounds are very, very sweet. Especially Kirsti Oodies.”

Oct 28, 2010 - “tonight very lucky that I talked with 3 American students. And they even got up before 7am in order to come to SL! Those guys are great and we spent a good time together. We referred to many things from weather to reading even some class we attend. The process was very comfortable and joyful.”

Oct 28, 2010 - “I think using a voice conversation is easier, and we can talk more by using a voice conversation.”

The most effective attractor for the Lingnan students is the use of audio voice capabilities in order to practice their spoken / listening English skills. The language computer labs used for the Global Classroom workshops have high-quality headphone / microphone setups at every workstation. When audio voice transmission is achieved using Second Life, it is typically of a fairly good quality (similar to Skype). The limiting factor of this attractor is the lack of reciprocal voice capability on the part of the TAMU students. Of the approximately 70 TAMU students who participated in the Global Classroom, only about 10% have the headphone / microphone equipment required to enable voice. Another 10% are willing to try voice, but could only do so using their laptop webcam microphone array, which often resulted in a severe echoing feedback, reducing the audio experience for everyone within “earshot” of them.

When a good audio discussion was achieved, however, it proved to be extremely rewarding for most students. When Lingnan students managed to participate in an intimate hour-long heartfelt discussion with a native speaker, they often heaped glowing praise on the Global Classroom as a language learning activity! These intimate discussions were typically achieved by a pair of female students who generally gave feedback that useful practical learning had been accomplished from both the TESOL and ESL perspectives.

About 50% of the US-based TAMU students managed to get online at a very early hour in order to achieve real-time interaction with the Lingnan students. In order for the US students to synchronously match to the Hong Kong 7 to 9pm workshops, they must be online from 6 to 8am! This has proved to be a very difficult hurdle for most of the TAMU students, some of whom must drive onto the campus in order to login using Second Life by 6am.

7. Conclusion

The Global Classroom has made a good start as an introductory language-learning activity, with a reasonable number of total participants and average weekly workshop attendance. The most limiting factor was the time zone difference between Hong Kong and Texas in the US: 13 hours proved to be a very high barrier to achieving synchronous interaction between the two groups. Combined with the use of advanced technology, the time zone barrier also proved prohibitive for the language instructors. While the US-based TESOL students were eager to support the language interactions, they are not qualified teachers. In order to achieve the level of educational support that Reyes and Vallone (2008, p.21) stipulate as a requirement for achieving an effective immersive teaching environment, the Global Classroom project needs more involvement from the instructors of the courses involved.

Chat proved to an extremely useful form of interaction for new users: the typing medium allows additional time for second language learners to compose their responses, and the tolerance for misspellings or poor syntax was much higher than for incorrect pronunciations or syntax in the spoken form (Beauvois, 1997, p.66). In order to address oral competence, however, the ultimate goal remains the achievement of audio voice communications. The immersive virtual environment offers a very good simulation of face-to-face interaction, with its fast-paced small talk and informal language style. When students have been trained how to use the machine translation recently built into the chat function to supplement voice communications with term definitions, this may become the dominant method of communication between disparate cultures.
Directions for future study

Continued exploration of this virtual world technology for language acquisition should include making the Global Classroom an activity available to the general student population, thus opening it up to all Lingnan University students in all courses. An investigation of a possible correlation between student learning style and subjective enjoyment of learning in the virtual environment may shed additional light on ways to improve the implementation of this educational technology.

Future collaboration with TESOL courses at universities located in more compatible time zones should be explored: Australia and New Zealand. Further integration with instruction should include participatory theatre / immersive learning projects with History, Academic English, Management, Sociology, and Philosophy courses.

Appendix 1

Transcript of a typed IM chat during a Global Classroom workshop between Lingnan English 101 students and TAMU TESOL students on Sep 30, 2010. Also present are the project coordinator (MrK Kas) and the two project assistants (MrAndric Jillybean and YCY Rain).

[05:15] Jessca Starspear: hello! my name is jessica and i go to a&m
[05:15] Chan Antiesse: o i see
[05:15] Edmond Hema: Hello Jessica
[05:15] MrK Kas: hello Jessca
[05:16] MrK Kas: glad you could make it online so early in your morning!
[05:16] MrK Kas: we're in a new lab today
[05:16] MrAndric Jillybean: hello jessca
[05:16] MrK Kas: and we're having some audio problems on the PCs
[05:16] Jessca Starspear: me too! it was a little hard getting out of bed
[05:16] Jenniferangie Lycour: i was the same way.
[05:17] Chan Antiesse: what are your hobbies?
[05:17] Jessca Starspear: i play a lof of soccer
[05:17] MrAndric Jillybean: oh
[05:18] Jessca Starspear: and love spending time with my family
[05:18] Chan Antiesse: o i see
[05:18] Jessca Starspear: how about you?
[05:18] MrAndric Jillybean: i like reading
[05:18] MrK Kas: Chan, do you do any sports?
[05:18] YCY Rain: Hi Jessica
[05:18] Chan Antiesse: I like running
[05:18] MrAndric Jillybean: i heard he like math
[05:18] Jessca Starspear: hi!
[05:19] YCY Rain: where are you from? ^^
[05:19] MrAndric Jillybean: who
[05:19] Jessca Starspear: oh ok! do you run cross country?
[05:19] Chan Antiesse: haha..
[05:19] Jessca Starspear: I am from a&m
[05:19] YCY Rain: oh i see
[05:19] Jenniferangie Lycour: does everyone here go to the same school?
[05:19] MrK Kas: now that sounded like good audio!
[05:19] Jenniferangie Lycour: I mean the people from HK?
[05:20] MrK Kas: yes, they all go to Lingnan University
[05:20] Chan Antiesse: what is a&m meant? I dont know
[05:20] Jessca Starspear: oh it is texas a&m university
[05:21] Jenniferangie Lycour: Agriculture and Mechanics. I think that's what it stands for, at lease I think that's what it used to stand for.
[05:21] Jessca Starspear: yeah i think thats right
[05:21] Chan Antiesse: anyone studies logic?
[05:22] Jessca Starspear: no sorry... it sounds very intereresting though
[05:23] Jessca Starspear: chan, are you studying logics?
[05:23] Chan Antiesse: of course
[05:23] Chan Antiesse: otherwise i will not ask
[05:24] MrAndric Jillybean: logic and critical thinking?
[05:24] Jessca Starspear: thats what i thought!
[05:24] Jenniferangie Lycour: Jessica, what class are you in?
[05:24] Chan Antiesse: introduction to logic
[05:24] MrAndric Jillybean: what is your major
[05:24] Chan Antiesse: it is quite easy
[05:24] Chan Antiesse: i recommend you to choose
[05:25] MrAndric Jillybean: i'm beth
[05:25] Jessca Starspear: i'm in inst 462

[05:25] MrK Kas: ok, have fun y'all, I need to go to a different part of the island

[05:26] MrK Kas: and tutor the Visual Studies students

[05:26] Jessca Starspear: oh its 502 i think

[05:26] Edmond Hema: ok, thanks

[05:26] Jessca Starspear: yes 502, how bout you?

[05:26] Jenniferangie Lycour: I'm in that one too. the one that starts at 2:20.

[05:26] Jessca Starspear: yes! where do you sit?

[05:27] Jenniferangie Lycour: if you're looking at the class, I'm on the far left.

[05:27] Jenniferangie Lycour: I am the one that has the baby. Smile

[05:27] Jessca Starspear: oh ok! how is she doing?

[05:27] Chan Antiesse: Get lost!

[05:28] Jenniferangie Lycour: she'd doing great. asleep right now, but I think she may be wakign up soon.

[05:28] Chan Antiesse: wrong typing

[05:28] Jenniferangie Lycour: waking*

[05:28] Jessca Starspear: aw well i guess it is about that time. does she sleep through the night?

[05:29] Chan Antiesse: when do you sleep?

[05:29] Jenniferangie Lycour: sometimes she does, but not really because we have really noisy neighbors.

[05:29] Jenniferangie Lycour: I sleep at night, Chan. Smile

[05:29] Chan Antiesse: i means what time usually

[05:30] Jenniferangie Lycour: I usually go to bed around 11.

[05:30] Jenniferangie Lycour: what about you?

[05:30] Edmond Hema: awsome answer

[05:30] Jessca Starspear: oh well noisy neighbors don't help

[05:30] Jenniferangie Lycour: i know. they aren't very nice either because i complain but they don't really stop.

[05:30] Jessca Starspear: ugh!

[05:31] Edmond Hema: terrible

[05:31] Edmond Hema: terrible

[05:31] Jenniferangie Lycour: definitely!
[05:32] Jenniferangie Lycour: speaking of my daughter. she's awake! I've gotta run. I'll see you in class jessica!

[05:32] Chan Antisse: 1,2,6,42, ? what is the next number, anyone knows?

[05:32] Jessca Starspear: ok sounds good!

[05:32] Jessca Starspear: 48

[05:32] Jessca Starspear: ?

[05:32] Chan Antisse: no

[05:32] Jessca Starspear: haha! never mind then

[05:33] Jessca Starspear: what is it?

[05:33] Chan Antisse: (1+2)*2=6

[05:34] Chan Antisse: (1+6)*7=42

[05:34] Jessca Starspear: oh ok i missed that part.. its early here

[05:34] Chan Antisse: (1+6)*6=42

[05:34] Jessca Starspear: yes that makes sense

[05:34] Chan Antisse: (1+42)*42 is the answer

[05:34] Chan Antisse: - -

[05:35] Jessca Starspear: there is this television show here called lost.. and i thought that's what you were referring to at first...

[05:35] Jessca Starspear: its really early

[05:36] Jenniferangie Lycour: what did you say Edmund?

[05:36] Edmond Hema: well, the sound of a little girl

[05:36] Jenniferangie Lycour: yeah. let's see if she says anything else.

[05:37] Jessca Starspear: oh i can hear her a little bit

[05:37] Jenniferangie Lycour: really?

[05:37] Mi Shinn: sorry

[05:37] Jenniferangie Lycour: she's actually being good smile

[05:38] Jessca Starspear: yay!

[05:38] Edmond Hema: that cute girl

[05:38] Jenniferangie Lycour: did you guys hear her?

[05:38] Edmond Hema: yes

[05:39] Chan Antiesse: haha

[05:39] Jessica Starspear: babies seem to be morning people

[05:40] Chan Antiesse: i just hear the baby

[05:40] Jenniferangie Lycour: yeah. she's great in the morning, most of the time.

[05:40] Jessica Starspear: do you send her to a day care when you are in class?

[05:41] Jenniferangie Lycour: no. my husband takes care of her.

[05:41] Jessica Starspear: oh thats perfect smile

[05:42] Jenniferangie Lycour: yeah. we stress out though... it's pretty hard

[05:42] Jessica Starspear: i bet!

[05:43] Jenniferangie Lycour: bye jessica!

[05:43] Jessica Starspear: bye!

[05:43] Edmond Hema: byb

[05:43] Edmond Hema: bye

[05:45] Jessica Starspear: are you all from hong kong?

[05:45] Chan Antiesse: me yes

[05:45] Jessica Starspear: oh thats right and you are studying logics corret?

[05:45] Beth Demen: metoo

[05:46] Beth Demen: can you hear our voice

[05:46] Edmond Hema: Beth and I come from mainland China, and we study in Lingnan, Hong Kong now

[05:46] Chan Antiesse: logic is wonderful

[05:46] Jessica Starspear: oh ok!

[05:46] Jessica Starspear: what are you both studying?

[05:47] Edmond Hema: for me, it's social science

[05:47] Jessica Starspear: oh thats interesting.. i would love to take some of those classes

[05:48] Beth Demen: Jessica .can you hear our voice

[05:48] Jessica Starspear: a little bit

[05:48] Edmond Hema: It seems that the politiacl science is really popular in American

[05:48] Chan Antiesse: may be

[05:48] Jessica Starspear: i get bits and pieces

[05:49] Edmond Hema: political
[05:49] Jessca Starspear: oh yes.. i think a lot of people who go into law study political science

[05:49] Jessca Starspear: i can try speaking.. lets see if you can hear me

[05:51] Jessca Starspear: ok i can't hear you very well

[05:52] Beth Demen: yes

[05:52] Beth Demen: may be it doesn't work well

[05:52] Jessca Starspear: i'm sorry, what did you say you were studying?

[05:54] Jessca Starspear: do you all spend a lot of time in second life?

[05:55] Edmond Hema: no actually

[05:55] Jessca Starspear: oh ok

[05:55] Jessca Starspear: i'm trying to figure it all out

[05:55] Jessca Starspear: as i'm sure you all have to do as well

[05:58] Jessca Starspear: welli think i'm going to go make myself some breakfast and get a little bit of reading done.

[05:58] Jessca Starspear: it was wonderful meeting you all!

[05:58] Edmond Hema: yes, it's great

[05:58] Edmond Hema: have a nice day

[05:59] Jessca Starspear: thank you! enjoy the rest of your night

[05:59] Edmond Hema: ha, that is

References


Principled Assessment Strategy Design for Online Courses and Programs

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Abstract: As the demand for online learning environments grow in higher education, so does the need for systematic application of learning and educational theory to the design, development and delivery of assessment strategies within these environments. However, there is little guidance in the form of principled design frameworks that can assist the design practitioner in the development of online assessment strategies. From four cases, we have identified six design principles that represent the collective experience of our team of design practitioners in creating assessment strategies for online teaching and learning environments; (a) technology affordances, (b) alignment of objectives with assessment, (c) discipline-specific practices and approaches, (d) meaningful and timely feedback, (e) authenticity and transferability and (f) transparency of assessment criteria. We present in-situ qualitative case studies that articulate how these principles have informed our design practice in online assessment strategy development.

Keywords: online assessment, distance learning, design principles, assessment design, case studies

1. Introduction

Designing an assessment strategy requires an understanding of the differences in the ways that teachers and learners think about the sequence of events that occur in an online course. To the teacher, assessment is at the end of the teaching-learning sequence of events, but to the student it is at the beginning (Biggs, 2003). We believe that it is good design practice to articulate assessments as early as possible in the design process so that the development of objectives, learning activities and media resources are more clearly aligned with the outcomes that instructors are striving to achieve. We also believe that the articulation of assessment strategies in a clear and definitive manner serves to align the teaching activities of the teacher and the learning activities of the learner towards the same goal.

The creation and delivery support of online assessments present particular challenges and opportunities as will be addressed within each of the cases. In addition to general best practices concerned with creating representative and valid assessments and rubrics, online assessment design requires knowledge of the technical environments and the features they each offer to the designer and instructor, as well as the ability to create a reasonably sustainable assessment that the instructor, who may have limited technical expertise can manage. For example, managing grading for online group assessments requires the development of specialized rubrics and reporting that most instructors may find daunting without the help of a designer who understands the technical side of the rubrics.

While there are a number frameworks that address online assessment of online discussions (Anderson, T., 2004; Levine, S. 2002), it is hard to find more generic frameworks that can guide online assessment strategy development. Therefore, we have identified the following design principles that represent the collective experience of our team of design practitioners; a) technology affordances, b) alignment of objectives with assessment, c) discipline-specific practices and approaches, d) meaningful and timely feedback, e) authenticity and transferability and f) transparency of assessment criteria. We briefly discuss each of these principles here followed by the presentation of four cases in assessment strategy design.
Technology affordances: This principle is concerned with mapping technology to the kinds of interactions that lead to learning. In assessment strategy design, this mapping requires selecting tools and technologies that can support both formative and summative strategies. For example, if students are asked to engage in asynchronous discussions, we need to decide: a) is this discussion going to be assessed, b) how will this discussion be assessed, c) what form will the assessment take and d) how will the results of the assessment be communicated to the student. Technologies can support these different kinds of assessment requirements in different ways. Ultimately the creation of the assessment strategy must incorporate the affordance of the technologies that are selected to support the teacher and the student. In each of our cases, there is a rationale for the selection tools, technologies and approaches that are best suited to the particular learning goals and contexts for each case.

Alignment of objectives, instructional methods and assessments: Biggs (2003) contends that we need to assess actual learning outcomes to see how well they match intended learning outcomes. However, there is more to this principle than to merely check off which assessments match which objective. The method of assessing the student based on the way in which the student is taught is also part of the alignment principle, alluded to above in the discussion of technology affordances. For example, if a series of case studies are used to teach students how to carry out an analysis, the assessment form should be aligned to this method. So we go beyond the matching of objectives to the alignment of intended goals, instructional methods and assessment methods. In our cases, the intended learning goals are pursued and integrated throughout timely and sufficient formative and summative assessments.

