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The papers contained in this issue are the result of the 13th European Conference on e-Learning, ECEL 2014, held at Aalborg University, Copenhagen, Denmark on the 30-31, October, 2014. These papers represent the selective best from the proceedings.

Massive open online courses have been at the forefront of discussion in academic and business circles for quite a few years. Given that the latest technologies allow scalable ways to deliver the content, allow discussions among participants and track student progress, challenges have included assessing student progress and providing needed feedback to promote and secure student achievement. In their paper, Wilfried Admraal, Bart Heusman and Olga Pilli approach the topic of MOOCs from the perspective of how self- and peer assessment might offer promising solutions for scaling the grading of complex assignments in courses with thousands of students. They also explore if intermediate assessments might engage more students in participating in the course. Their study is predicated on three Leiden University MOOCs built on the Coursera platform.

I was most excited to read Edilson Arenas’ study on Affordances of Learning Technologies in Higher Education Multicultural Environments. Since I work for a multicultural institution of higher education, this investigation has potential for practical application at my own institution. This study argues that part of the problem of lackluster empirical evidence on the benefits of using technologies to improve learning is either the content or teacher-centric perspective of these frameworks. Thus, the need to explore the benefits from a more student-centric perspective. Further, the study draws on an ethnographic study of culturally diverse computing students and teachers within learning environments that blend online and face-to-face pedagogies. Arenas looks at aspects of teaching and learning such as (1) the nature of the subject and, (2) students’ learning styles of intellectual inquiry. Biglan’s classic model on academic disciplines and Kolb’s learning styles theory as used to provide context to Arenas’ hypothesis. The results are impressive and can be applied in a range of institutions.

Zwelijongile Gaylard Baleni provides enlightenment on Online Formative Assessment in Higher Education: Its Pros and Cons. This is a topic frequently explored and discussed in teaching and learning circles. Unearthing the impact of assessments in online settings is the focus of this investigation, especially formative assessments. The author used a missed method questionnaire on formative assessment with the primary focus on how formative assessment within online contexts operates. Multiple strategies for formative assessment were deployed dependent on such online tools as discussion forums and objective tests. Some of the most noticeable benefits consisted of improvement of student commitment, speedier feedback, enhanced flexibility around time and place of taking the assessment task and importance in the procedure for students and professors also benefited with less grading time. A savings on administrative costs was also realized. The findings and final analysis bore out that effective online formative assessment is an effective methodology in a student-centric approach. The paper is a story well told and worthy of continued focus on the encouraging results with low achievers.

It takes a Community to Develop a Teacher: Testing a New Teacher Education Model for Promoting ICT in Classroom Teaching Practices in Chile by Paula Charbonneau-Gowdy provides a fascinating subject. The paper adds to an emerging and needed dialogue on best practices in teacher education for preparing future teachers to use technology to promote grounded theory based practices in their classrooms. The case study was conducted over 12 months at a private university in Childe. Charbonneau-Gowdy asked the intriguing questions: (1) Do innovative technology-infused courses serve to enable beginning teacher participants to shed their traditional passive, rather narrow mindsets to adopt identities of effective, 21st century teachers; and, (2) Do opportunities to use various innovative technologies for learning have an influence on pedagogies teachers utilize in their teaching practices? The results are interesting and prove to be innovative and potentially game changing.

Using MOOCs to explore alternate pathways to traditional degrees is a frequent topic under discussion in contemporary higher education circles. Recently, several institutions have incorporated MOOCs into online course offerings leading to earning a MBA degree. In their paper, authors Rachel Fitzgerald, Maggie Anderson and Ross Thompson set out to consider recurring themes in the literature in the context of the design and delivery of a MBA which utilizes MOOCs in the schematic. The authors offer insight into incorporating MOOCs’
objectives with insuring quality and standards. Moreover, the paper explores options for sustaining the model and further empirical research.

A novel approach to achieving buy-in from higher education professors in the use of digital tools in their teaching practice is offered by Sue Greener and Craig Wakefield. Their study on developing confidence in the use of digital tools in teaching hypothesizes that by offering instructors the simple incentive of the use of mobile devices, they will more readily adopt new practices in the classroom. Their project was staged in three parts: (1) Presenting student feedback from courses taught by the subjects; (2) Surveying instructor opinions on the impact of the devices after issuance; and (3) Select interviews which focused on results of questionnaires. Stay tuned for the results which confirmed digital confidence issues and the pedagogical reasoning for integrating technologies.

Here’s a different topical presentation on The Scoring of Matching Questions Tests; A Closer Look by Antonín Jančařík and Yvona Kostelecká. While most contemporary educators are familiar with the mechanics and capabilities of electronic testing, this paper attempts to identify how the types of questions used in a test can affect student results on such tests expressed as test scores. The authors demonstrate how the number of distractors included in a question influences the overall test score. The results bear out that these types of assignments are of very little consequence if the end goal is to rank students or delineate between excellent performing students. Two methods of rectification of data obtained from tests made up of closed questions were used in the analysis. Further research using this summary outcome would be useful to obtain additional significance on electronic assessments.