Discipline-specific practices and approaches: As designers who work collaboratively with faculty members in the design and development of assessments, we are keenly aware of the particular strategies that disciplines and fields use to assess student learning. While most of the research literature on distance and online learning has been concerned with discovering general principles and practices that may be applied across disciplines and contexts, we draw from work that focuses on discipline specific issues in teaching and learning to inform our design strategies. We concur with Donald (2002) who suggests that in order to improve teaching and learning we must acquire a deep understanding of the contexts and constraints which students encounter in different disciplines. Research on student learning in the disciplines has provided highly compelling evidence that understanding of the experience of the learner in relation to the content they are attempting to learn provides potential for designing powerfully transformative learning activities (Ramsden, 1992; Gibbs, 1992; Biggs, 1999; Bowden & Marton, 1998). Therefore, this design principle promotes the idea that designers must be concerned with creating assessments that are aligned to the particular nature of the difficulties that students encounter in their understanding of the principles and concepts associated with disciplinary practices and approaches.

Meaningful and timely feedback: Our assessment strategy design must be concerned with how data on student understanding is to be collected, analysed and reported in ways that may be quite difficult to accomplish in face-to-face environments. For example, online tests and quizzes can provide immediate feedback to students – particularly important for formative assessment. However, the most effective type of feedback for improving learning is specific to the individual student, and there is no getting around the fact that this type of specific, timely and meaningful feedback is labour-intensive. However, technology can help to reduce some of the time involved in creating and communicating feedback. For example, audio recording can accompany written comments. Laurillard (2002) proposes that not only is feedback essential to the student to help them make sense of the material they are attempting to learn, but that the instructor must deeply engage in understanding the nature of the difficulties that students are revealing in their assessments in order to make adjustments to the way that the material is presented Technology can support multiple modes of communication including any combination of student-student, student-faculty, faculty-student, faculty-faculty, student-others, others-students, etc, providing more options for ways in which feedback may be accomplished (Gayton & McEwan, 2007).

Authenticity and transferability: Much of the literature about authentic assessment focuses on assessing students in real-world contexts (Brown et al., 1989). According to Herrington, Oliver and Reeves (2003), there are a number of technology affordances that can be employed to support authenticity. For example, an online course of study can incorporate a metaphor based on a realistic and authentic context to preserve the complexity of the real-life setting. Students accessing the site
can move freely around the resources as required, rather than in a linear manner through modules or sections of text in a set sequence. Problems presented to students can use the full capacities of the technology to present situations and scenarios in video clips, text links and images to give meaning and purpose to the students’ endeavors, and to provide motivation to complete the task. Technology can provide collaboration tools that may mimic more real-world interactions that occur in workplaces.

In a similar way, the ability for students to transfer their knowledge from formal educational settings to either professional work settings or other formal settings is a complex issue. Therefore, any intended assessment should promote application of the knowledge into real world issues.

Transparency of assessment criteria: Literature on assessment argues strongly that providing students with a well articulated assessment strategy as well as the criteria by which they will be assessed helps to orient them to the amount of time and effort that will be required of them to complete the requirements of the course (Brown & Glasner, 1999; Gibbs & Rowntree, 1999; Thorpe, 2000). The use of online forms for sharing grading rubrics for assignments of all types is highly valued by students. The transparent assessment criteria and procedures will help students understand the expectations of the instructor and the course from the beginning. Also they will help students check in with their learning progress during the course.

The process of teaching a course and the process of designing a course in online environments both represent a complex planning enterprise consisting of decisions framed within a set of constraints and opportunities. While we consider teaching as a specialized form of design (Wiggins & McTighe, 2005), the design professional who plans for a future implemented course works with simultaneous abstracted attention to multiple constructs; the structure of the content, the needs of the instructional team to create conceptually sound and interesting materials that will convey the stated goals of the course, and a keen awareness of the ways in which students will interpret and understand the material and forms of interaction created within the course. Bowden and Marton (1998) refer to this as having the ability to be focally aware of certain things in the foreground at the same time as being aware of more peripheral things, with the focal awareness changing over time depending on time and circumstances. This is a very good image of how we work in our design practice and while we limit the scope of our paper to a discussion of our approach to assessment strategies within this complex environment, it is within this larger context that we practice as designers.

We present four cases from our design practice, and end with a reflection of how our assessment strategy design is informed by identifying principles and by the experience of instructors and students, and design practitioners in situ.

2. Case presentations

We present four cases as exemplars of design practice in online assessment strategy development, each of which has been developed by an Instructional Designer in cooperation with a faculty member at the University of British Columbia as part of a program or course design initiative. Each of these cases represents the outcome of collaborative work between instructional designers and course authors over several years through a process of continuous refinement based on the experience of the online instructors and students. In all cases, the course authors and instructors were highly engaged in the development of the strategies and instruments represented here.

Case 1: Professionalism and Peer Assessment

The UBC Dental Hygiene Undergraduate Degree Program places high value on students developing the skills necessary to be practicing professionals during their course of study, using peer assessment as one means of assessing whether or not the core competencies of professionalism, critical thinking, collaboration and communication have been achieved. These competencies are among those that have been identified as essential abilities for health care professionals for the 21st century and apply to all courses within the program (Dental Hygiene Educators Canada, 2008; Verma S., Paterson M., Medves J., 2006; World Health Organization, 2007).

Rationale. A primary consideration in choosing to implement a peer assessment model is to support the learner in the development of their role as a health care professional and, in particular, in developing decision-making abilities which include taking responsibility for one’s own learning, making constructive contributions to the learning of others, and reflecting on self- and peer-performance. Another key objective is to support student participation in the decision-making process, which
includes focusing on initiating decisions and providing meaningful feedback to colleagues about their professional decisions. In this way, peer assessment forms a foundational role in the overall assessment strategy of the program and provides a vital means for students to demonstrate their acquisition of the skills commensurate with a professional dental hygienist.

The need for peer assessment arose in part due to the demands and constraints of group and collaborative work required in the Dental Hygiene courses. As such, assessing a student’s ability not only to learn the course content but also the ability to function within a professional setting became a key consideration. Peer assessment was designed to help students refine their conflict resolution skills and their ability to develop a respectful team environment. In order to do this we designed a rubric for assessing these skills according to clear and explicit criteria readily available to the students. Such transparency in assessment criteria not only makes it easier for students to understand what constitutes good work and what is necessary to achieve program benchmarks, but also helps students to undertake a process of reflective practice, including the unanticipated and often unknown path that learning often takes. This in turn helps close the gap between current and desired competencies, especially in a professional setting. (McNamara & Brown, 2009; Boud & Falchikov 2006).

Assessment Strategies. In all 3 and 6 credit courses, students are expected to both self and peer assess, in addition to being assessed for professionalism by the instructor. Each term, students are organized into teams of between 4 and 6 members and are responsible for providing peer assessment for each team member. Peer assessment constitutes 20% of the final grade, half of which is determined by the instructor. Students are required to achieve a peer assessment minimum of 60% to be considered successful.

Students are assessed on a 5 point scale in the areas of: participating in group discussions, helping to keep the group focused on tasks, contribution of useful ideas; quality of work, quantity of work, and general conduct. The same rubric is used for all three assessments: self, peer and instructor (http://www.oltubc.com/courses/dhyg/ipeer/ProfessionalismRubric.pdf). Students are provided with extensive descriptors of the criteria needed for assessment of the criteria needed for assessment at the start of term and these descriptors are woven throughout the course narrative during group and individual activities.

The professionalism grade not only assesses the learner’s contributions to the class discussions, but also applies to the group work. Providing thoughtful feedback to their colleagues and reflecting on their own professional competence enables learners to develop their ability to take responsibility for their learning, in addition to contributing to the learning of others. However, as the peer assessment is a summative, high stakes form of assessment, it is critical that students feel that the grades and comments assigned are an honest reflection of the work performed. Therefore, peer assessments remain anonymous to the students, but not the instructors, who are able to access the grades assigned and any comments made by the students.

The Dental Hygiene Program is delivered primarily through WebCT Vista, so it is important that we create a smooth, reliable and low-maintenance integration of the peer assessment framework within the LMS that takes into account user support requirements, institutional resources and course sustainability. In consultation with Faculty, it was decided that combining the native grading form tool in WebCT Vista with the discussion board would provide the most cost-effective option while offering the necessary functionality. This approach provides a low-threshold solution that does not require extensive faculty or student training prior to implementation and does not require the integration or development of an external application within the WebCT Vista environment. It also provides the students with easy, integrated access to the grading rubric throughout the course for reference and the only setup required on the part of the instructor is the creation of a new discussion thread that is dedicated to self and peer assessment for each student in a group. The result, from a design perspective, is a clear and effective workflow that is easily implemented and maintained.

Lessons Learned. One of the drawbacks of this implementation is that the statistical treatment of peer review data is limited. Attaching a grading form to a discussion post in WebCT Vista does not allow for easy statistical review by the instructor, which means instructors must manually calculate, or employ other tools, should they wish to analyze the results further or compare the results to previous course offerings. This can be both time consuming and frustrating for the instructor. In addition, although an
aggregate of responses is readily provided, individual student responses must be viewed by clicking an ‘Expand/Collapse’ button beside each student’s name. While not overly onerous, this small task can make the process seem tedious when working with a large cohort. Figure 1 shows a completed peer assessment.

<table>
<thead>
<tr>
<th>Objective/Criteria</th>
<th>Performance Indicators</th>
<th>Objective/Criteria</th>
<th>Performance Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extensive Indicators of Criteria 5/5</td>
<td>Substantive Indicators of Criteria 4/5</td>
<td>Solid Indicators of Criteria 3/5</td>
<td>Criteria not met 2/5 or 1/5 depending on degree to which criteria demonstrated</td>
</tr>
<tr>
<td>Participated in group discussions</td>
<td>67% (4)</td>
<td>33% (2)</td>
<td>0% (0)</td>
</tr>
<tr>
<td>Helped keep group focused on tasks</td>
<td>50% (3)</td>
<td>50% (3)</td>
<td>0% (0)</td>
</tr>
<tr>
<td>Contributed useful ideas</td>
<td>33% (2)</td>
<td>67% (4)</td>
<td>0% (0)</td>
</tr>
<tr>
<td>Quality of work</td>
<td>83% (5)</td>
<td>17% (1)</td>
<td>0% (0)</td>
</tr>
<tr>
<td>Quantity of work</td>
<td>83% (5)</td>
<td>17% (1)</td>
<td>0% (0)</td>
</tr>
<tr>
<td>General conduct</td>
<td>83% (5)</td>
<td>17% (1)</td>
<td>0% (0)</td>
</tr>
</tbody>
</table>

Figure 1: Completed peer assessment

Students initially require detailed instructions on the use of grading forms, without which they may provide their peer assessment by simply replying to the initial message from the instructor, thereby making their comments public and personally identifiable. However, once students are made aware of how grading forms work, they find them easy to use. After the first implementation it was noted that further faculty training would be required for them to be responsible for the management of the framework, including setup each term. In response to this, a screencast was developed and made available to all instructors. Once such training resources were made available, instructors have found implementation reasonably easy and effective.

Case 2: Virtual Patients: Assessment and Treatment Planning for Advanced Periodontal Diseases

Educators and designers in health professions regularly employ virtual patients in different forms to respond to students needs for real patient encounters and opportunities to practice in safe, accessible and responsive environments (Ellaway, R., Poulton, T., Fors, U., McGee, JB. & Albright, S., 2008). The Assessment and Treatment Planning for Advanced Periodontal Diseases course has been using virtual patient cases as a form of assessment for the last few years. It is a fourth year course with approximately 20 students in each term that is primarily for dental hygiene degree students and builds upon basic knowledge acquired from diploma dental hygiene education and dental hygiene practice. Using virtual patient cases, students learn to assess each patient’s specific needs, develop a periodontal diagnosis, develop a comprehensive dental hygiene care plan based on current and reliable evidence, and evaluate the effectiveness of their dental hygiene care with follow-up strategies in a team environment.

Rationale. Assessment is one of the key components of the educational experience in the dental curriculum as the results of assessment can be used to evaluate students’ readiness to enter their fields as entry-level practitioners. Assessment in the dental curriculum requires higher order thinking skills (i.e. analysis, evaluation, etc.) as well as effective communication skills, procedural skills, problem-solving and critical thinking skills. To facilitate transfer of learning from formal education to...
practitioner contexts in health professions, it is imperative that assessment is designed to mimic authentic environments (Huwendiek, S., Reichert, F. Bosse, HM., et al, 2009).

**Assessment Strategies.** The course development team incorporated a number of instructional strategies (Huwendiek, S., Reichert, F. Bosse, HM., et al, 2009) when designing the virtual patients cases. Cases are designed to predict the learner’s performance outside of the instructional environment and in a “real” situation; cases unfold in a series of stages over 2 or 3 weeks to provide a record/baseline of performance over time, and multiple types of assessments within a case are provided to address learning style differences and enhance motivation. Learners are encouraged to work interactively and collaboratively with peers in a small team and later with the whole class. The small team format helps learners to master the skills necessary to assess, diagnose, plan, implement, and evaluate (ADPIE) (2004) a case study. Students’ professionalism is also assessed through the content of discussion, participation and contribution to the groups and by self and peer assessment forms (see previous case study in this paper for a discussion of the peer assessment strategy).

The course makes ample use of grading rubrics; these rubrics match expectations for particular aspects of the assignment to grade ranges. Comments on submitted work will reflect performance according the expectation laid out in rubrics. The instructor will provide feedback in timely manner. For virtual patient cases, detailed rubrics were developed for grading case reports and professionalism. Figure 2, shows the grading rubric for case reports.

<table>
<thead>
<tr>
<th>Grade Range</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extensive Indicators of Criteria</td>
<td>Identified the overt problem(s) as well as potential problems not readily apparent in the case</td>
</tr>
<tr>
<td>90% plus</td>
<td>Provides creative, innovative, novel recommendations/solutions to the problem(s)</td>
</tr>
<tr>
<td></td>
<td>Provides highly individualized solutions to the problem(s)</td>
</tr>
<tr>
<td></td>
<td>Search of the evidence is broad in scope and depth</td>
</tr>
<tr>
<td></td>
<td>Provides a critical analysis of evidence with the best information synthesized into the report</td>
</tr>
<tr>
<td></td>
<td>Recommendations/solutions are supported with extensive, relevant, and credible resources</td>
</tr>
<tr>
<td>Substantive Indicators of Criteria</td>
<td>Identified the main problem and all secondary problems</td>
</tr>
<tr>
<td>80 to 89%</td>
<td>Recommendations/solutions are comprehensive and case-specific</td>
</tr>
<tr>
<td></td>
<td>Evidence was analyzed and the best information was incorporated into the report</td>
</tr>
<tr>
<td></td>
<td>Recommendations are supported with comprehensive, relevant, and credible resources</td>
</tr>
<tr>
<td>Solid Indicators of Criteria</td>
<td>Identifies the main problem and a few secondary problems</td>
</tr>
<tr>
<td>70 - 79%</td>
<td>Recommendations/solutions are individualized; within the realm of solutions that a dental hygienist would be expected to think of for the problem</td>
</tr>
<tr>
<td></td>
<td>Search for evidence was relevant and focused</td>
</tr>
<tr>
<td></td>
<td>Evidence was analyzed, summarized and the appropriate information integrated into the report</td>
</tr>
<tr>
<td></td>
<td>Recommendations are supported with relevant, diverse, and credible resources</td>
</tr>
<tr>
<td>Criteria Met</td>
<td>Identifies the main problem</td>
</tr>
<tr>
<td>60-69%</td>
<td>Provided basic recommendations/solutions that are applicable to every case, but are not individualized for this particular case</td>
</tr>
<tr>
<td></td>
<td>Indications that a basic search for evidence was conducted</td>
</tr>
<tr>
<td></td>
<td>Evidence was summarized and integrated into the report</td>
</tr>
<tr>
<td></td>
<td>Recommendations are generally supported with evidence</td>
</tr>
<tr>
<td>Criteria not met</td>
<td>Did not identify the problem(s)</td>
</tr>
<tr>
<td>&lt; 60%</td>
<td>Recommendations are vague, confusing and/or irrelevant to the case</td>
</tr>
<tr>
<td></td>
<td>Search for evidence appears cursory or superficial</td>
</tr>
<tr>
<td></td>
<td>Evidence was not analyzed to determine its strengths and weaknesses</td>
</tr>
<tr>
<td></td>
<td>Little evidence that recommendations grounded in credible resources</td>
</tr>
</tbody>
</table>

**Figure 2: Virtual patient case rubric**

Initially, learners work through a sample case together to become familiar with the case study approach and what is expected of them (there is no grade attached to the sample case). The instructor works closely with learners through sample case using different technologies such as Wimba and takes an active role communicating with learners using Mail, Chat and Discussion forums in WebCT Vista. The instructor also provides clear guidelines and tips about expectations concerning participation, interaction, and the assignment and provides feedback and support in a timely manner to ensure learning and understanding.
As shown in Figure 3, each case is divided into different rounds, and each round is divided into Disclosure and Tasks sections. In the Round 1 Disclosure, the students receive information about patient's medical history, dental history (including Odontogram and radiographs, see Figures 3 and 4), oral health care routine and oral self-image. In Round 1 Tasks, students are asked to work with their team members to answer different questions, to apply the skills obtained from the previous blocks and identify their client's risk factors for periodontal disease within their teams. Then they move on to the analysis of their client's clinical and radiographic findings with their team and continue their teamwork to arrive at an evidence-based dental hygiene diagnosis and dental hygiene care for their patient. At the conclusion of the case, students are asked to develop a further plan of action for their client's continuing care. The same format is used for Round 2. The subsequent second case study is more complicated than the first to provide learners with additional challenges.