Signe Schack Noesgaard and Rikke Ørngreen examined closely, The Effectiveness of e-Learning: An Explorative and Integrative Review of the Definitions, Methodologies and Factors that Promote e-Learning Effectiveness. These authors took a different approach of examining the effectiveness of e-Learning defined? How is the effectiveness of e-Learning measure? What makes e-Learning solutions effective? Notwithstanding, the authors not only found 19 distinctive ways to define effectiveness, but also how the use of the fulfillment of pre-defined learning objectives affect outcomes. Further, this paper deconstructs if e-Learning and traditional face-to-face learning should be gauged using exact definition of effectiveness. This paper provides timely and worthwhile information to the ongoing debate among traditionalists and futurists in the education arena.

Along the oft discussed theme of assessing outcomes in the electronic delivery of teaching and learning, Birgette Holm Sorensen and Karin Tweddell Levinsen explore Powerful Practices in Digital Learning Processes. The paper utilizes two empirical research studies focusing on learning design frameworks involving student agency and participation in digital production across subjects and disciplines. Focus of the unfinished study resides with preliminary evidence that the inaction between student-formulated requirements/learning objectives and the various forms of formative evaluations. Another finding was that students voluntarily initiate formative evaluations practices in their learning design. It is interesting to note that this study opens a new range of research interests.

The final study in this edition was collaboratively written by Saraswathy Thurairaj, Er Pek Hoon, Swaggata Sinha Roy and Pok Wei Fong. The authors very timely investigated, Reflections of Students’ language Usage in Social Networking Sites: Making or Marring Academic English. This topic is one of contemporary concern and philosophical discussion. Considering that social networking is so integral as a form of communication on the global landscape, the effects of the language use on teaching and learning is significant. Descriptive statistical method was used to analyze data collected from questionnaires. The findings exhibited that frequency in the use of short text messaging did not severely affect the English language proficiency of participants. These findings advance the body of literature on the influences of social media on language. Promoting further research on this topic would be a beneficial result of the study.

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Assessment in Massive Open Online Courses

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Abstract: Open online distance learning in higher education has quickly gained popularity, expanded, and evolved, with Massive Open Online Courses (MOOCs) as the most recent development. New web technologies allow for scalable ways to deliver video lecture content, implement social forums and track student progress in MOOCs. However, we remain limited in our ability to assess complex and open-ended student assignments. In this paper, we present a study on various forms of assessment and their relationship with the final exam score. In general, the reliability of both the self-assessments and the peer assessments was high. Based on low correlations with final exam grades as well as with other assessment forms, we conclude that self-assessments might not be a valid way to assess students' performance in MOOCs. Yet the weekly quizzes and peer assessment significantly explained differences in students' final exam scores, with one of the weekly quizzes as the strongest explanatory variable. We suggest that both self-assessment and peer assessment would better be used as assessment for learning instead of assessment of learning. Future research on MOOCs implies a reconceptualization of education variables, including the role of assessment of students' achievements.

Keywords: MOOC; Open Online Learning; Higher education; Assessment; Peer assessment; Self-assessment; Quiz

1. Introduction

In recent years, free access has been provided to content which previously had a price: searches, software, music and references, to name but a few. Access to the Internet and broadband has increased rapidly and huge growth in mobile connectivity has brought online content and interaction to a global audience. At the same time, open online distance learning in higher education has quickly gained popularity, expanded, and evolved. Recently, Massive Open Online Courses (MOOCs) appear to be a significant force within higher education. However, while new web technologies allow for scalable ways to deliver video lecture content, implement social forums and track student progress, we remain limited in our ability to evaluate and give feedback for complex and often open-ended student assignments. Self- and peer assessment might offer promising solutions that can scale the grading of complex assignments in courses with thousands of students. Moreover, intermediate assessments might engage more students with participating in a course. In this study, we provide insights into various forms of assessment that are applied in three Leiden University MOOCs in the Coursera platform.

2. Massive Open Online Courses (MOOCs)

A typical MOOC of 2014 might take place over 4 to 10 weeks. Students, on average, dedicate two to six hours a week to the course. Materials are consumed in diminishing volumes throughout the MOOC as many learners' commitment wanes. Course applicants can be numbered in the tens of thousands, while those who complete and obtain certificates are usually numbered in the hundreds. As in regular higher education, the value of a MOOC for student learning highly depends on how learning processes are facilitated, stimulated and assessed.

The most influential categorization of MOOC pedagogy relates to the notion that there are two main kinds of MOOCs, each of which determines a particular pedagogical approach: the connectivist or cMOOC, driven by pedagogical principles of social learning, and the institutionally-focused xMOOC, reliant on video-lecture content and automated assessment. Table 1 indicates the basic differences between cMOOCs and xMOOCs.

2.1 cMOOC

Connectivist MOOCs (cMOOCs) are directed by explicit principles of connectivism: autonomy, diversity, openness and interactivity (Bell 2010), and it is expected to be hosted by using free social network sites, wikis, and blogs (Rodriguez 2013). Four significant design principles of cMOOCs are generally acknowledged (Bates, 2014; Kop, 2011):

- Autonomy of the learner: Learners choose what content or skills they wish to learn, which makes learning personal without a formal curriculum
- Diversity: Learners use various tools and content and they differ in knowledge levels
- Interactivity: Learners collaborate, co-operate and communicate, resulting in emergent knowledge
- Openness: Learners have free access to content, activities and assessment

PLENK2010 (Personal Learning Environments, Networks, and Knowledge), CCK 08, 09, 11 (Connectivism and Connective Knowledge), MobiMOOC 2010 (Mobile Learning) and EduMOOC (ONLINE Learning today and tomorrow courses) are the main examples of cMOOCs (Ebben and Murphy 2014; Kop 2011; Rodriguez 2012).

2.2 xMOOC

xMOOCs are characterised by the step by step learning, breaking down the content into small steps, limited feedback and interaction, pre-determined office-hours for students questions, and criterion-referenced based assessment approaches (Ebben and Murphy 2014). The xMOOCs follow the similar course design model of many of the on-campus higher education courses. The design of the courses unlike the cMOOCs is based on linear, content-based and objective-oriented learning paths. xMOOCs present the content of the course with a list of topics, readings, and small lecture videos. Students are assessed through a combination of quizzes, assignments and final exams and the format of the exam is mostly short-answer or multiple-choice questions. The most popular way of presenting course material is by pre-recorded video lectures which are typically between 3 to 15 minutes long (Bulfin, Pangrazio and Selwyn 2014; Hew and Cheung 2014). Udacity’s CS101 and Coursera’s Artificial Intelligence are well-known xMOOCs, which deliver online content from the instructors of top-ranked universities.

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Table 1. xMOOCs vs. cMOOCs

<table>
<thead>
<tr>
<th>Basic Features</th>
<th>xMOOCs</th>
<th>cMOOCs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning theories</td>
<td>Cognitive-behaviorist</td>
<td>Networking-connectivist</td>
</tr>
<tr>
<td>Teaching approach</td>
<td>Objective-oriented</td>
<td>Construction-oriented</td>
</tr>
<tr>
<td>Learning approach</td>
<td>Transfer of information</td>
<td>Sharing of knowledge between participants</td>
</tr>
<tr>
<td>Interaction</td>
<td>Limited interaction</td>
<td>Student-student, student-content, and student-instructor</td>
</tr>
<tr>
<td>Student role</td>
<td>Receivers, follow the instructions in video-based format, complete the assignments, quizzes and exams</td>
<td>Creators, contributors through blog posts, tweets, or discussion forms</td>
</tr>
<tr>
<td>Teacher role</td>
<td>The authority who is responsible to create the content, assignments, quizzes and exams deliver the lesson</td>
<td>Co-learner, create content and shape goals by working collaboratively with other learners</td>
</tr>
<tr>
<td>Content</td>
<td>Subject-compelled</td>
<td>Participant-compelled</td>
</tr>
<tr>
<td>Assessment</td>
<td>Multiple-choice tests, quizzes, computer-marked assignments, peer-review with the help of rubrics</td>
<td>No formal assessment, informal feedback from knowledgeable participants</td>
</tr>
<tr>
<td>Teaching materials</td>
<td>Lecture videos, text-based readings, slides, practice exercises, audio files, urls to other resources, and online articles</td>
<td>Social media; wikis, blogs, social networking sites (Facebook, Twitter, Google+), learning management systems (Moodle), Student-created videos and exercises</td>
</tr>
</tbody>
</table>
2.3 Other typologies of MOOCs

However, there is a move away from the cMOOC/xMOOC dichotomy towards recognition of the multiplicity of MOOC designs, purposes, topics and teaching styles, sometimes using alternative terms such as Distributed Open Collaborative Course (DOCC; Jaschik 2013), Participatory Open Online Course (POOC; Daniels 2013), Small Private Online Course (SPOC; Hashmi 2013) or Big Open Online Course (BOOC; Tattersall 2013). Another useful typology of MOOC has been proposed by Clark (2013) who has distinguished eight types of MOOCs based on their functionalities:

1) transferMOOCs that take existing courses and put them onto a MOOC platform with the pedagogic assumption of transfer from teacher and course content to learner similar to traditional academic courses with lectures, short quizzes, set texts and assessments.

2) madeMOOCs in which peer work and peer-assessment is used to cope with the high teacher-student ratios and which tend to be more vocational in nature, VOOCs (Vocational Open Online Courses), where the aim is to acquire skills.