**Figure 3**: Sample virtual patient case

**Figure 4**: Radiograph for sample virtual patient

*Lessons Learned.* While designing a virtual patient case can be complicated and costly, designers with limited budget and resources can still develop good cases using simple text and images. What is important is to make the cases as interactive as possible, and to create relevant questions and explanations tailored to the clinical reasoning process. The instructor uses Virtual Patient in the course to enhance the learning experience and to aid in the transition from simulation to practice. As the cases are "real" patient cases, they give learners opportunities to see exactly how the new clinician will encounter the condition in practice. In response to the question "if you had more budget and time, how you would have developed the cases?" the instructor replied, "More interactive, for example, we would have a virtual patient 'in the chair' and would have a 'real' scenario and see how the students ask questions to achieve an assessment. Instead of the information given to them, they would have to ask questions to achieve more information. This approach encourages higher level thinking processes in contrast to only identifying a ‘diagnosis’. It is more valuable for a student to be..."
encouraged to solve problems with a systematic methodology that can be applied in any situation than to support only the development of a single diagnosis. Students find the cases challenging and thought provoking, as they have never seen such advanced conditions, thereby providing an opportunity to apply the knowledge they have learned in various courses and focus that knowledge on a relevant case.

Figure 5: Odontogram for sample virtual patient

Case 3: Improving Problem-solving skills through extended Biology case studies

Problem-solving and critical thinking are important skills that help to solve relevant real-world practical problems and are crucial for students who pursue careers in health sciences (e.g., biochemistry, microbiology, physiology, genetics and molecular biology). Biology 200, Introduction to Cell Biology, is an online foundational course in undergraduate life science education consisting of reflective assignments, self-tests, problem workshops and extended case studies, all of which contribute to helping students to develop these skills.

Each course module is organized around an extended case study. The three case studies count for 20% of the final grade. The key objectives for the case studies lie in the experience with problem solving in life science, experience with putting ideas about biological issues into writing and experience with taking collaborative approaches to learning and problem solving across all the course modules.

**Rationale.** The rationale for developing the extended Biology case studies is to help student to go beyond simply memorizing biology facts by taking constructivism and active learning perspectives. They were designed and developed to offer examples of real-world problems and challenge students to apply their learning. It is expected that students will begin to understand the connections between elements of basic cell biology and real health problems faced by populations around the world. In this sense, the case study plays an important role in the overall assessment in the course and provides the students with an opportunity to demonstrate their knowledge and apply the knowledge to resolve real problems, which are aligned with the course content and its objectives.

The extended case studies use a “cycle” model as a process guide for student work. The cycle model consists of five phases as shown in Figure 6.

The cycle starts with the initial challenge. In the next two phases students generate ideas as an individual or a group, and research additional perspectives for more information and revise ideas if necessary. In the fourth phase, students evaluate their findings and exchange feedback from peers. As a final phase, students go public with their solutions to the challenge in a measured and thoughtful way. This process model teaches students not only how to engage in a particular case, but teaches them a general problem-solving framework that will extend well beyond the course to their careers in
health sciences. For the set-up and submission of the case studies, WebCT Vista Discussion Forum, Assessment Tool, Turnitin, and Assignment Drop Box were chosen. As the course is delivered through WebCT Vista, the reliable and smooth integration of the case studies within the LMS was a primary consideration.

Figure 6: BIOL 200 case study cycle

Assessment strategies: Students are engaged in three different assessments: self, peer and instructor assessment. The following are instructions to students.

- **Case Study 1 is worth 5% of your final grade.** You will complete a report on your diagnosis of malaria in blood samples from a Kenyan Village.

- **Case Study 2 is worth 5% of your final grade.** Your team will write a report explaining the genetic bases of the different forms of hearing loss that you have investigated in a Nepalese community. In addition, your fellow team-members will also be asked to rate your participation in the team-based work through a process of peer review. You may gain an additional 1-point from a positive peer review.

- **Case Study 3 is worth 10% of your final grade.** Your team will prepare a report for the Global Health Organization. You may gain an additional 1-point from peer review. (BIOL 200, Jan. 2008)

In addition to the WebCT Vista Assignment Drop Box, Turnitin is employed for the improvement of student writing for the final reports of the case studies; Students are expected to submit their reports...
through Turnitin before they submit their final reports to the Assignment Dropbox. The main objective of using Turnitin in this course is to help students avoid committing plagiarism. The instructor allows students to rewrite their reports if any plagiarism is found and submit their updated report to the Assignment Drop Box. In this course, Turnitin is used as an educational guide.

**Lessons Learned:** One of the drawbacks of the case studies is in students’ unequal participation in the group work. Even though each member’s contribution to their case studies is expected, some students demonstrated perfunctory and procrastinated participation in their group work. The problems stem from various reasons such as the heavy workloads for the course activities, language problems as a non-native speaker, being disoriented in problem-solving skills, etc. However, most of the student feedback on the case studies is generally positive, and focuses on how their research skills have improved, how group work has helped them to share and articulate information with peers, and how from the instructor’s regular feedback and stimulated interest by the topics the case studies has engaged them more in the discussions. The following comments are cited from evaluations of the course taught in September 2010.

*Case study 2 was a lot more interesting and researching the topic of interest helped tie in the fundamentals of cell biology. (Student A)*

*Unexpectedly, this Distance Education course turned out to be as good or better than the regular classroom course! Because of the relatively small group size, we had an opportunity for more discussion, group work and regular feedback from Dr. Jane Doe. Excellent set of activities and practice problems, and an interesting approach to learning!* (Student B)

The success of the course can therefore be attributed to a combination of 3 main factors; 1) frequent and meaningful feedback from the instructor to the discussion forum and to student assignments, 2) tight alignment of objectives with assessment methodology and strategies and 3) the provision of authentic and transferrable practices for students pursuing life sciences. And while our assessment design strategy is clearly important, we affirm that no matter how well we design activities or assessments, the success of a course cannot be achieved unless the course instructor is actively engaged in implementing the strategy.

**Case 4: The Design Wiki; assessing collaborative writing in the context of a multi-year community knowledge-building project**

ETEC510: Design of Technology Supported Learning Environments is a graduate level course within UBC’s online Masters of Educational Technology (MET). ETEC510 is a core course and each year approximately 100 students take the course. The students in the course come from several different professional contexts: 75% are in-service teachers in the primary or secondary level; and 25% are higher instructors or educators in government and corporate training contexts. A key learning outcome of the course is for students to “[d]evelop skills in the design of educational media, and the integration of design thinking with scholarship in education.” (ETEC510, 2011) This case will focus on an individual or paired activity called the ETEC510 Design Wiki, an activity worth 20% of student final mark, where students collaborate on an extensive community knowledge base that is public to the Internet.

*Rationale:* The rationale for the Design Wiki assignment activity is to provide a space where all ETEC510 students will engage actively over the duration of one semester, with the twin goals of learning and communication in a publication medium that affords editing, linking, and dialogue as persistent and critical elements in the production of useful knowledge (Scardamalia & Bereiter, 1994). Alongside the course materials created by the course authors (Mary Bryson and Jeff Miller), the Design Wiki materials are a knowledge base that is many times larger than the original course, and students express a strong sense of ownership and responsibility for the material that they have authored, edited and curated year to year. By running this activity outside of the UBC’s Learning Management System, WebCT Vista, we have been able to preserve student work beyond the duration of a course as well as provide public access to this growing educational knowledge base developed by MET students, ([ETEC510 Design Wiki site](http://sites.wiki.ubc.ca/etec510/)).

For the Design Wiki assignment, we use Mediawiki because it is open source software. For many of the educators in the MET, exposure to open-source options is quite useful, particularly if they work in cash-strapped school districts. It is worth noting that students have regularly gone on to transfer this
collaborative knowledge-building approach into their own classroom practice, often within days of starting the activity.

**Assessment strategies:** The assessment criteria for the Design wiki were designed to encourage students to engage in collaborative knowledge building with their peers. Students are asked to consider the contribution they are making to the Design Wiki as well as the quality of their writing. For new entries, students are assessed on three main components: is it a meaningful contribution to the Design Wiki, is it educationally significant, and does it provide a unique critical perspective. Students are also assessed on the nature of the resources they contribute; are they diverse, useful and connected to the topic. Finally, students are assessed on the quality of their writing in terms of the Wikipedia format we ask them to use, as well as for clarity and for proper documentation. For revisions of existing entries, students are assessed in a similar fashion on the focus and resources of the entry, but they are assessed on a rationale they write to justify their revisions. Many of these rationales are now attached to secondary pages (discussion pages) that are created alongside the main page for an article in MediaWiki. These sub-textual pages make it possible for students and other readers to see both the top-level article and the messy process of knowledge creation that goes on beneath the surface within this collaborative writing space.

One of the most important tools within the wiki for instructors is the history page that tracks the revision history of an article. By looking at and comparing versions, it is easy for the instructor to identify student edits as well as to assess the amount of time students have put into the authoring or editing. The history page, along with the discussion page for each article provides context relating to the writing process. These pages also provide students with a means to contribute their own responses to the work developed by their peers or to reflect upon their own work. It has been interesting to see that students end up receiving feedback from their peers, even though we don’t require that students provide such feedback to one another.

**Lessons Learned:** The growth of the Design wiki has created challenges relating to the structure of the activity and our assessment approach. Starting from a state of *tabula rasa* in the first year, the Design wiki has grown enormously and in 2011 has over 230 topics, some of which have been edited and revised multiple times. Close to 500 students who have taken the course in the last 5 years and made contributions to the Design Wiki. The activity has been revised and expanded several times moving from a focus on the creation of new entries, to revision of existing entries, to revision of the overall organizational structure of the Design Wiki. Students engage with the Design Wiki as authors and editors, and students now often curate areas of the Design wiki so as to build coherence, look for overlap between entries and to look for opportunities to improve the quality of this peer-authored, collaborative knowledge base.

The Design wiki has also prompted students and instructors to discuss the nature of writing in a shared space where it is possible for one student to make edits and revisions to another student’s work. And while writing in shared spaces can create tensions between students, particularly if they feel that their work has been overwritten or changed, the negotiation of what ends up on the main page of the entry, and the process by which revisions come about, leads to critically engaged and engaging conversations both within the Design Wiki and in the discussions that are posted to WebCT Vista by the students. Perhaps most importantly, the experience of negotiating writing in this community site has an impact on how these students, who are themselves teachers, design spaces and activities to support learning with their own students.

### 3. Discussion and conclusion

We have seen in the cases presented that clearly articulated assessment strategies are vital to the effective design of online courses and programs. The peer assessment case demonstrates a program-level solution to the need to provide a tool that assesses professional skills in group-level and individual-level performance within an online context. The virtual patient case illustrates how low-tech resources used within a phased set of “rounds” help students to engage in authentic practice. The design of extended case studies in the problem-solving case in Biology shows how an iterative process model for problem solving supported by discussion and feedback contributes to an effective online learning experience for students. And finally, the Design Wiki case illustrates how an open-source environment designed for the purpose of encouraging collaborative learning within a well-specified assessment strategy leads to a persistent shared workspace that has a life beyond a single course.
While some argue (Norton, 2004) that making assessment criteria more explicit in higher education may have a deleterious effect on students’ learning, our design practice demonstrates that establishing meaningful learning activities aligned to course objectives as a purposeful and iterative collaborative process of working with instructors from initial design through to delivery and evaluation is an effective design practice.

We have seen how discipline-specific practices and teaching approaches must be well understood in order to develop a rationale for an assessment strategy in two of our cases that are designed around systematic diagnostic problem solving and use both generic and discipline-specific models in their assessment strategies.

All of our cases are concerned with how best to match the affordance of technologies and tools that can be used and customized to meet the purpose for online assessment. The design wiki tools in particular provide tracking and revision histories that afford visibility of individual contributions to the collaborative learning process.

Our current work continues to further articulate the design principles and the common elements within and between the cases in order to develop a framework that designers can use to guide the design of online assessment strategies. We are also interested in developing a more comprehensive view of the online learning environments through focusing on the experiences of the students and the instructors as a way of improving our practice and in considering new models of assessment. The process of articulating and sharing our design practice has had a positive impact on our teams’ awareness of the critical role of online assessment design in our work.

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Acquiring Software Project Specifications in a Virtual World

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Abstract: In teaching software engineering, it is often interesting to introduce real life scenarios for students to experience and to learn how to collect information from respective clients. The ideal arrangement is to have some real clients willing to spend time to provide their ideas of a target system through interviews. However, this arrangement cannot be scaled up as it demands too much resource. Starting from 2008, we have used Second Life (SL) to create a virtual company, named SVG Corporation, which has multiple departments so as to simulate the real-world business environment. The development of this fictitious company not only provides a new experience in requirement collection to students, but also lowers the working effort of our colleagues in acting as external business clients. Students can practice their communication and fact finding skills during visits in the departments and interviews with the virtual “staff”. The company has been used to support 2 subjects, Human Computer Interface and Foundations of Database Systems. The presence of SL acts as an online platform for students to access and acquire user requirements from staff (AI robots) of a virtual company, through a series of interviews, for system development. The roles of SL are twofold: to reduce the operational overheads in the project administration and to allow students to gain more hands-on experiences through working on a simulated real-life business cases. Hence, student could learn how to apply their knowledge and understand the software development process in the real business world. In this paper, we would like to report our experience and results of using SL in the software engineering student projects. Furthermore, the problems and the difficulties encountered during project period will be discussed for future enhancement.

Keywords: second life, software development project, AI robots, simulation, eLearning

1. Introduction and motivation

Compared with the educational environment in the past several decades, it is undoubted that the development of technologies, especially the advancement of the Internet, applies revolutions on traditional teaching and learning tools. Face-to-face lectures are no longer regarded as the solely productive means for education. Instead, there are different media for facilitating effective teaching and learning, including animations, videos, involvement of multimedia games and etc. Educators, however, are not merely contented with these auxiliaries. Hence, some of them have brought about the application of online virtual worlds for education due to the practicality as well as usability of virtual immersive environments (Warbuton 2009). It is obvious that virtual worlds are often used as a social communication source without geographical restriction. Its simulative nature also allows students to easily get familiarized from their physical world experience. With the help of avatars, the visual representation and interactive tools of users in virtual worlds, students are able to experience everything provided as if they are acting in reality (Hew et al. 2010). Amongst a number of 3D virtual worlds available on Internet, Second Life (SL) has been identified as the most popular and commonly used in education by the regular Eduserv virtual worlds survey (Warbuton 2009). SimTeach, an online resource about multi-user virtual environments (MSVEs), says there are over 100 institutes of higher education having active projects in SL. Also, the Linden Lab, the developer of SL, often receives enquiries from different educators worldwide about either starting a SL class or working an educational project using SL platform (Joly, 2007). Zhang suggested that the building and scripting functions allow SL to be ideally applied for Computer Science education and it could be proven from the research works done on diverse disciplines (Zhang, 2007), including programming (Esteves et al. 2010), aesthetic computing (University of Florida, 2007) and software engineering (Ye et al., 2007).

Apart from different teaching methods, assessment tools, such as assignments and projects, are also significant in education so that student learning progress could be reviewed through their works. Hadjerrouit emphasized that a more realistic environment is required for software engineering education in order to nurture skillful engineers (Hadjerrouit, 2005). In Fall 2006, a simulated environment with business cases of a company has been introduced to a class of software engineering students and departmental colleagues were acted as external clients for giving requirements during interviews. Students gave very positive feedback because they considered, through the arrangement, they have learned communication skill and business knowledge, which were quite difficult to acquire in regular lectures and tutorials. However, the project arrangement
cannot be scaled up. When there are increasingly more students involved, resources of physical presence of company managers are very difficult.

This paper reports our work on providing students term projects for software engineering education using SL as a platform and discusses the observations done within these 3 years. After the introduction, section 2 presents the roles of SL in the term project. It is followed by the feedbacks from students and teaching staff for analysis in section 3. Finally, in Section 5, we will conclude the paper and discuss problems encountered and future enhancement.

2. Background work

In this project, students were working in teams and required to solve business problems and facilitate operational processes of a virtual company named “SVG Corporation” (SVG) using their professional IT knowledge. In order to develop useful computerized systems for “staff” in SVG, students have to acquire the specification of the to-be-developed system and hence interviews are required. This arrangement could not be scaled up because of the demanding resources while the introduction of SL overcomes the problem of the shortage of manpower. AI robots have been set up “physically” in the virtual company to act as SVG staff in SL. The presence of AI robots allows students to interact with and get the user requirements for system development through avatar-robot conversation. Figure 1 shows a snapshot SVG Corporation in SL.

Other than hands-on technical skills, it is anticipated that students could be trained with soft skills such as communication skill and collaboration skill in this term project since students are allowed to work in an excellent learning space which mimics the real-life professional context provided by a 3D virtual world, SL (Sancho et al. 2009). It is believed the training of important soft and social techniques could be achieved during the interviews. Therefore, logging of interview conversations has been done possible so as to allow lecturers to analyze and provide comments based on the student performances reflecting in their interview records.

3. Methodology

For Fall terms of the past 3 years, students were guided progressively to work on the Multi-Subject Student Project (MMSP) with just in time releases of information from the SVG Corporation, a fictitious company. The flowchart of the project schedule is shown in Figure 2. In addition to conducting interviews, SL also acts as an interactive platform for students to receive progressive supervision from teaching staff on their works. Students would obtain feedbacks from lecturers during the second project meeting held in SL. The purposes of this meeting are to guide students in doing a software development project properly, and to further imitates the progress meetings in reality so that students would have an idea that progress meetings are the normal practice of the real-life business environment.

In order to streamline the logistics of the multi-subject student project, our team has developed a set of support tools inside and outside SL. They are described next.
A virtual company with several departments named as the SVG Corporation was built inside SL. The following is a description of the SVG, which was provided to students as a handout on the project website.

“SVG Corporation mimics an international company which earns revenue as a franchiser and an operator of restaurants. Apart from restaurants, SVG also funds SVG Charity House (SCH) and SVG Burger University. Although the SCH is an independent non-profit organization, SVG Corporation pays the general and administrative costs of the SCH global office. Therefore, a majority of the money donated by individuals and organizations go to the SCH and support the SCH programs. SVG Burger University has provided trainings which emphasize consistent restaurant operation procedures, service, quality and cleanliness. It is the marvelous global center for SVG’s operations training and leadership development. Furthermore, SVG Privilege Club has been set up as the membership program for the customers. It also links with SCH because points can be gained through any kind of donations to the SCH. The SVG is a subsidiary of the SVG Corporation.”

Some snapshots of SVG in SL are shown in Figure 3 and Figure 4.
3.2 Project website

A project website for the multi-subject student project (MMSP) provided a centralized information hub to provide group formation, submission deadline, sample templates tutorials and other materials related to the MMSP. It also acted as a channel to notify students about the progress of their projects and collect feedbacks from the lecturers.
3.3 Avatar registration page

The registration webpage enabled students to establish the correspondence between their avatar IDs and student numbers. After matching, recording of student activities or conversations in the SVG was possible. Lecturers could use the logs to analyze student activities and provide individual guidance. They could advise on the communication skill of students. Also, the registration page supported the appointment arrangements for interviewing with SVG staff.

3.4 SVG Staff – AI Robots

One objective of introducing SL is to reduce the workload of colleagues to act as external clients while at the same time, to enrich students to acquire some real world experience in communicating with people outside campus. After investigating a number of techniques and the approach of utilizing AI robots have been adopted. The building of AI robots was based on Pandorabots, which provided the robot hosting service (http://www.pandorabots.com/botmaster/en/home). The dialog control of the interviews between students and SVG staff were based on the Artificial Intelligence Markup Language (AIML). Through matching pre-defined keywords and question structures, SVG staff could offer appropriate responses to students. Through the support of Pandorabots, the processes for both robotic creation and robotic training became simpler and easier and the AIML scripts could be generated automatically by using a few user-friendly interfaces without computer programming. Figure 5 illustrates the first step for building an AI robot.

![Figure 5: Robot initialization in Pandorabots](image-url)
Besides the development of the AIML scripts, PHP coding was used for logging the conversations during staff-student interviews. A database was constructed to store the student information, including student ID and the corresponding avatar names as well as the questions and answers acquired during interviews. It acted as a source for lecturers to investigate the interview skill of an individual student. Figure 6 includes some snapshots of the staff (AI robots) during interviews.

![Managers as Pandorabots in SecondLife](image)

Figure 6: Managers as Pandorabots in SecondLife

4. Evaluation

The multi-subject term project, with the involvement of SL, has been run for 3 times and a set of student surveys has been conducted during each project period in order to evaluate the student learning experience. In 2008, a survey was conducted for the students. It mainly focused on the usage of SL but the data collected was not sufficient enough to reflect the student needs. Thus, a set of 3 surveys, which are Pre-project survey, Mid-project survey and Final Project Survey, have been designed and used in the Fall semesters of 2009 and 2010, respectively. In addition to student feedbacks, we have received comments from teaching staff concerning the effectiveness of the application of SL towards student studies in this term project.

4.1 Student survey in 2008

The survey was divided into three parts. The first part allowed students to indicate the subjects taken. In the second part, students were required to give general evaluation of SL into different aspects. For instance, it was necessary for students to evaluate the user-friendliness of the interface of SL; the usefulness of the orientation package provided; the attractiveness of facilities and buildings in virtual PolyU campus for more exploration; the benefits to teaching with the help of SL; the interestingness of this project; the adequacy of the use of SL; their understanding of this project and the operations in the real business world. In the last part, students were expected to write down some comments about SL and the difficulties encountered when using SL. The overall result of the second part is shown in Figure 7.

As shown in Figure 7, students were mostly satisfied with the application of SL in the term project, particular in the usefulness of the orientation package provided and their understanding of the role of Second Life in this project.

In general, students who have much experience on online games, especially in 3D MUVEs, can adapt to the new mode of requirement collection process easily but the SL orientation package provided also allows students with little online game experience to get familiarized with this new platform and tried to gather system requirements in a smooth and efficient way. Hence, over 60% of the students knew what they were supposed to work with the SL. In addition, around 60% of them also satisfied with the simulated business environment for improving their practical skills such as communication skills and problem-solving skills.

Nevertheless, there was a noticeable dissatisfaction on the “benefits to teaching” category. As this project focused on the practical trainings for students without much active teaching involved, students were less likely to receive much knowledge using SL. In addition, it was the first year to involve SL as teaching and learning tool and hence it could be difficult for students, who have been taught in a traditional way for decades, accept this innovative approach.
Figure 7: General evaluation of SL (2008)

Table 1: Survey questions (2008)

<table>
<thead>
<tr>
<th>Question</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The interface of Second Life is easy to use.</td>
</tr>
<tr>
<td>2</td>
<td>The orientation package provided is useful.</td>
</tr>
<tr>
<td>3</td>
<td>The facilities and buildings in virtual PolyU campus attract me to explore more in Second Life.</td>
</tr>
<tr>
<td>4</td>
<td>The use of Second Life benefits to teachings.</td>
</tr>
<tr>
<td>5</td>
<td>Second Life makes this project more interesting than other traditional projects.</td>
</tr>
<tr>
<td>6</td>
<td>I know what I am supposed do in this project with the use of Second Life.</td>
</tr>
<tr>
<td>7</td>
<td>The use of Second Life is adequate to this project.</td>
</tr>
<tr>
<td>8</td>
<td>The virtual company (SVG) helps to understand the operations in the real business world better.</td>
</tr>
</tbody>
</table>

4.2 Student surveys in 2009 and 2010

In 2009, a set of 3 surveys has been provided for students in order to evaluate the application of SL as well as the practicability of term project in promoting software engineering education. It is believed that the surveys could help in collecting meaningful data for analysis. Since the same set of surveys has been conducted in the Fall semester of 2010, results got from these 2 years would be presented below, with the exclusion of the data collected from the Final Project Survey because it focused on the feasibility of the entire multi-subjects term project.

4.2.1 Pre-project surveys

The Pre-project survey was conducted before the commencement of the multi-subject term project and it acted as a preliminary statistics of student cognition on virtual worlds as well as SL. Hence, questions are usually related to student experience on virtual worlds and SL. It is discovered that most of the students, either from 2009 or from 2010, felt strange to SL platform and less than 10% of them had tried it before the first project briefing. These results explained the necessity of the SL tutorials so as to enable students to get familiarized with this new platform soon. However, a slight increase in the amounts of student trying out SL when comparing the two years (5.3% vs 9.3%). This increase indirectly reflects that the SL began attracting students to try it out as a game and estimates its possibility as a learning tool.
4.2.2 Mid-project surveys

The Mid-project survey was conducted after the first submission, the User Requirement Specification (UR Spec.) on the ninth week of the semester. Students had just finished the UR Spec. with information collected from the interviews using SL. This survey was mainly focus on the user experience of SL. Students were asked to judge the user-friendliness and effectiveness of SL in the requirement collection process. The results of the self-evaluation of the learning progress in the mid-project period and the general evaluation of SL are shown in Figure 8 and Figure 9 for 2009 and 2010, respectively.

![Self-evaluation on learning progress in Mid-project period (2009)](image)

Figure 8: Self-evaluation on learning progress in mid-project period (2009)

![Self-evaluation on learning progress in Mid-project period (2010)](image)

Figure 9: Self-evaluation on learning progress in mid-project period (2010)

**Table 2: Questions of mid-project survey (Self-evaluation on learning progress)**

<table>
<thead>
<tr>
<th>Question</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>My understanding on how to apply IT to business cases has been raised.</td>
</tr>
<tr>
<td>2</td>
<td>My team spirit can be developed and trained when working on this Term Project.</td>
</tr>
<tr>
<td>3</td>
<td>My knowledge on how to develop an informative system progressively has been advanced.</td>
</tr>
</tbody>
</table>
4.2.3 Post-project surveys

Figure 10 and Figure 11 illustrated that less than 20% of students thought that they cannot gain much knowledge from this multi-subject term project. Only around 16% and 14% of students, in 2009 and 2010 respectively, disagreed that their team spirit can be developed through the project works. These statistics are quite encouraging that majority of students was contented with our proposed learning approaches. Hence, it fulfills the learning objectives of developing soft techniques as well as technical knowledge.

![General Evaluation of Second Life (2009)](image)

<table>
<thead>
<tr>
<th>Question No.</th>
<th>Overall Satisfaction</th>
<th>Overall Dissatisfaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
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<tr>
<td>2</td>
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<td>9</td>
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</tbody>
</table>

**Figure 10: General evaluation of Second Life (2009)**

From Figure 10, it is found that most students were satisfied with the application of Second Life in the term project, particularly in the following 3 areas.

- SL tutorials and assignment
- Flexibility interviews
- Experience on the software development process in real business world

Around 90% of students agreed that SL tutorials allowed them to familiarize with the new platform. This indicates that SL tutorials were essential to students before commencing the interview process for requirement collection. With this arrangement, students were motivated to explore more about SL in a relaxing environment and hence the promotion of student active learning could be achieved indirectly. Approximately 70% and over 80% of students were contented with flexibility interviews as well as experiences on the software development process in real business world, using SL, respectively. These results revealed that the presence of SL may complement the deficiencies in limited resources.

However, the situation has been altered to a certain extent in 2010 and which are illustrated in Figure 11. Students generally suggested improvement would be needed of the application of SL in the interviews. Similar to the results got from 2009, students satisfied with the SL tutorials and the experience on the software development process in real business world but not the interview arrangement. Although students were provided with reasonable periods for interviews, from 9am to 7pm, daily within 2 consecutive weeks, some of the students expressed that they were often occupied by lectures and tutorials which hindered them from conducting interviews during the assigned period. It revealed that the project team should check up student needs at intervals.
Figure 11: General evaluation of Second Life (2010)

Table 3: Questions of mid-project survey (General evaluation of SL)

<table>
<thead>
<tr>
<th>Question</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The tutorial and SL assignment allows me to get familiarized with Second Life environment soon.</td>
</tr>
<tr>
<td>2</td>
<td>The facilities and buildings in virtual PolyU campus attract me to explore more in Second Life.</td>
</tr>
<tr>
<td>3</td>
<td>Second Life makes this project more interesting than other traditional projects.</td>
</tr>
<tr>
<td>4</td>
<td>The virtual company (SVG) helps to understand the operations in the real business world better.</td>
</tr>
<tr>
<td>5</td>
<td>The arrangement for interview is adequate to this project.</td>
</tr>
<tr>
<td>6</td>
<td>My communication skill and interview skill has been increased.</td>
</tr>
<tr>
<td>7</td>
<td>It is an innovative approach to do interviews within Second Life.</td>
</tr>
<tr>
<td>8</td>
<td>The involvement of SL allows greater flexibility in the time of interviews.</td>
</tr>
<tr>
<td>9</td>
<td>I gain more understanding on software development process in real business world through interview process and preparing UR Specification.</td>
</tr>
</tbody>
</table>

Despite both groups of students agreed that it is an innovative approach to have interviews within SL, a significant portion of them did not think that SL makes the project become more interesting. In terms of the student comments, the application of SL in the term project distracted them because students claimed that the set-ups of SL tasks were occasionally out of order and which leads to somewhat time-consuming task completion.

4.3 SL teaching staff

Apart from feedback received from students, the opinions collected from SL teaching staff were also significant in determining the feasibility of the application of SL in this software development project. SL, in the perspective of teaching staff, acts as a very useful means to support an innovative user requirement collection process. Nevertheless, there are still some drawbacks in applying SL in a software development project which are outlined below.

4.3.1 Insufficient feedbacks during student interviews

For the sake of examining the student activities during interviews, we have logged the conversation between students and AI robots. Students would be provided with comments about their performance so that their social and interview skills would be improved. Owing to the number of students available in each subject, it is less likely for students to receive immediate comment during their interviews. Hence, it makes students feel frustrated by repeating failure in acquiring the required information.
4.3.2 Inadequacy of SL workshops

Some teaching staff assumed that students from Computing (CS) are not necessarily provided with extra SL workshops or tutorials because they believed that CS students are keen towards any computing-related technologies, including RFID, online games, 3D virtual worlds and etc. Students can learn and master new software platforms independently. On the contrary, SL trainings are required for students since it provides an opportunity for students to learn the basic operation of SL and enable to have a chance to seek help when facing difficulties. It is obvious that a decrease in the number of SL tutorials held for 2010 students resulted in general drop of student satisfaction in the Mid-project survey.

5. Conclusion and recommendation

Our work is the first full scale operation of student joint projects across multiple subjects in the Department of Computing, The Hong Kong Polytechnic University. During the project period, several surveys have been conducted in order to gather student feedbacks in order to help us to understand the feasibility of using SL to empower students learning the process of software development. Also, comments from teaching staff have been collected so as to provide different perspectives. After reviewing the results and comments, it is obvious the multi-module term project arrangement does serve its purpose and improve on student learning. Students are in favor of the joint project arrangement. Yet, some students were not content with some of the support in the developed SL environment. Their dissatisfaction is generally based on 3 areas, including technical set-ups of AI robots, unfamiliarity with SL platform and insufficient SL training.