3) synchMOOCs which have a fixed start date, tend to have fixed deadlines for assignments and assessments and a clear end date.

4) asynchMOOCs which have no or frequent start dates, tend to have no or looser deadlines for assignments and assessments and no final end date. They can be taken anytime and anywhere.

5) adaptiveMOOCs use adaptive algorithms to present personalised learning experiences, based on dynamic assessment and data gathering on the courses. They take learners on different, personalised paths through the content.

6) groupMOOCs start with small, collaborative groups of students with the aim to increase student retention. They have mentors and rate each other’s commitment and progress. Groups are also dissolved and reformed during the course.

7) connectivistMOOCs rely on the connections across a network rather than pre-defined content. These courses tend to create their own trajectory, rather than follow a linear path.

8) miniMOOCs are more suitable for precise domains and tasks with clear learning objectives and offer more intense experiences that last for hours and days, not weeks.

These different categorizations of MOOCs are based on varieties in pedagogies and assessment and their underlying ideas about effective learning.

3. Assessment in MOOCs

In a review of the literature and debate, Bayne and Ross (2013) extracted three emerging issues for MOOC pedagogy: 1) the role of the teacher, 2) learner participation and 3) assessment. Firstly, the role of the teacher in the MOOC has been under-examined as most research has investigated the learner perspective (Liyanagunawardena, Adams and Williams 2013). Two main teacher roles appear from the literature, which are connected to the way the MOOC is designed: the academic celebrity teacher in xMOOCs and the facilitator in cMOOCs. The academic celebrity teacher is the role of a respected authority based in an elite institution. These lecturers are not available to MOOC participants in any interpersonal way, but primarily through the recordings of their lectures. The recordings are supplemented with automatically marked quizzes, discussion posts and pass/fail tasks. In cMOOCs, the teachers’ role focusses on facilitating self-directed learning. A more sophisticated distinction between teacher roles in MOOCs is necessary in order to get a better understanding of effective pedagogies. Literature on moderator roles in computer conferencing from the 90s (e.g., Admiraal, Lockhorst, Wubbels, Korthagen and Veen 1998; Paulsen 1995) might be helpful in this.

Secondly, learner participation is one the most examined aspects in literature and debates about MOOCs. The key dilemmas in MOOCs centre on what participation actually means, how it should be measured, and what metrics of success and quality are appropriate (DeBoer, Ho, Stump and Breslow 2014). Milligan, Littlejohn and Margaryan (2013) describe a continuum of active, lurking and passive participation and Hill (2013) distinguishes five archetypes of no-shows, observers, drop-ins, passive participants and active participants. The notion that people might sign up for a course not intending to complete the assessments is common in free courses where the barrier to entry is usually as low as clicking a registration button and entering an email address. This means that new measures of success and quality are required, because participant behaviours and intentions are so diverse.
Assessment is the third emerging issue in literature on MOOCs leading to questions like “What sorts of learning can be assessed at scale?”, “How should individuals be authenticated so that the correct person’s work is being assessed?”, “How can cheating be prevented?”, and “Who should decide how much university credit a MOOC is worth?”, to name a view (cf. Bayne and Ross 2013). It becomes clear that “openness” of a MOOC has a very different future in a system of accreditation than that it does in informal learning settings. In general, the quality of assessment in MOOCs has been criticized by some authors (Admiraal, Huisman and Van de Ven 2014; Clarà and Barberà 2014). Reilly, Stafford, Williams and Corliss (2014) examined the effectiveness of automated essay scoring (AES) to assess writing assignments in two MOOCs. Three groups of assessments were compared: the AES-holistic grades, the AES-rubric grades and the instructor grades. AES-holistic grades and AES-rubric grades highly correlated, but both AES systems tended to give lower scores than the instructor, with the largest differences between instructor and AES-holistic grades. The authors concluded the AES tools gave less accurate assessments of the writing assignments presented in two MOOCs when compared to instructor assessment.

Self- and peer assessment - which has been historically used for logistical, pedagogical, metacognitive, and affective benefits - might offer promising solutions that can scale the grading of complex assignments in courses with thousands of students. How to design assessments is a challenge in itself as MOOCs have massive, diverse student enrolment. In the current study, we have examined various assessment forms in three MOOCs (quizzes, self-assessment and peer assessment of an essay, and final exam). More specific, we formulated the following research question:

1) What is the relationship between self- and peer assessment and quizzes?
2) To what extent do quizzes and self- and peer assessment explain differences in students’ final exams scores?