5.1 Unfamiliarity with SL platform

Although SL is a well-known 3D virtual world, it is not popular in Hong Kong. As discussed in Section 3.2.1, most of our students have not heard of SL before. According to Frailey, familiarization is fundamental human characteristic that people always seek for (Frailey, 1999). Hence, changes often become unfavourable even though a comfortable condition has been provided. Therefore, it is expected that plenty of time is required for adaption if innovation has been included in teaching and learning means. For instance, SL could be introduced during the summer time so that students could be provided with a longer period to know this new platform well.

5.2 Incomplete dialogue database of AI robots

Students considered the question and answer sets of the robots are not exhaustive. Since everyone has his/her own style in conversation, it could be quite hard to enhance the “brain” of each robot with only a limited number of robotic dialogic trainers. Hence, only limited sets of question could be prepared for each AI robot. Apart from keyword matching, sentence structure is another criterion for our robots to determine if any relevant and useful answer could be replied. However, it is discovered that, sometimes, students just typed in keywords when checking the interview logs. This would increase the difficulties for students in acquiring user requirements. In order to solve this problem, people from different academic fields should be invited as system trainers so that the robots could be “smarter” with comprehensive question sets. Also, a new mechanism, in addition to keyword matching, should be included in the AI robots to interact with students. Furthermore, students should be encouraged to raise questions instead of keyword presumption.

5.3 Inadequacy of SL training

In our practice, SL would be first introduced to students at the very beginning of the semester. Therefore, students have to be familiar with SL at most within 1-month period. Some students may find it difficult to begin and lose interest towards SL rapidly if no further SL trainings is available. Therefore, continual trainings should be offered before the commencement of the term project so that students can have more hands-on experiences on using SL.

References


Frailey DJ (1999), 'Opportunities for software engineering education', Annals of Software Engineering, vol. 6 (issue 1-4), pp 131 – 144
Constructive Disruptions for Effective Collaborative Learning: Navigating the Affordances of Social Media for Meaningful Engagement

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Abstract: The essentialist view that new technological innovations (especially Social Media) disrupt higher education delivery ride on educators’ risk averse attitudes toward full scale adoption of unproven technologies. However, this unsubstantiated logic forecloses possibilities for embracing the constructive dimensions of disruptions, and grasping the tremendous academic potential of emerging technologies. Community of inquiry and virtual ethnography were adopted as theoretical and methodological lenses for exploring the productive pedagogical impacts of appropriating Social Media in an Information Systems course at a South African University. Lecturer-student and peer-based postings on Facebook were examined to understand the influence of Facebook adoption on student meaningful learning and pedagogical delivery. The findings suggest that Facebook constituted a collective “Third space” for student enactment of counter scripts, augmented traditional academic networking, fostered “safe” havens for student democratic expression, and afforded learning communities for student co-construction of knowledge. Shortfalls identified include challenges of developing quality academic discussions and fostering student engagement at epistemological and conceptual levels to ensure deep learning. The study recommends a multi-pronged strategy that foregrounds contingent relaxation of academic authority, on-task student behavior, strategic alignment of powerful collaborative technologies with pedagogical designs, and learning needs and styles of students.

Keywords: Facebook, constructive disruptions, disruptive technology, meaningful engagement

1. Introduction

Pessimist constructions of technological disruptions of pedagogy fail to adequately capture the complexity of the context in which higher education delivery unfolds, and the sophistication of the learners involved. Literature on the pitfalls of disruptive technological innovations (Social Media, Web 2.0 collaborative learning environments) emphasises challenges of engaging a wired generation with limited attention spans (Prensky, 2005, Baron and Maier, 2005), and Social Media’s distractive nature (Pierce and Vaca, 2008; Watters, 2010; Warman, 2011). Other studies have reported Social Media’s violation of copyright laws through instructional cheating software (Seitz, Orsini, Gringle, 2011) and subversion of asymmetrical relations of power between academics and students (Selwyn, 2007; Rambe 2011). While these studies locate the potential drawbacks and unintended consequences of adopting Social Media, they are either inconclusive on or have downplayed the tremendous potential of these emerging technologies to enhance deep learning.

The thesis of this paper, therefore, is that there is dearth of literature that articulate the positive educational incentives activated by disruptive technological innovation in higher education. As such, the relationship among disruptive technologies, student meaningful learning and effective pedagogical delivery remains unknown or speculative. Yet, when Social Media environments are tightly anchored in constructivist, knowledge-centred learning environments where dialogical discourses and on-task academic behavior are sustained, they present profound opportunities for deep scholarly engagements. As such, conceptual framing of Social Media studies within the operational logic of binaries is flawed and less informative for capturing the complexity of technology-enhanced pedagogical innovation in higher education.

This study explores whether the academic appropriation of disruptive Social Media in tertiary learning derives some constructive gains for learners and academics. The research also investigates the constitution of the Community of Inquiry (CoI) instantiated by lecturer-student and peer-based interaction in a Social Media-enhanced environment. The rest of the study is structured as follows: provides a literature review, theoretical framework, and a methodology. These articulations are followed by a presentation and discussion of findings, implications for pedagogy and a conclusion.

2. Literature review

Disruptive technology innovations
The concept “disruptive technology” has evolved significantly from the time Christensen (1997) invented it to explicate new technology entrants’ accumulation of value and their displacement of traditional ones in established markets. Disruptive technologies constitute trajectories of performance offered by technological alternatives (Danneels, 2004) including shifts in behavioral practices that accompany them. In academia, a [technological] disruption arises when educators use technology in ways that the original inventors and designers might never have imagined (Gower et al., 2001). Academics who deploy technological tools in novel, unexpected ways enable researchers and designers to (re)conceptualise the social world from different perspectives, culminating in the development of influential innovations (ibid). At university, a shift from a transmission pedagogical mode, pre-packaged content and lecturers as authority figures towards an informal, constructivist mode that foregrounds knowledge construction and student control of learning presents diverse pedagogical opportunities for deep learning.

Redecker, Ala-Mutka, Bacigalupo, Ferrari and Punie (2009) highlight that the adoption of [technology-enhanced] learning 2.0 strategy necessitates fundamental innovations at the levels of pedagogy, and technology. Technological innovations necessitate the provision of authentic learning resources; embedding learning in engaging, multimedia environments; supporting individualised learning processes, and equipping learners with powerful tools for knowledge exchange and collaboration. Pedagogical innovation underlies the recreation of the learning environment to ensure collaborative learning activities unfold and a definition of learners and lecturers’ roles.

3. Pessimistic constructions of disruptions

Research on Social Media as a vestige of academic concern emphasises its distractive nature (Watters, 2010; Warman, 2011; Pierce and Vaca, 2008) and appropriation for vertical surveillance and enforcement of discipline (Boyd, 2007; Albrechtslund, 2008; Fuchs, 2010, Grodzinsky, Gumbus and Lilley, 2010). Other studies highlight that Social Media render backstage opportunities to academically-challenged students to challenge academic authority and contest asymmetrical power (Selwyn, 2007, Rambe, 2011). It also subverts copyright laws through its plagiarism and cheating practices (Seitz, Orsini, Gringle, 2011), phishing and spreading of viruses.

Distractive technology

Social Media percievably distracts the less academically motivated students from learning. Watters (2011) bemoans educators’ erroneous assumption that instant messaging encourages off-task behavior in class, the same way the exchange off-topic messages and informally passing of “notes” can be disruptive. Given the ubiquity of Social Media-enabled phones at South African universities coupled by student’s “texting culture,” the aforementioned practices conceivably generate chaos and lack of concentration. The volume of tweets exchanged, student's limited attention spans, loss of context as information flows across different interactants and platforms are some drawbacks of Social Media communication (Fincham, 2011).

Academic ambivalence about appropriation of Social Media is explained by student enactment of hidden counter scripts involving public critique of academics' teaching practices on their personal blogs. Liew (2010) articulates that despite their social constructivist affordances, blogs’ blurring of formal and informal spaces and their diverse back-talk processes (from joking, vicious grievances, slander and rumour) complicate their potential use for meaningful learning. Teenagers’ critique and public embarrassment of educators and academic authorities on their blogs compel universities to question their academic value (ibid). Similarly, despite Facebook’s potential to foster peer-based academic networking and collaborative inquiry, Selwyn (2007) documents its use by academically challenged students to contest asymmetrical educator-student offline relations, and its affordance of backstage opportunities for such students to be disruptive and challenging (ibid).

Vertical surveillance

Albrechtslund (2008) reports on how casual digital conversations on social networking sites are targeted by the U.S. National Security Agency to nub criminal activities in the United States. Academics often exploit Social Media for vertical surveillance of student off-task behavior, while universities’ disciplinary committees are blamed for intercepting student social communications on social networking sites. Such communications often serve as incriminating evidence for sanctioning, disciplining or expelling students. The monitoring of student online activities by academic authorities is
conceived to constitute an invasion of privacy, disruption of personal autonomy, something analogous to parents snooping in diaries or listening in on phone conversations (Grodzinsky, Gumbus & Lilley, 2010). Fuchs’ (2010) finding on Salzburg students’ use of social networking site, studiVZ suggest their general awareness of social networking providers’ access and use of personal data, and this critical information behaviour explained their declining of advertising gimmicks.

Academic dishonesty

Escalating incidences of plagiarism, inappropriate citations and violation of copyright law account for academics’ hesitation to appropriate Social Media in higher education. The “copy-cut-and-paste” generation frequently exploits the powerful affordances of Web 2.0 technologies to re-organise, edit, remix, recreate, repackage content for republication, thus plagiarising texts with impunity. Seitz, Orsini and Gringle (2008) articulate You Tube-sanctioned academic cheating involving the posting of instructional cheating videos online. Their findings suggest the presence of technologically aided instructional cheating on exams, homework and assignments, and the popularity of cheating videos judging from the positive affirmations they received from viewers.

Szabo and Underwood (2004) identify fear of failure and the temptation to use freely available information on the Internet as plausible explanations for student engagement in academic honesty. Their study report that more than 30% of the 291 participants surveyed admitted to copying information from the Web and incorporating it into their assignments without acknowledging their sources. Threats of using Social Media to concoct information or duplicate peers’ work in progress and projects often discourage educators from appropriating Social Media.

4. Productive (re)constructions of disruptions

Recreating context

Fincham (2011) discusses how a Social Media application, Storify, enhances journalists and learners’ ability to contextualize information streams by embedding dynamic images, live text, tweets, even Facebook status updates, and integrating them with the context provided by the journalist/learner. Real time streams of information enhance re-imagination and recreation of context and contribute to engaging students with limited attention spans. Perez (2008) documents how a Stanford University Professor reconfigured a Wi-Fi enabled classroom by seamlessly integrating collaborative Social Media tools like forums, blogs, wikis, chat, social bookmarking, microblogging, and video conferencing. The Social Media classroom enabled the conduct of live lectures interlaced by collaborative learning activities like micro blogging, video viewing and collaborative writing of wikis. It, therefore, constituted an innovative, participatory platform were curriculum materials were embedded into Social Media tools to leverage collaborative engagement and transform traditional instruction.

Fostering transparent learning communities

Watters (2011) demonstrates how educators can exploit Social Media-enhanced applications like Remind101, Poll Everywhere, and Celly (SMS-based group messaging) to anonymously text reminders / updates to students, give student feedback and execute quizzes, and organizing study groups respectively. Armstrong and Franklin (2008) relates how a Stanford University Computer Science professor and his class developed Facebook applications that sustained a social constructivist learning environment. This environment enabled students to showcase their projects as they evolved, and constituted a networking platform for consulting with seasoned software developers and bloggers on their projects. Given that higher education now evolves in a high information society, King (2011) advocates the adoption of Social Media as a necessary innovation that fosters universities’ engagement with communities where this knowledge is generated.

5. Theoretical Framework

Community of Inquiry (CoI)

Garrison and Cleveland-Innes (2006) highlight the necessity of creating a Community of Inquiry where interaction and reflection are sustained; ideas are explored and critiqued; and processes of critical inquiry are scaffolded and modeled. CoI identifies key elements of an educational transaction from a process perspective (Akyol and Garrison, 2008) that allow for a dynamic interactions and meaningful pedagogy in a text-based environment. The CoI framework comprises three interdependent and
dynamic structural elements: social presence, cognitive presence, and teaching presence (Akyol, Garrison and Ozden, 2009).

**Social presence** underscores intentional communication and expression of a feeling of belonging to a given community that recruits interactants' participation in knowledge building processes. Garrison (2009) defines it as “the ability of participants to identify with the community (e.g., course of study), communicate purposefully in a trusting environment, and develop inter-personal relationships by way of projecting their individual personalities” (p. 352). Social presence activates discourses and critical inquiry by allowing co-present online participants to recognise the common norms and values within which they operate and mutually of their collective goals.

In asynchronous communication, learning emerges at the intersection of social and cognitive presence, where students are inducted from socialisation towards deep intellectual inquiry. The three main categories of social presence are affective communication, open communication, and group cohesion. (Akyol, Garrison and Ozden, 2009). In an online learning environment, affective expression is the ability of online learners to project themselves through text-based verbal behaviors like para-language, self-disclosure, humor, emotional expressions and values. Open communication underscores provision of a risk-free learning climate in which participants trust one another enough to reveal themselves. Group cohesion refers to the development of a group identity and the ability of participants in the learning community to collaborate meaningfully (Boston et al, 2009).

**Cognitive presence** is the “the extent to which the participants in any particular configuration of a community of inquiry are able to construct meaning through sustained communication” (Garrison, Anderson, and Archer, 2001, p. 11). Cognitive presence is critical to the generation and sustainability of a community of inquiry focused on the exploration, integration, and testing of concepts and solutions (Garrison and Cleveland-Innes, 2005). It underscores critical problem solving processes, negotiation of meaning and the activation of intellectual processes that enable cycles of information seeking and deep engagement. Systematic discourses underlie educator and student interaction with each other, with content and technology to ensure higher levels of cognitive development, meaning making and collaborative problem solving. Garrison and Cleveland-Innes (2005) remind us that while high interaction may be reflective of group cohesion, it does not directly create cognitive development or facilitate meaningful learning and understanding as interaction directed to cognitive outcomes is characterized more by their qualitative nature.

**Teaching presence** underscores the design of the pedagogical environment, facilitation of learning and definition of participants’ roles. Akyol, Garrison and Ozden (2009) foreground the regulatory and mediating role of teaching presence that entails three areas of responsibility: design and organization, facilitating discourse, and direct instruction. Garrison and Anderson (2003) conceive teaching presence to underlie the macro organisational and intellectual attributes of the learning design environment that enable student sustained involvement in on-task behaviour and deep forms of engagement. The determination of student misconceptions and the delivery of specific task driven resources and content constitute part of this learning package.

6. **Research questions**

- Does student appropriation of Social Media in university contexts constitute and manifest constructive disruptions? If so how?
- How are the different components of a community of inquiry articulated through lecturer-student and student-peer engagements on Facebook?

7. **Methodology**

Virtual ethnography was employed as a methodological approach. For Creswell (2007) ethnography is the study of an intact cultural or social group (or individuals within a group) based primarily on observations over a prolonged period of time by a researcher in the field. The current study examined the “lived experiences” of a virtual community in situ, as they interacted collaboratively in an established social network. As Fourie and Schurink (2011) suggests, the ethnographer records the voice of informants where the interactions happens with the intention of studying the cultural concepts and generating a cultural portrait. The current study sought to develop rich in-depth descriptions of the productive dimensions of disruptive innovations by examining how students appropriated technology to engage in deep interactions that transcended their traditional networks. Lecturer-student and peer-
based interactions on Facebook provided rich, formative accounts of how interactants navigated and made sense of their academic world.

The Case Study

The study examined two first year Information Systems (IS) clusters at a South African university. Their module covered three courses: Introduction to Information Systems (IS), Microsoft Excel, and Microsoft Access. While the first course was largely a theoretical course delivered using the lecture mode, the latter courses involved lectures which were accompanied by practical exercises and timed quizzes in computer laboratories that tested student understanding of taught concepts. Face-to-face lectures were conducted in conjunction with an institutional learning management system that hosted learning materials (slides, readings, course planning tools, collaborative tools) for student use.

To supplement these transmission delivery modes, a departmental Facebook group was created to render a communicative and consultative environment for learners with content-related queries and learning difficulties. The IS Department expected the 450 students constituting the two clusters to open Facebook pages and join this group. To heighten student online presence, the Department awarded a 2% course mark to all students who fulfilled these requirements. The course convener introduced the researcher to the students, articulated his research agenda and signalled his intention to interact with them on Facebook. A regular IS lecturer who taught the student clusters was designated as an online administrator who addressed academic queries from students, fulfilling the teaching presence responsibilities. The course convener maintained social presence on Facebook but marginally participated in Facebook discussions. As such, the lecturers employed Facebook as a useful cognitive scaffold for students with learning difficulties by reinforcing issues they taught in class. To heighten collaborative engagement and ensure inclusivity of varied student learning styles, lecturers allowed three options for Facebook interactions, namely:

- **Private inbox**: personal web spaces for sending private messages to peers and lecturers.
- **Discussion board**: specialised discursive space through which students publicly consulted.
- **Wall**: an accessible public space where students collaboratively networked with peers and the lecturer.

Of the 450 students, 165 participants posted 414 posts. These participants posted 154 wall posts, 121 discussion board posts, and 139 posts to the administrator’s inbox over two semesters. The lecturer–peer and peer-based interactions ranged from academic (theory, practical queries), logistical (announcements, exam and test scheduling, lecture venues), academic related (extra lessons, scholarships, conferences) and course administration (missing marks, submission deadlines) and social queries.

8. Data analysis

CoI variables were employed to develop a rich cultural portrait of how the interactants appropriated disruptive innovative technology (Facebook) to construct social meaning from the pedagogical content they exchanged. As Weiberger and Fischer (2006) suggest, the epistemic focus of learner’s contributions should examine whether learners are engaging in activities to solve the task (on-task discourse) and differentiate specific epistemic activities to solve a task.

<table>
<thead>
<tr>
<th>Table 1: Analytical framework: community of inquiry</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ELEMENTS</strong></td>
</tr>
<tr>
<td>Social Presence</td>
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<tr>
<td></td>
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<tr>
<td></td>
</tr>
<tr>
<td>Cognitive Presence</td>
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<tr>
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<td></td>
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<td></td>
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<tr>
<td>Teaching Presence</td>
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<tr>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Source: Akyol and Garrison, 2008
### Table 2: Applying community of inquiry

<table>
<thead>
<tr>
<th>ELEMENTS</th>
<th>CATEGORY EXAMPLE</th>
<th>INDICATOR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Social Presence</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Open Communication</strong></td>
<td>Free Expression</td>
</tr>
<tr>
<td></td>
<td>Please will you put up an announcement on vula (a LMS) explaining what preparation we need to do for Task 5. Your lecture was not very clear about this [Student posting]</td>
<td>Misconceptions about task expectations for which clarity is inquired</td>
</tr>
<tr>
<td></td>
<td><strong>Personal</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>I think it is very unfair for an announcement to have been made less than 2 hours before a rescheduled lecture at 1pm today.</td>
<td>Expression of unfair treatment caused by a late announcement</td>
</tr>
<tr>
<td></td>
<td><strong>Affective</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Take it from a 3rd year: There is not an Information Systems Department in the whole of Africa that has power of matching UCT for academic quality!!! [Jonathan]</td>
<td>Affective emotions</td>
</tr>
<tr>
<td></td>
<td>The lectures were so boring. I didn't go to them and and I am not prepared to study a whole chapter just for a 5min test [...] No offence to anyone but yeah the quizzes sucked [Melissa]</td>
<td>Expression of disappointment and disgust at less engaging lectures</td>
</tr>
<tr>
<td><strong>Cognitive Presence</strong></td>
<td></td>
<td>Perceived contradictions between the expected values of a technology course and its practical delivery</td>
</tr>
<tr>
<td></td>
<td><strong>Exploration</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>This is an information systems course where technology should make life easier so why is it that all my courses have their slides on the LMS BEFORE the class and us, who are doing and information systems course don't have our slides on even a week AFTER the lecture... im trying to figure out wh</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A literature review means, you must try to summarise the topic provided by reading a range of articles, books and the Internet. on how to hand in, you must submit a hard copy to [name given] and send it to turnitin.com for plagiarism check.[Wonder]</td>
<td>Information Exchange Peer-based exchange of useful information</td>
</tr>
<tr>
<td></td>
<td><strong>Resolution</strong></td>
<td></td>
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<tr>
<td></td>
<td>So i think the latter option would be sufficient. The search thing you can get working without the connection to the Database. I used a program called Zoom Search engine</td>
<td>The use of new programs not taught in class suggests that students were creatively applying new knowledge drawing on knowledge and concepts acquired in class</td>
</tr>
<tr>
<td><strong>Teaching Presence</strong></td>
<td></td>
<td>Shaping Constructive Exchange Explanation of a theoretical concepts</td>
</tr>
<tr>
<td></td>
<td><strong>Facilitating Discourse</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>That would mean you did not have thorough understanding of what ERP is all about, how it originated and where the best software can be found. Enterprise Resource Planning are network enabled business tools that [...]</td>
<td>Focusing and Resolving Issues Practical problem resolution</td>
</tr>
<tr>
<td></td>
<td><strong>Direct Instruction</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>The IF function needs to have some sort of comparison to operate properly. A very common type of comparison is greater/less than (&gt;):&lt;). These math symbols can be used to form logical expressions like &quot;A2 &lt; 40000&quot;, which in English means &quot;Cell A2 is less than 40000&quot;</td>
<td></td>
</tr>
</tbody>
</table>

NB: All extracts in this work are original and are not corrected for grammar.
10. Social presence

The creation and sustenance of a collaborative learning community is critical to student proactive involvement in learning and their ultimate satisfaction with the learning processes. Social presence is articulated through student expression of affection with the learning environment, their close contact with their learning communities and passion to sustain on-task behaviour.

**Affection**

In transmission pedagogies student feeling and mental dispositions towards the course are assessed through summative course evaluations, whose impacts are to improve the successive cohort of learners (and not the current stream). To the contrary, Facebook was constructively disruptive to the extent that it enabled students to assess and evaluate the courses and /departmental practices as the course progressed. As one student affectionately complimented:

*Take it from a 3rd year: There is no Information Systems Department in the whole of Africa that has power of matching UCT for academic quality!!!*

The student expresses a deep affection for his department by giving it a superlative evaluation in comparison to other African IS departments. The remark constitutes a salient evaluation of the teaching programmes, quality of content delivered and possibly the inclusivity of the learning environment. The several exclamation marks after the compliment are reminiscent of an enriching personal experience coming from an avid, task-focused student.

**Open communication**

Sustaining dialogic interaction and multi-voicedness in online learning communities necessitates the development of shared learning goals, social practices and common intentions. Continuous, transparent communication, and open inquiry into course requirements and addressing logistical issues that contribute to student meaningful experiences becomes quite critical. Contrary to student congregation around the lecturer to pose mundane questions on general course administration after lectures, Facebook pre-empted these questions by creating a central repository of queries and responses publicly accessed by all students. Some of the queries students posed which were accessed via the public Facebook discussion board are highlighted:

*Please will you put up an announcement on the LMS explaining what preparation we need to do for Task 5. Your lecture was not very clear about this.*

*I called up Prof Brian Habana (pseudonym) once enquiring about doing his PHP course and then I relocated to Durban. What’s on offer via correspondence?*

*My laptop does not have Microsoft Access installed and when I enquired at Information and Computer Technology Services they informed me that due to Microsoft licensing they are unable to install it for students. Is there any other means of obtaining Access which I am unaware of?*

Not only did Facebook enable students to articulate their misconceptions about content areas, rather it constituted an informal, innovative proxy for lecturers' prognosis and diagnostic assessment of student understanding. Facebook offered a “cozy,” less threatening space for student discussion of the technical challenges they were confronted with in their courses and opportunities for soliciting their redress. For academics, Facebook innovatively pre-empted student questions through provision of group announcements, and responses that were publicly accessed by students.

**Expressing emotions**

Social presence played out through student democratic expression of their dispositions and perceptions towards lecturers' delivery methods. For Garrison and Anderson (2003) social presence creates the climate for intellectual collaborative interaction and precedes the support and articulation of discourses. Learners shared collaboratively their experiences of multiple choice quizzes (MCQs), which they wrote weekly to test their grasp of content had been taught. The discussion topic “What has been your experience of the MCQ tests? Do you think that they were fair? & why?” ignited tough and unapologetic responses:
I will have my say there. The lectures were so boring. I am not prepared to study a whole chapter just for a 5min test. Vula (LMS) itself had many problems like one week it just crashed and other times you got given 8 options for a MCQ. And MCQs were just another problem with IS. No offence to anyone but yeah the quizzes sucked. [Yolanda]

i am appalled by my performance in task two. none of my formulas made sense and when i tried to practice it still was not working out. the quiz was tough, are we meant to read the information in our text books? i was taken aback because not most of the stuff we do in lectures was related to the quiz, or was it just me? [Joachim]

The disappointments with the quizzes were founded on uncreative lectures; unreliability and malfunctioning of the institutional LMS and perceivably faulty design of quiz tests. Although the authenticity of these claims is debatable, it is envisaged that such public critique was instrumental in sensitising Faculty about perceived pedagogical and technology-related flaws in course delivery. Facebook served as a deliberative space through which students complained about inadequate course administration processes like late announcements on change of lecture venues:

I think it is very unfair for an announcement to be made less than 2 hours before the rescheduled lecture at 1pm today. Many of us did not read the announcement and sat in leslie [venue] at 2pm waiting for the lecture. Surely an announcement could have been put up earlier in the week.

The computer mediated nature of Facebook allowed students to grumble more as it shielded them from intimidating, physical features characteristic of facial interactions. More so, Facebook created a “student regulated space” where they enacted a sense of personal ownership of the space. Unlike the LMS that they conceived as an institutional provision they had no control of, Facebook was a personalised space they were already familiar with before lecturers recommended it. It therefore, provided a quasi-formal, grievance handling platform where student questioning was not constrained by class size, in-class inter-group dynamics, or lack of time.

Group identification

Facebook organically created a collective learning community whose interactions potentially activated deep learning. The enactment of a collective identity and articulation of mutual interests enabled the fostering of cohesive social relations on Facebook. A feeling of a collective identity and collegiality manifested in the appropriation of inclusive pronouns like “we” and “us,” depicting some semblance of solidarity:

Hey, how long does it take b4 we get our IS Lit Review marks back? are you marking as they come in or do you wait we all hand in b4 you mark?? [Olinda]

Hello Salah, For the reviews do we need to search for it even if we have enough information from text books [Nyasha]

Many of us did not read the announcement and sat in leslie (venue) at 2pm waiting for the lecture [Meshia]

The shared academic destiny concept therefore, constituted a subtle prerequisite for strong group cohesion and student progression towards more meaningful learning. Affirmative greetings like “hello” demonstrate recognition of peers’ social presence and their acceptance of each other as co-participants.

11. Cognitive presence

Exploration

Garrison and Anderson (2003) project exploration as a clear recognition of a complex problem and the quest for a solution. Students bewildered by quasi-academic puzzles saw Facebook as a “cool” habitat for exploring them and soliciting solutions. In the postings below a critical student questions the logic of lecturers’ procrastination in delivery lecture slides:

this is an IS course where technology should make life easier so why is it that all my courses have their slides on the LMS BEFORE the class and us, who are doing and information systems course don't have our slides on even a week AFTER the lecture... im trying to figure out what sense that makes? How can we follow lectures without something in front of us to look at? [Trish]
Facebook democratised communication by giving students the voice and agency to question inadequate departmental practices that perceivably undermined meaningful learning. Talk-back processes and transactional feedback afforded a perceivably democratic platform for academics to be accountable for their actions. In response to the aforementioned query, the lecturer expressed some reservations on uploading slides before a lecture:

_I have noted your concern. Lecturers have been advised to post slides on the LMS as soon as they can. However, there are several arguments around posting slides before lecture._

**Giving information**

Creating an informing framework is critical to the sustenance of a learning community. The population of the informing space with authentic intellectual resources activates meaningful interactions and triggers on-task behavior that leads to construction of knowledge. Yet the provision of intellectual resources should be complemented by information seeking, information giving and information retrieval skills that drive transformative learning. In the posting below, a knowledgeable peer responds to a student query on entrepreneurship opportunities in IS:

_some friends have done some research on possible functionalities of an ecommerce. You should be able to think in that direction. do some research on some e-commerce websites, integrate relevant functionalities in your own work. thats it...understand what entrepreneurship means and identify potential areas in IS where such opportunities can exists.....this topic is linked to innovations and creativity in IS._

The knowledgeable peer’s elaborate response demonstrates that Facebook was harnessed as a useful collaborative learning space for sharing ideas, perspectives and personal knowledge thus complementing classroom practice. This deliberative space also provided digital trail of student’s thought processes that enabled students to draw on peers’ ideas and critique in their explorative discovery processes.

The possibilities for creating and self-publishing of content are some of the hailed attributes of constructive disruptions. The interaction between Facebook participants is indicative of the benefits of mass intellectualty:

_i’m still not clear on what i should know […]things that came in the 5min quiz, i had read prior and thought that they were irrelevant, like the question about ERP._

The elaborate response below demonstrates the capacity of Social Media to focus attention of interactants and engage in collaborative knowledge construction:

_Enterprise Resource Planning are network-enabled business tools. ERP marks the current generation of resource planning and is a central system, which replaces “islands of information” with a single, packaged software solution that integrates all traditional enterprise management functions […]_

Reciprocal peer teaching and cooperative learning evolved through the dialogic interactions and diverse feedback loops. With increased academic scaffolding, students claimed ownership of the learning process, assumed responsibility for their learning, pushing their learning trajectory even higher.

**12. Teaching presence**

Assignment of tasks

Teaching presence is the adhesive that keeps academics and learners as a cohesive entity and allows all academic consultative processes to be task-driven and meaningful. It emphasises the organisation and design of the curriculum and learning materials and the assignment of academic tasks. The following discussion between the lecturer and student is indicative of teaching presence component-assignment of academic tasks:

_Hey, I kinda share the same problem. I thought we were to get into groups doing Literature reviews? What should we do? [Julian]_

The pedagogical role of learning design and the assignment of learning tasks is self evident in the lecturer’ feedback:
Hi guys in literature reviews: you need to read the work on that subject/topic you have been given....read textbooks, academic papers, journals etc in libraries or internet as long its is credible work. Write what you have found in your own words as well as your understanding in class and reference it properly [Lecturer].

In explaining a literature review, the lecturer articulates her expectations of students and connects classroom practice to students’ private study skills. The lecturer also rendered some guidance on student requests for extra lessons to ensure inclusive learning and avert differential empowerment. The lecturer-student conversation below is a typical example:

Hi, I don’t feel learn enough in tutorials, cause being only one tutor, not able to answer questions. In task 2, I didn’t actually know what to do in tutorial when they were suppose to help us use formulas. could we have another day for extra tutorial not compulsory [Laura]

It would be difficult to arrange for another class but will see what we can come up with. However, in case you have a problem, don’t hesitate to make an appointment with your Excel lecturer or me or ask your lecturer in the next class to repeat it [Lecturer]

Shaping constructive discourses

Constructive dialogic discourses revolved around interpretation of academic concepts and recruitment of feedback from the lecturer. Facilitating lecturer-student and student-peer interaction does not only activate student motivation, but heightens student involvement in task-oriented activities. The student-lecturer interaction below the lecturer differentiates information from data:

I don’t understand the difference between Data and Information [Phineas]

In response, the educator renders an example to clarify the distinction:

Data: The numbers 100 or 5%, completely out of context, are just pieces of data. Interest, principal, and interest rate, out of context, are not much more than data as each has multiple meanings which are context dependent.

Information: If I establish a bank savings account as the basis for context, then interest, principal, and interest rate become meaningful in that context with specific interpretations. Therefore, Principal is the amount of money, R100, in the savings account. Interest rate, 5%, is the factor used by the bank to compute interest on the principal.

Meaningful discourses necessitated the application of abstract concepts in real world contexts to improve student understanding and meaning making. This application of de-contextualized knowledge enabled students to make connections between prior knowledge and new knowledge and to transfer concepts learned across different contexts. Limited contact time often challenged academics not to explain complex concepts in depth resulting in student misconceptions and confusion:

I have been assigned topic 2.6 for the literature review but there is a problem. I can’t find information about importance of hardware standards and I have been looking for couple of days now [Terrence]

In a response, the lecturer elaborated on hardware’s practical application:

The primary considerations for any hardware configuration are: ease of connectivity to a given network; ease of connectivity to external systems and organizations; consistent performance of integrated components in our networked environment, successful in-house experience with the chosen product and configuration; serviceability by external hardware repair providers etc [Lecturer].