4. Methods

4.1 Context of the study

In two MOOCs organized at Leiden University in the Netherlands, intermediate quizzes, self-assessments and peer assessments were used in addition to final exams. The first MOOC, The Law of the European Union: An Introduction, was a 5-8 weeks MOOC, run in June 2013. This course included small video clips, discussion fora, quizzes, a case study and a voluntary exam. The second MOOC, Terrorism and Counterterrorism: Comparing Theory and Practice, was a 5-weeks MOOC in Fall 2013 with weekly videos, quizzes and peer assignments as well as a voluntary final exam. This MOOC was rerun February 2014. All three courses required 5 to 8 hrs. student work per week.

4.2 Assessments

In each of the three MOOCs, four types of assessments were implemented: weekly quizzes, self-assessment, peer assessment and final exam.

4.2.1 Weekly quiz and final exam

The weekly quizzes and final exam were automatically marked multiple-choice quizzes, testing declarative knowledge of the course content. In MOOC 3 (Terrorism 2014), it was possible to follow a certification track, which means that students who completed all quizzes, self- and peer assessments and the final exam could receive a certificate. Of the total of 18,622 registrants, 410 students signed up for the certification track.

4.2.2 Self- and peer assessment

In each of the three MOOCs, students could complete an essay on a topic that was relevant for the particular MOOC. In the first MOOC, this topic was provided; in the other two MOOCs students could choose from four topics. The essay assignment started with a case description in which an authentic context was pictured, followed by some prompts. Students were encouraged to prepare this assignment with the use of information which was available in the course environment (video, syllabus, background materials). Then the procedures of how to complete the assignment were introduced along with a rubric of how to assess it. Students had to
assess their own essay and then the essay of at least two (in MOOC 1) or four (in MOOC 2 and 3) of their peers. The nature of the rubrics differed slightly between MOOC 1, on the one hand, and MOOC 2 and 3, on the other hand. The rubric of MOOC 1 had a pre-structured format with four items with several sub-items on the accuracy of the content of the essay and one item with four sub-items on the structure and the presentation of the essay. Each possible score on each sub-item was clearly described. The rubrics of MOOC 2 and 3 were less structured with four (assignment 1) or five (assignment 2) items. The first three items referred to the accuracy and adequacy of the content of the essay; the last item assessed the structure of the essay. Students were instructed about the deadlines and they were reminded that they agreed with the Coursera Honor Code about plagiarism. Students were instructed to assign a score of 0 to plagiarized work.

4.3 Data

Thousands of participants were registered in each of the three MOOCs, although substantial less data was collected on quizzes, self-assessments, peer-assessment assignments and final exam. From Table 1 it is clear that in all three MOOCs the number of participants who completed the quizzes decreased over time. The number of participants who completed self-assessments and peer assessments was a small portion of the total student enrolment. Participants who completed the voluntary final exam formed about 10% of the total student enrolment (from 6% in MOOC 1 to 12% in MOOC 3).

4.4 Analyses

In addition to descriptive statistics, reliability indices and correlations between all assessments, regression analyses were used to explain differences between students in their final exam scores.

5. Results

5.1 Four types of assessments

In Table 2, we present descriptive indices of each assessment (mean scores, standard deviations in scores, range of scores and number of valid assessments, respectively). The reliability of the self-assessments (based on 4 or 5 items) ranged from Cronbach’s $\alpha = .59$ in MOOC 2 to $\alpha = .83$ in MOOC 1. This means that the pre-structured format of self-assessment in MOOC 1 showed the highest reliability. We observed a similar result in the reliability of the peer assessment with the highest reliabilities in MOOC 1 (three peer assessments $\alpha = .87$, .89 and .90) and somewhat lower reliabilities in MOOC 2 (between $\alpha = .72$ and .80) and MOOC 3 (between $\alpha = .59$ and .79). In both types of assessment, the item that refers to the presentation (structure, layout, and language use) of the completed assignment showed the lowest item-rest correlations (between $r = .55$ and $r = .64$). The other items referred to an assessment of the content quality of the completed assignments. Given the small number of items, we can concluded that both self-assessment and peer assessment showed high internal homogeneity. The correlations between peer assessments of the same assignments were generally moderate (MOOC 2 mostly between $r = .30$ and .40) to strong (MOOC 1 between $r = .42$ and .57 and MOOC 3 mostly between $r = .50$ and .60). So, in general the reliability of both self-assessment and peer assessment was satisfactory.

5.2 Relationship between different assessment forms

The scores on the quizzes of the three MOOCs were generally highly correlated (between $r = .50$ and .77), but showed low to moderate positive correlations with self-assessment and peer assessment. Correlations between the MOOCs’ quizzes and self-assessment were between $r = .10$ and .29, with most correlations around .15; Correlations between the quizzes and peer assessment were a somewhat higher, between $r = .12$ and .37 with most correlations .30 or higher. Finally the correlations between self-assessment and peer assessment scores of the same assignment were generally higher (mostly around $r = .38$) compared to the correlation between self-assessment and peer assessment scores of different assignments (mostly around $r = .18$). However, for both self-assessment and peer assessment the correlations between the scores on the two assignments in MOOC 2 and 3 were higher ($r = .42$ and .55 for self-assessment, and $r = .43$ and .47 for peer assessment) compared to the scores of the different assessment forms for the same assignment. In other
words, the relationship between the same assessment forms is stronger than between the assessments of the same assignment.

Table 2. Descriptive indices of assessment types (N=number of registrants; Mean=mean score; SD=standard deviation in scores; Min/Max=range of scores; n=number of valid assessments)

<table>
<thead>
<tr>
<th></th>
<th>MOOC 1</th>
<th>MOOC 2</th>
<th>MOOC 3</th>
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<tbody>
<tr>
<td></td>
<td>N=52559</td>
<td>N=26890</td>
<td>N=18622</td>
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<tr>
<td></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
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<td></td>
<td>Min</td>
<td>Max</td>
<td>Min</td>
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<tr>
<td></td>
<td>n</td>
<td>n</td>
<td>n</td>
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<td>Quizzes</td>
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<tr>
<td></td>
<td>7472</td>
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<td>10</td>
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<tr>
<td></td>
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<td>10</td>
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<td></td>
<td>8.83 (1.48)</td>
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<td>10</td>
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<tr>
<td></td>
<td>4.21 (1.18)</td>
<td>12.07 (2.22)</td>
<td>8.59 (1.82)</td>
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<td></td>
<td>5</td>
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<td>2810</td>
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<td>8.98 (1.62)</td>
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<td>Self-assessment</td>
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<td>28.30 (2.99)</td>
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<td>Peer assessment</td>
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<td></td>
<td>688</td>
<td>824</td>
<td>635</td>
</tr>
<tr>
<td></td>
<td></td>
<td>40</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>40</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>491</td>
<td></td>
</tr>
<tr>
<td>Final exam</td>
<td>1</td>
<td>11.44 (5.48)</td>
<td>17.26 (5.58)</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>3168</td>
<td>2988</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>2274</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5.3 Relationship between different assessment forms and the final exam

In Table 3, the results of the stepwise regression analyses for each MOOC are summarized. Both self-assessments did not significantly explain differences between students in their final exam grade. The strongest explanatory variable was in all cases one of the quizzes, although peer assessments were also significantly related to the final exam grade.

Moreover, the correlations between the number of assessment attempts (Quizzes, self-assessment, peer assessment) and the final-exam grade were moderate to low (between r=.26 and .41). This means that there seems to be a weak relationship between the number of assessments students took and their final exam grade. This finding contradicts other MOOC research that finds a strong positive relationship between the number of student activities and their final course grade (DeBoer et al. 2014).

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### Table 3. Stepwise regression analyses with final exam as dependent variable (B coefficients, standard errors (SE) and proportion explained variance ($R^2$ change))

<table>
<thead>
<tr>
<th>MOOC 1</th>
<th>MOOC 2</th>
<th>MOOC 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EU Law 2013</td>
<td>Terrorism 2013</td>
</tr>
<tr>
<td></td>
<td>$B$ (SE)</td>
<td>$R^2$ change</td>
</tr>
<tr>
<td>Weekly quiz 1</td>
<td>1.08 (0.26)</td>
<td>0.04</td>
</tr>
<tr>
<td>Weekly quiz 2</td>
<td>0.82 (0.20)</td>
<td>0.03</td>
</tr>
<tr>
<td>Weekly quiz 3</td>
<td>n.s.</td>
<td>n.s.</td>
</tr>
<tr>
<td>Weekly quiz 4</td>
<td>1.43 (0.22)</td>
<td>0.28</td>
</tr>
<tr>
<td>Weekly quiz 5</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
<tr>
<td>Peer grading 1</td>
<td>0.31 (0.03)</td>
<td>0.08</td>
</tr>
<tr>
<td>Peer grading 2</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
<tr>
<td>Self-grading 1</td>
<td>n.s.</td>
<td>n.s.</td>
</tr>
<tr>
<td>Self-grading 2</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
<tr>
<td>Adjusted $R^2$</td>
<td>0.41</td>
<td>0.35</td>
</tr>
<tr>
<td>Degrees of freedom</td>
<td>4, 379</td>
<td>5, 475</td>
</tr>
</tbody>
</table>

n.a. = not applicable; n.s. = not significant with $\alpha=0.05$

1. Entered with the following sequence: Weekly quiz 4, Peer assignment 1, Weekly quiz 1, Weekly quiz 2
2. Entered with the following sequence: Weekly quiz 2, Peer assignment 2, Weekly quiz 3, Weekly quiz 5, Peer assignment 1
3. Entered with the following sequence: Weekly quiz 5, Peer assignment 1, Peer assignment 2, Weekly quiz 2

In MOOC 3, students could sign up for a certification track, which required completion of all quizzes, self- and peer assessments and final exam in time. Student who registered for a certification track received significantly higher scores on their final exam, compared to the other students (M_{certification track} = 19.2 and M_{other students} = 17.1; $t(574.5) = 7.41; p<.001$)). We repeated the regression analyses for students following a certification track and the other students separately. The results are presented in Table 4.