The elaborate explanations helped students to develop a deep understanding of concepts that were superficially discussed in lectures; the challenge was leveraging these interactions from information transmission towards constructive dialogue and knowledge construction.
13. Discussion
Constructive Disruptions

Networked learning

The disruptive innovation of appropriating Facebook for academic purposes fostered a democratic virtual classroom where academics and student roles were profoundly transformed in support of networked learning. While the mandate of academics as academic authorities remained significant, it was innovatively transformed to that of dialogue facilitators, information managers, knowledge brokers, and knowledge management consultants. These roles played out in their elaboration of concepts, handling of student critique on Faculty's inadequate course management practices, and validation of student opinions during collaborative dialogues. Social Media also constructively subverted traditional delivery mode by disintegrating classroom walls and opening up new knowledge centres beyond lecturers. As some scholars (Downes 2006, Siemens 2008) argue, Web 2.0 technologies are transforming higher education from a hierarchical teaching approach to a networked approach wider than a community of practice. Web 2.0 technologies enable the innovative transformation from an educational model structured around courses, regulated by universities using a ‘broadcasting’ model in an enclosed environment, to an adaptive model owned by individuals (Kop, 2008).

However, the aforementioned results were not always straightforward but rather fuzzy. In the domain of curricula design, knowledge validation and assessment procedures, academic boundaries were reinforced rather than relaxed. In spite of some semblance of peer-based collaboration in knowledge building, the majority of Facebook postings were lecturer directed. These findings support Czerniewz and Brown's (2010) view on the reinforcement of boundaries in academia involving academics' shaping of student experiences through the curriculum design, determination of teaching times and venues; task assessments and assessment criteria. Therefore, constructive disruptions were contingent and context driven-involving a push-pull relationship among pedagogical, learner, and technology variables.

Democratised communication

Constructive disruptions were also constituted in Facebook's liberalization of student communication with academics and mass intellectuality. Student deliberative democracy manifested in the diversity (intellectual, social, logistical) of queries handled on Facebook, which could not otherwise be addressed under the constrained lecture contacts. The multiple postings on Facebook resonates with student conception of Facebook as a "safe space" for posting those queries which academics would normally perceive as "unsophisticated," "ridiculous" or "naïve" in face-to-face contacts.

Hidden counter scripts

Critically, Facebook constituted an alternative, collapsed context for student launch of “hidden” counter scripts that contested educators’ hegemonic scripts. The dominant scripts included lecturers' conceivably inflexible assignment deadlines, poor design and assessments of quizzes, lecture venues changes, and procrastination in delivering lecture slides. Student critiqued academics for these shortcomings, including unimaginative, boring lectures and problematic course designs. This finding backs Liew’s (2010) report on how blogs offered backstage opportunities for students to joke, complain and slander academics and school authorities leading to public scrutiny and embarrassment. Blogs thus afforded students “digital hidden transcript” where they re-scripted hierarchical student-teacher relations through satirical portrayal of educators’ classroom practices (ibid). Therefore, Facebook created an alternative “Third space” (Gutierrez, 2008) for public articulation of personal agency and subverted perceived asymmetrical relations of power.

Social habitat for psycho-social and emotional comfort

Facebook also created a “safe' haven for the sharing of psycho-social and emotional support between students. Student expressed their anxieties about pending assignments, complex conceptualization expected of them, and challenges of meeting strict deadlines, and hence their requests for extra lessons. Learner voice and personal agency on Facebook contradict traditional lectures where
garrulous students’ hegemonic voices dominate discussions, and silence introverts, shy and less confident students. This finding consummates Conole and Alevizou’s (2010) finding that case study-based research into Web 2.0 tools affirms their positive influence on learners’ voice and renders invaluable insights on these Net savvy learners’ experiences and expectations of learning.

For academics, however questions, queries, and complaints rendered them an informal, reasonable proxy for making inferences about student grasp of difficult topics, concepts and issues. As Ng’ambi and Brown (2009) aptly reiterates, questions are representations of the search for knowledge, and embodied in questions is implicit knowledge about students’ current understanding. Facebook postings, therefore served as informal rubric for assessing of common student misconceptions and lack of understanding.

14. Constitution of community of inquiry

Social Presence

Learning community with collective identity

The Facebook environment generated an information repository that integrated personalized learning environments with collaborative networking. Public postings via walls and discussion board broadened academic networking while personal messages via inboxes served as props for personal reflection on content and self-regulation of learning. Honorific, inclusive pronouns like “we” and “us” resonated with student self identification as a cohesive networked community.

Asymmetry of Community of Inquiry components

Although all three dimensions of presence were represented in lecturer-student and peer-based interactions on Facebook, social presence component was more dominant than the other variables. While social presence is a pre-condition for successful cognitive presence, the fact that it was proportionately far higher than cognitive presence was regrettable. This signifies complexities in scaffolding collaborative discussions and academic networking to ensure deeper engagement levels. Facebook was supposed to be an exclusively creative space, in Punie & Ala-Mutka’s (2007) characterization, learning spaces that emphasize personalization, creativity and innovation in learning, as opposed to reproducing knowledge. Rather than reinforce teacher dominance in information provision, Facebook should have been a reflective space for bridging different learning forms (face-to-face live lecture streams, asynchronous and asynchronous mode), and different media (text messages, voblogs, audio recordings, graphics) to enrich student learning experiences.

Cognitive presence

The cognitive presence domain displayed limited salience of higher categories namely integration and resolution. The information exchange dominated the cognitive presence layer, with limited opportunities for deeper reflexive engagement with concepts, and connection between theory and practical issues. Although nascent attempts were made at drawing on theoretical concepts in constructing discourse during lecturer-student levels, there was a dearth of such constructions at peer-based collaboration level. As Garrison and Cleveland-Innes (2005) suggests, interaction in online learning environments should transcend social engagements and simple exchange of information to capture the qualitative dimensions of structured and systematic communication aimed at influencing critical and reflective thinking. The challenge in Web 2.0 collaborative environments is whether teachers are willing to embrace the promises of student empowerment at the peril of their own embarrassment. Arguably, by exposing teachers’ classroom practices to public scrutiny, students’ digital testimonials could heighten teachers’ sense of professional accountability (View, 2010).

Teaching presence

Much of teaching presence was linked to didactic teaching approaches which targeted student completion of tasks (assignments, elaboration of concepts, explanations of technical procedures in practical assignments) and not the facilitation of peer-based discourses. As Rourke and Kanuka (2009) contend, CoI suffers at the level of application because deep and meaningful learning does not occur as described in the framework as students are not engaged in the constituent processes.
proposed by the framework (cited in Annand, 2011). To the contrary, Web 2.0 technology-enabled pedagogical innovation requires transformation of teaching and learning processes, support for learner-centred learning approaches, group work and inquiry projects, interactive forms of learning that trigger reflective, deeper, participative learning, problem solving and creativity (European Commission, 2008).

15. Implications for pedagogy

Given that low-level components of cognitive and teaching presence dominated Facebook postings, educators' support of dialogic interaction and intellectual engagement was critical to student deep learning. Scaffolding of students necessitated their in-depth training in epistemological and conceptual development of knowledge. This training would embrace making logical connections between theoretical knowledge and its application in real world contexts. The academic dominance in knowledge production on Facebook buttresses Czerniewicz and Brown's (2010) view that ICTs are being appropriated to cement long-standing pedagogical roles rather than challenge them. Therefore, for technological innovation to play a more pivotal role in pedagogical change, academics should rethink its deployment in ways foster student critical thinking at epistemological and conceptual levels. A multi pronged strategy where question prompts are used to activate student search for new perspectives and ideas, where intellectual conversations merge based on multiple theoretical concepts, connections are made between existing and new concepts, and where concepts are applied in real world contexts is necessary.

If Facebook spaces can be reconstructed as student-regulated spaces, Punie and Ala-Mutka (2007) observes that they should enable reflexivity, allow learners to take a step back to reflect upon their own work and learning, hence enable connections to learning from one's personal context. Such a controllable environment demand academics provision of information prompts that activate students search for new information relating to specific concepts, lecturer provision of URLs to important websites and connecting student to experts on specific problem areas and concepts. More so, task design that demand student collaboration in clusters and academic tasks that require searching for information and immersion in experts' content (live lecture videos, articles, audio repositories, e-books) and intellectual dialogue is necessary.

While the Facebook learning environment rendered students freedom of expression and agency, there were challenges with regard information quality assurance. Therefore, educators should strike a logical balance between control of task design and assignment of learning activities, and student self-regulation and facilitation of their meaningful task completion. As Kop (2008) suggests, an understanding of how students learn is critical to good educational experience and sound teaching strategy as it allows teachers to relinquish control if and when appropriate and provide learners with additional choices, without them feeling overwhelmed by uncertainty about the new unknown to be learned.

16. Conclusion

The central thesis of this paper is that contemporary literature’s preoccupation with the potential negative consequences of Social Media disruptions constitutes an determinist view of technology that fails to adequately substantiate the complexity of meaningful technology-enhanced pedagogical delivery. This pessimism downplays opportunities for exploiting disruptive technologies to induce tremendous changes to pedagogical delivery by instituting student-regulated, collaborative learning environments. Such environments present opportunities for student exercise of deliberative democracy, create “hidden” counter scripts that contest academics’ hegemonic scripts, and generate alternative, networked information repositories for student deep learning. Disruptive technologies also demonstrate capacity to provide less threatening, talk-back processes for less confident students, and complement learning in traditional spaces (lectures, LMS).

For academics, Social Media technology afforded the pre-empting of frivolous, unsophisticated questions from academically challenged students, and rendered diagnostic platform for assessing student misconceptions about learned content. These provisions potentially enhanced academics’ ability to modify and adjust their teaching styles and foreground complex concepts and issues. Lastly, the Social Media learning environment created a networked community of inquiry that afforded academics and students a collective digital identity and a “cosy” habitat for student expression of their academic anxieties, fragilities and learning challenges.
References


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Can Online Peer Review Assignments Replace Essays in Third Year University Courses? And if so, What are the Challenges?

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Abstract: Essays are a traditional component of the course requirements in many post-secondary courses. However, the practical and pedagogical disadvantages of essays are significant. These include the increasing ease with which essays can be plagiarized, the lack of peer involvement in the traditional essay submission and feedback process, the usual lack of meaningful instructor-student intellectual discourse in the essay development and feedback process, and the inability to include hyperlinks and non-text media in essays submitted on paper. It is suggested that as instructors make the transition from traditional to blended/online instruction, they consider jettisoning the traditional essay requirement and replace it with some form of “assignment essay/peer review” system such as the one described. Contemporary Learning Management Systems facilitate peer review and peer assessment approaches in ways that were not available in traditional offline education. This paper describes and discusses an online assignment system utilizing peer commentaries that addresses many of the shortcomings of these traditional essay requirement. The system is modeled after peer commentary academic journals such as Behavioral and Brain Sciences and Current Anthropology. This system has successfully been used as a substitute for the traditional essay requirement in a number of third year psychology course sections platformed on both Moodle and Blackboard. The advantages, challenges and practicalities of instituting, managing and grading such peer-reviewed assignments are outlined, and the benefits of the system in terms of student engagement, intellectual modeling, and learning community enhancement are discussed. The peer reviewed assignment system is discussed in the context of recent research indicating some advantages of blended learning approaches compared to traditional approaches. Criticisms of peer feedback approaches are examined, and instructors are encouraged to provide students with detailed instructions and criteria regarding the peer review process. It is hoped that the discussion will be particularly useful to instructors who are in the process of moving from traditional face-to-face course context to the blended/online education environment.

Keywords: peer assessment; peer review; blended learning; LMS; essays

1. Introduction

The ongoing transformation of post-secondary education from traditional face-to-face models to blended and online learning environments provides instructors with a valuable opportunity to examine traditional methods of assessing student learning, and consider replacing or augmenting them with assignments and assessment methods that take advantage of the online environment’s strengths and possibilities.

One such traditional assessment technique is the essay.

2. Disadvantages of essays

Essays (or term papers: I will use the two terms synonymously for the purposes of this paper) have long been a standard requirement of many post-secondary courses, yet their usefulness as a learning aid is questionable, and there are many practical disadvantages to their use (e.g., Battaglia 2008).

In the traditional essay system, students generally submit their essays to the course instructor at or near the end of term. The essays are usually (and often laboriously) marked by the instructor, who often appends detailed comments to the essays, such as suggestions for improvements, queries about unclear passages and commendations regarding incisive points, in addition to a final grade on the essay.

The instructor then usually returns the essays to the students (or leave them to be picked up by the students), often several days or sometimes weeks after the end of classes.

One disadvantage to essays is the “private” nature of the traditional essay submission and grading process. The only people involved in the transaction are the student and instructor. This “privacy” runs counter to the ideally public nature of both the education process, and of accepted scientific and scholarly discourse. It does not facilitate students benefitting from the learning experienced by other
students in researching and writing their essays, and it does not allow students to augment the learning of their peers by critiquing, commenting on or expanding upon their essays.

Moreover, the privacy inherent in the traditional essay system fails to leverage the social energy that is activated when learning is more public and social. Post-secondary students are often young adults who are intensely social and are very responsive to the attention, evaluations and commentary of their peers (as demonstrated in the resounding interest in “social media” in this age group). However, the traditional essay system forgoes the learning motivation unleashed in a more public, peer-oriented forum for the “closed system” of the instructor-student dyad.

A second disadvantage of the traditional essay system is that often the carefully constructed instructor feedback on the essay is not processed or even read by the students. Many students apparently read the instructor’s feedback in only the most cursory fashion, or not at all. The latter is necessarily the case in the many instances where students fail to pick up their marked essays.

Another growing disadvantage of the essay system is the ease of plagiarism ushered in by internet and related digital information storage and transfer technologies. Although there are a variety of anti-plagiarism services and techniques available, none are fool-proof, and the variety of digital essay sources available provides a daunting problem for the classic essay system.

Other disadvantages for the traditional essay system include the substantial amount of paper used every year to provide the medium for the transmission of essays, as well as the inconvenience of delivering, receiving, filing, transporting, storing and returning paper-based essays.

3. Peer reviewed assignments as essay replacements

I wanted to institute a system of online major “assignments” in my third year university courses to replace the traditional essay system that I had been using. Although essays are subject to the problems reviewed above, they do provide students with the opportunity for a deeper level of analysis and, potentially, knowledge of a topic, then is afforded by preparing for examinations or quizzes.

3.1 The “assignment essay”

The “assignment essay” described by Scouller (1998) provides many of the learning advantages of the essay while avoiding some of its problems. Biggs (1988) defines the “assignment essay” as “… a response in continuous prose to a specific question, for which the student has received advance notice, which is to be prepared in the student’s own time, and which is to be subject to some kind of summative evaluation (P. 185)”. I wanted to combine “assignment essays” with a peer review system in order to provide some of the learning advantages of the essay in an online learning environment.

3.2 The peer review journal as a model for scholarly discourse (and maybe online education?)

In searching for an alternative to essays for third year psychology classes, I was aware of and admired the journal Behavioral and Brain Sciences, which uses a “Peer Review” model of publication, where “target articles” are posted online, and qualified commentators (usually academic experts on the topic explored in the target article) are invited to make short commentaries on the target articles. The authors of the target articles then respond to the commentaries.

The peer review model of scholarly discourse is attractive for a number of reasons. (Harnad, 1979). It facilitates the reactions of expert peers simultaneously with the publication of an important theoretical or empirical reviews, and provides the paper’s authors with a public forum to respond to the criticisms and comments of their work. This system shortens the usual latency between scholarly publication and peer response, and also adds the “energy” of public, transparent discourse among groups of scholars with an interest in a particular topic.

3.3 Online peer review systems

Peer review systems have been used and discussed for some time. (Bostock, 2000; Brown, Race and Rust, 1995; Race, 1998; Wolfe 2004). Student peer review systems are sometimes subsumed under the broader category of “peer feedback” approaches (Nilson, 2003), together with “peer assessment” approaches. Generally speaking, peer assessment approaches involve suggesting a mark or grade to
a peer’s work, while peer review approaches do not. The system described in this paper is therefore best described as a “peer review” approach, as students were not asked to assign marks or grades to their peers.

Wen and Tsai (2006) reported that the students they surveyed were generally positive toward peer assessment systems, with the caveat that they preferred that the peer assessment component of their mark be a relatively small percentage of the course total.