From Table 4 it is clear that the assessments explained more differences between students in final exams score in cases that they followed a certification track: the first two quizzes, both peer assessments and the first self-assessment significantly explained differences in the final exam scores. For the other students, the total amount of variance in the final exam score explained by the other assessments is less compared to the students from the certification track.

### 6. Discussion and conclusion

In general, the quality of both the self-assessment and the peer assessment appeared to be moderate to high. These assessments showed a homogenous structure — and therefore a high reliability—, but the correlations between peer assessments of the same assignments were low to moderate. The latter means that peers did agree on their grades for the assignments only to a limited degree. The correlations between the various peer assessments of the last MOOC were moderate to high. In this MOOC, the procedures and criteria for peer assessment were adapted on the basis of the 2013 run. Moreover, there is only a weak correlation between self-assessment and peer assessment, and the correlations between different self-assessment assignments are higher than the correlations between self-assessment and peer assessment of the same assignments. In addition, self-assessments did not significantly explained variance in students’ final exam scores. This suggests a bias of self-assessments and led us to conclude that self-assessments might not be a valid way to assess students’ performance in MOOCs. Yet the weekly quizzes and both peer assessments significantly explained differences in students’ final exam scores, with one of the weekly quizzes as the strongest explanatory variable.
in all three MOOCs. Finally, the number of assessment attempts of students did not significantly correlate with their final exam scores. The latter result does not confirm conclusions from earlier research that found a strong positive relationship between the number of student activities and their course grade (DeBoer et al. 2014).

Table 4. Stepwise regression analyses with final exam as dependent variable for students following the certification track and the other students in MOOC 3 (B coefficients, standard errors (SE) and proportion explained variance ($R^2$ change))

<table>
<thead>
<tr>
<th></th>
<th>Certification track</th>
<th></th>
<th>Other students</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B (SE)</td>
<td>$R^2$ change</td>
<td>B (SE)</td>
<td>$R^2$ change</td>
</tr>
<tr>
<td>Weekly quiz 1</td>
<td>1.34 (0.38)</td>
<td>0.07</td>
<td>n.s.</td>
<td></td>
</tr>
<tr>
<td>Weekly quiz 2</td>
<td>1.42 (0.39)</td>
<td>0.22</td>
<td>n.s.</td>
<td></td>
</tr>
<tr>
<td>Weekly quiz 3</td>
<td>n.s.</td>
<td></td>
<td>n.s.</td>
<td></td>
</tr>
<tr>
<td>Weekly quiz 4</td>
<td>n.s.</td>
<td></td>
<td>n.s.</td>
<td></td>
</tr>
<tr>
<td>Weekly quiz 5</td>
<td>n.s.</td>
<td></td>
<td>1.87 (0.31)</td>
<td>0.18</td>
</tr>
<tr>
<td>Peer grading 1</td>
<td>0.20 (0.09)</td>
<td>0.11</td>
<td>0.27 (0.08)</td>
<td>0.07</td>
</tr>
<tr>
<td>Peer grading 2</td>
<td>0.10 (0.04)</td>
<td>0.02</td>
<td>0.11 (0.04)</td>
<td>0.02</td>
</tr>
<tr>
<td>Self-grading 1</td>
<td>0.26 (0.10)</td>
<td>0.02</td>
<td>n.s.</td>
<td></td>
</tr>
<tr>
<td>Self-grading 2</td>
<td>n.s.</td>
<td></td>
<td>n.s.</td>
<td></td>
</tr>
<tr>
<td>Adjusted $R^2$</td>
<td>0.42</td>
<td></td>
<td>0.27</td>
<td></td>
</tr>
<tr>
<td>Degrees of freedom</td>
<td>5, 157</td>
<td></td>
<td>3, 256</td>
<td></td>
</tr>
</tbody>
</table>

n.s. = not significant with $\alpha=0.05$

1 Entered with the following sequence: Weekly quiz 2, Peer assessment 1, Weekly quiz 1, Self-assessment 1, Peer assessment 2

2 Entered with the following sequence: Weekly quiz 5, Peer assessment 1, Peer assessment 2

With this study we provided insight in the quality of the various assessments in MOOCs and how these are related to the final exams. We conclude that self-assessments and peer assessments should be improved if they are used as summative indicators of one’s achievements (assessment of learning). In the current MOOCs, they only can be used for self-reflection and peer feedback, emphasizing the formative function of assessment (assessment for learning). Of course, we should be careful with generalizing this insight to other types of MOOCs. The MOOCs of the current study can be classified as xMOOCs with a mixture of traditional course pedagogy of transferring knowledge from the lecturer to the student and more connectivist ideas of student interaction and peer assignments. Future research might go deeper into the quality of assessment assignments of different kinds of MOOCs including both assessment of learning and assessment for learning.