In the peer review system described in this paper, students were not asked to assign marks or grades to their peers. The “assignment essay”, peer reviews, and response to peer reviews contributed 15% of the final grade in the course: 10% for the assignment essay; 2% of each of two peer commentaries; 1% for the response to peer commentaries.

4. The peer reviewed assignment system: Steps in implementing in third year post-secondary courses

The peer reviewed assignment system described below is designed to be a replacement for the essay requirement in third year university courses. The steps involved in implementing the system are described below. Although many of these details will be unsurprising to instructors familiar with peer feedback systems, they are aimed more at instructors who may be moving from a traditional F2F context into the blended or online environments.

4.1 Step 1: Provide students with list of possible assignment topics

I provide students with a list of 40 - 60 possible “Assignment” topics (example from Blackboard given in Figure 1 below, but I am currently using Moodle for the same peer review assignment system).

Figure 1: List of assignment topics

An advantage of supplying the list of topics, instead of having students choose their own, is that this deters plagiarism. Students cannot find an assignment topic discussion online, and then ask to submit that topic as their assignment. Assignment topics can be tailored to avoid standard discussions found on the internet by adding specific or “non-standard” subquestions.

For instance, for both Topics 16 and 17 in Figure 1, I added a sub-question involving “… why is there such wide variability in … [artistic ability/musical ability]”. These “individual differences” aspects are not covered in many “standard” discussions of these topics, and therefore students are expected to apply their knowledge of evolutionary principles and findings from the course and other sources to those aspects of the topic, rather than simply find the answer in an online passage or source.

Students can suggest assignment topics other than the ones supplied by the instructor, but these require a discussion with the instructor to determine the student’s reasons for wishing to do a “non-
posted" topic. Part of the purpose of this discussion is to attempt to determine whether the student’s interest in the “non-posted” topic is genuine, and does not appear to be simply a convenient “canned” discussion that was found on the internet.

The majority of student are happy to choose one of the posted assignment topics, and each class perhaps two or three students ask to discuss topics other than the ones posted, and these requests are usually granted, after the discussion outlined above.

4.2 Step 2: Have students choose their topics midway through the term

Some of the assignment topics maybe seen as more desirable than others, so it is important that the system for students “claiming” their topics is fair and gives all students an equal chance to claim the topic of their choice.

Figure 2 (below) provides the directions given to students regarding “claiming” their topics.

![Figure 2](image-url)

**Figure 2: Directions for claiming assignment topics**

For the “topic claiming” system to work well, students need to be very clear about when and how they claim their topics, and the directions above (which are discussed in class, posted online, and emailed to the students) is constructed to provide such clarity. Student have reported few problems with claiming their topics in this system with these directions, and any issues have been easily addressed.

4.3 Step 3: Provide detailed directions regarding every aspect of the peer assignment and commentary system

Because most students are unfamiliar with the peer review assignment system, it is necessary to provide them with detailed, specific instructions that outline every aspect of what they are expected to do to complete their peer reviewed assignment. Detailed and specific instructions are of course good
pedagogical practice in almost all educational environments, but they are particularly important when students are asked to complete a relatively novel assignment such as this.

To this end, students are provided with detailed (20 page, with 14 pages of appendices) instructions outlining every aspect of the assignment, including, deadlines, formatting, evaluation criteria, and late penalties. See Figure 3 for the topics covered in the assignment instructions, and Figure 4 for the Assignment, Peer Commentaries and Response to Peer Commentaries deadlines. The Assignment deadline is several weeks before the end of term, to allow time for students to submit commentaries on their peer’s assignments, and to prepare their responses to the commentaries.

Students are also provided with links to sample Behavioral and Brain Science articles as models of “target” articles, peer commentaries and responses.

![Figure 3: Peer review assignment instructions: Table of contents](image)

![Figure 4: Assignment, peer commentaries and response to peer commentaries deadlines](image)

4.4 Step 4: Students submit their “assignments” online

As the assignments are submitted online (via a Learning Management System such as Blackboard or Moodle) no paper submission is required.
Students’ submitted assignments are visible to all students in the class, and they are encouraged to view as many as they can (See Figures 5 and 6).

**Figure 5:** Assignment topic with two students assignment submissions posted

**Figure 6:** Posted assignment (excerpt) visible to all students in the class

Evolutionary Medicine

Evolutionary medicine integrates medicine with evolutionary biology. As opposed to a traditional medical approach, which focuses on determining the proximate reasons for disease, evolutionary medicine, also known as Darwinian medicine, addresses the evolutionary reasons for medical conditions. The natural history of our species plays a fundamental role in evolutionary medicine, attributing a new form of analysis for human disorders and degenerative disease. Charles Darwin, whom the term “Darwinian” is coined from, contributed the theory of natural selection, which explains the adaptation of species. Natural selection is not thought of as a model for creating perfection. Rather, slight quantitative changes are brought about, allowing species to adapt to their various environments. Consequently, any evolving lineage is subject to acquiring functionally arbitrary and sometimes maladaptive features through such slowly formed adaptations. The aim of evolutionary medicine is to encourage biomedical research to consider the evolutionary history of our species and the organisms that afflict it. More specifically, evolutionary medicine seeks to explain disease using an adaptationist approach, which uses a set of methods in the evolutionary sciences to distinguish the products of adaptation from traits that arise through other processes. Examples of such adaptations include the evolution of pathogens, the evolved responses that aid in human rehabilitation and recuperation from infection, injuries, and immunity, as well as contemporary human issues such as diet, life expectancy, and hygiene.

1. Pathogens: Virulence and Resistance

The origin of pathogens was one of the original tenants of evolutionary medicine. The adaptation of bacteria and other pathogens play a central role, as this process explains several essential issues of medical concern. One such issue, being that of pathogen virulence, seeks to explain the difference in pathogen fitness in organisms. Selection on pathogens tends to favor an associated
4.5 Step 5: Students assigned to comment on their peers assignments

I randomly assign students to comment on one of their peers’ assignments (Figure 7). They select one assignment of their own choosing to comment on.

![Figure 7: List of assigned commentaries](image)

4.6 Step 6: Students respond to commentaries

![Figure 8: Example of completed assignment with two commentators and student's response to commentators](image)

![Figure 9: Sample commentary](image)
4.7 Step 7: Marks are assigned to assignments, commentaries and responses

After the commentaries and responses are completed, I review each student’s assignment submission, commentaries and responses and give them a mark out of 12 or 15 for the entire assignment “package”, based on the criteria described in the Assignment instructions.

So I would characterize this system as more of a “peer review” system than a “peer assessment” system, as students are not required to grade their peers.

However it retains almost all of the benefits of peer assessment (Bostock, 2000) without the drawbacks of requiring students to assign a grade or mark to their peers.

5. Discussion

5.1 Online peer review assignments and the blended learning “advantage”

One of the advantages of the described peer review system is that, as it necessarily takes place in a blended learning context, it potentially accesses the pedagogical resources available in the online environment. Means, Toyama, Murphy, Bakia, and Jones (2009) conducted a meta-analysis that assessed the effectiveness of blended instruction as compared to both traditional face-to-face, and “online-only” instruction. One of their general conclusions was that students in blended courses tended to demonstrate superior learning than students in traditional face-to-face courses. This analysis provides some empirical reassurance that moving traditional components of courses, such as the “formal writing/essay” component into the blended learning environment, may indeed have the potential to increase the learning benefit of these assignments in consistent and measurable ways.

Means et al (2009) suggest that many of the learning benefits of blended versus traditional courses appear to be due to the fact that online learning tends to give students more control of their learning activities and that “manipulations that trigger learner activity or learner reflection and self-monitoring of understanding are effective when students pursue online learning as individuals”. It would seem likely that peer review systems such as the one outlined here might indeed lead to greater student reflection on their topics; partly because the expanded “audience” for their work may lead to greater care and diligence in the preparation of their assignments. Similarly, the feedback provided by their peers, as well as the required formal response to the feedback, might be useful in developing the increased intellectual “self-monitoring” that is one of the goals of the “cognitive apprenticeship” inherent in most advanced post-secondary courses.
Means et al (2009) also point out that ultimately, perhaps the most important factor in the observed advantage of blended instruction appears to derive from the greater "time on task" that the online environment facilitates and, in some cases, promotes. This suggests that one of the challenges for instructors designing and delivering online-based assigned essay review systems is to include requirements or motivations in the guidelines and in-class discussion of the peer review system that serve to increase the productive time and thought that students spend on their assignments. The described system does includes several such features. For instance in the traditional essay system, there is just one “assessment/feedback” point: at the end of the term, when the student submits the essay and the instructor marks and returns it.

By contrast, the described peer review system involves at least four separate intellectual “products” that have to be submitted, and that lead in turn to further feedback and/or reflection: the assignment itself, two peer reviews and the response to the peer review. The construction of each “product” involves applying the concepts learned in the course, as well as requiring the student’s general critical, analytic, synthesizing, research and writing abilities. It is likely that the repeated, iterative application of these valuable intellectual skills is more useful in promoting desired higher-order learning outcomes in a course than the “single product” traditional essay system.

5.2 The differing goals of peer assessment

Gielen et al (2011) point out that peer assessment systems can have at least five distinctive goals. They are social control, assessment tool, learning tool, learning how-to-assess tool, and active participant tool. The peer review system presented in this paper focuses on the “learning tool” and “active participant tool” goals. Gielen et al (2011) suggest that reasons that peer assessment may be particularly effective as a learning tool include the fact that peers are “on the same wavelength” and share some of the same discourse templates. These shared learning schemas likely provide advantages in feedback appropriateness and relevance compared to feedback from instructors.

The system described in this paper also focuses on the benefits of peer review for increasing the active participation of students. Gielen et al (2011) discuss the “emancipatory” effect that including a peer review component can have on student learning and self-perception as apprenticing scholars. These effects include the development of student intellectual autonomy and contributing to the development of students as lifelong learners.

Kollar and Fischer (2010) in a review that focussed on the cognitive processes underlying the learning benefits of peer assessment, is that a crucial aspect of effective peer assessment (but one that is often overlooked) is that for peer assessment to facilitate learning, the peer feedback must be processed and acted upon by the learner. It is therefore not enough to simply provide an opportunity for students to review and provide feedback for their peers. It is equally important that students are required to respond to the their peers’s assessments. The system described here fulfills this criterion by requiring students to post a “response” to the comments of their peer “commenters”. In line with the model outlined by Kollar and Fischer, this response serves as a cognitive capstone to the peer review and response process, and provides a sense of task closure that serves as an affective reinforcement to the completion of the assignment.

5.3 Online peer review assignments: Facilitating the learning community

Beebe, Vonderwell and Boboc (2010), in a discussion of issues involved in transferring assessment practices from offline to online environments, emphasize the necessity of carefully considering the differences between the online and F2F class environments in designing assessments in online and blended courses. A particular issue that they raise is the difficulty in encouraging the “community of learners” in the online environment, and suggest that instructors should search for assessment methods that are “community-friendly” rather than falling back on the “individualistic” strategies carried over from the traditional offline classrooms.

I would suggest that the essay requirement is one such “community-unfriendly” assessment tool that instructors would benefit from jettisoning in moving to the online/blended course environment, and that assignment-based peer feedback systems are far more likely to encouraging the kind of active, stimulating, and “public” learning community that most instructors and students desire.
5.4 Two peers are better than one

In the peer review system described in this paper, each student generally ends up with feedback from at least two peers. Some evidence that it is desirable to have students receive feedback from more than one peer is provided by Reily, Finnerty and Terveen (2009) who found that aggregating peer reviews for computing assignments improved the accuracy of the review score, and that the aggregated scores were generally similar to those provided by an experienced teaching assistant. Although the system described here did not involve assigning scores to peers’ work, this finding implies that multiple reviews increase the chance that the feedback received by students will be valuable.

5.5 Critiques of peer feedback approaches

Nilson (2003) critiques peer feedback approaches as having questionable validity, reliability and accuracy, and of being potentially too “...uncritical, superficial, vague and content-focused... (p.34)”. Nilson suggests a number of remedies to address these problems, including avoiding opinion-oriented assessments, and providing detailed and specific guidelines to students regarding what questions they should ask themselves about their peer’s work, and what specific criteria they should apply in assessing or reviewing the work.

Nilson’s suggestions are very useful, and are should be considered prior to designing and implementing a peer assessment or review system, whether it is in an online context or not. Nilson concludes that, if the peer system addresses some of the potential pitfalls that she outlines, peer feedback can be very useful in facilitating student learning, and that experience with giving and receiving feedback from peers is a valuable “life skill” that can be developed in classes that use peer feedback systems. Similarly, Orsmond and Merry (1996) reported that where assessment criteria were detailed and specific, student and instructor assessments of a biology poster project were similar.

5.6 Peer feedback approaches: Quality and planning issues

Ploegh, Tillema and Segers (2009) suggest several criteria that can be used to evaluate the quality of peer assessment systems. They include authenticity, transparency and fairness. Authenticity refers to the extent to which the peer system is similar to the “real world” environment where the learning is expected to be applied. Insofar as the present system is explicitly modelled on “real world” academic peer commentary journal where professional scholars present and critique their findings, it meets this criterion well.

The quality criterion of transparency refers to the requirement that the goals, process and assessment criteria be completely clear to the students. This criteria is well addressed by the extensively detailed guidelines and examples provided to the students, as well as by the fact that all the students submissions, commentary and responses are visible online to all students in the course. This is in marked contrast to the highly “opaque” nature of the traditionally essay system.

The fairness aspect of the present system is facilitated partly by the transparency outlined above, and also by the fact that students have a great deal of choice in this system. They can choose to do one of the suggested “questions” or they can suggest one themselves. They can choose one of the “target” articles that they would like to critique. Students generally believe that the more control that they have of their academic “product”, the fairer the system is. Furthermore, this system removes verbal skills, extroversion, and appearance as factors that can provide unwanted “halo” effects: for instance, in classroom based presentations. Creating an online exchange of ideas and critiques “levels the playing field” in regards to these extraneous factors, and provides a forum for student to be evaluated based on well-considered analysis and research, rather than on impromptu classroom participation.

Topping (2009) provides a list of “planning issues” for instructors and course designers to consider in designing and implementing peer feedback systems. Experience with the peer review system described here suggest that three of the most important such issues are:

- “Clarify purpose, rationale, expectations and acceptability with all stakeholders”. Of course, the most important stakeholders in this system are the students, and it very important that the instructor’s reasons for using the peer review system instead of the standard essay system are
communicated clearly, early and often. Such communication primes the students to the anticipated advantages of the system, and helps them move past any "novelty angst".

- “Provide training, examples and practice”. A number of studies (e.g. van Zundert, Sluijsmans and van Merrienboer, 2010) have provided evidence that the effectiveness and learning benefits of peer review systems improves substantially with increased training and practice. Instructors should try to provide these training and practice opportunities both the in-class, face-to-face environment, and also online.

- “Provide guidelines, checklists or other tangible scaffolding”. Students always appreciate detailed and clear directions, but this is particularly important with a relatively novel (to most students) course component such as this.

6. Conclusions

Bostock (2000) summarizing Brown, Rust and Gibbs (1996), Race (1998), and others, lists the following potential advantages of peer assessments for students.

- Gives a sense of ownership of the assessment process, improving motivation
- Encourages students to take responsibility for their own learning, developing them as autonomous learners
- Treats assessment as part of learning, so that mistakes are opportunities rather than failures
- Practises the transferable skills needed for life-long learning, especially evaluation skills
- Uses external evaluation to provide a model for internal self-assessment of a student's own learning (metacognition)
- Encourages deep rather than surface learning

My experience with the peer review system described in this paper leads me to advance some further potential advantages of online peer review and assessment systems for students.

- Can make the learning process more transparent, and visible
- Makes learning more social, and thereby recruits students’ sociability motivations to the learning process
- Helps transform the class to a learning community, rather than a collection of individuals learning
- Takes advantages of the knowledge and critical skills of the students as powerful resources for their peers
- Learning from your peers can be more interesting and fun than learning from your instructor

Online technology provides tools and models that facilitate and encourage the use of well-designed peer feedback systems. As more instructors and students enter the blended learning environments that constitute the future of education, online peer review assignment systems such as the one described in this paper are likely to play an important role in post-secondary courses, and evidence is accumulating that these approaches are likely to increase student motivation, learning and enjoyment.

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