However, we agree with DeBoer et al. (2014) that we also should reconceptualise educational variables in research on MOOCs. Differences between traditional classroom data and MOOC data refer to the magnitude of data gathered in terms of numbers of registrants per course, observations per registrant and type of information, the diversity of registrants in reasons for registration as well as in their background, and the registrant use of course tools which is asynchronous and relatively unrestricted in sequence (DeBoer et al. 2014). These authors suggest a reconceptualization of enrolment in MOOCs (e.g., based on registration, course activities, course assignments and assessment, or final exam), participation (the authors show 20 participation metrics which are linked to students’ general attendance, their clicks, the hours they spent on course activities, and the assessments), curriculum (curriculum activities showing a variability in sequence), and achievement (which can be based in various indicators of performance and participation). In order to understand the relationship between assessments, final grades and learning activities in MOOCs we have to think thoroughly
what kind of metrics for achievement should be used, how we should define enrolment and participation, in what way the curriculum is implemented, and –therefore– how assessments should be applied.

References


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Affordances of Learning Technologies in Higher Education Multicultural Environments

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Abstract: A cluster of research has been conducted in higher education to investigate the affordances (action possibilities) and the influence information and communication technologies (ICT) may have on students’ learning experiences and outcomes. Such studies have given rise to the implementation of a wide range of educational frameworks with a great deal of empirical evidence on the benefits of using technologies to improve learning. However, these benefits do not appear to have fulfilled higher education expectations for more meaningful and transformative learning experiences. In this paper, I argue that part of the problem is either the content or teacher-centric perspective of these frameworks and the need to explore the benefits from a more student-centric perspective. Learning is contextual, with learners having different abilities to learn and varying preferences for educational technologies with greater potential to facilitate their learning activities. Drawing on an ethnographic study of culturally diverse computing students and teachers within learning environments that blend online and face-to-face pedagogies, I argue that our understanding of what ICT has to offer for the design and implementation of transformative learning activities is a far more complex issue than is often anticipated, particularly in the design and implementation of learning for computer science programs.

Keywords: academic disciplines, computer science, computing science education, e-learning, ICT affordances, learner’s preferences, learning styles, learning technologies, media affordances, online learning

1. Introduction

There is an extensive body of research on the affordances of information and communication technology (ICT) to transform learning and teaching in higher education (see Collis 1997; Fowler & Mayes 1999; Goodyear 2005; Laurillard 2002; Oliver 2001). For example, in her influential Conversational Framework, Laurillard (2002) claims that for ICT to play an effective role in learning and teaching, there need to be mechanisms to support the interactive dialogue between teachers and students with the subject matter. Fowler and Mayes (1999) take a similar dialogical approach but primarily focusing on ICT to support the three essential learning stages of understanding: conceptualisation, construction and contextualisation; enabling the learner to move from a novice level to an expert level of learning. A different perspective is presented by Collis (1997) in her pedagogical profile of a course, where the intention of incorporating ICT into the course is to maximise flexibility, with more student engagement and locus of control. Collis sees two ways to achieve this: either through the pedagogical enrichment of the course profile or through a more transformative approach known as the pedagogical re-engineering approach where the components of the course are expected to be radically changed. In the Australian Flexible Learning Framework for the Vocational Education and Training sector, according to Oliver (2001), the underpinning theme is for the use of ICT to support the design of the three learning elements which represent critical components of any learning setting for knowledge construction: learning activities, learning resources and learning support. Similarly, in Goodyear’s (2005) conceptual design framework for networked learning environments, the use of ICT is instrumental in supporting the institutional combination of two elements: the teacher’s pedagogical approach (teachers’ philosophy to teaching) and the educational setting including the learning environment, the learning tasks and the learning activities.

However, despite significant investment in infrastructure and training and a wide-scale uptake of such ICT-mediated educational frameworks, the promised transformative effect on student learning is yet to be actualised outside of small pockets of innovation (Arenas & Lynch 2012; Price & Kirkwood 2014). Of particular interest are students’ approaches to learning in multicultural learning environments where ICT is considered as integral to teaching and learning activities. The above discussed models appear to overlook factors like that learning is cross-cultural, that learners have different abilities to learn and modes of approaching the intellectual inquiry; and that all these factors may affect the way students perceive ICT-mediated learning activities (Arenas 2012). Specifically, this research addresses the following questions:
In the context of computing science programs, what are students’ preferences for ICT media in their learning activities?

What is the relationship between the different types of ICT media, their action possibilities and the way these ICT media best support the learning of computer science?

2. Related work

Two interlocked aspects of learning and teaching appear to be critical in the choice of ICT to support learning: 1) the nature of the subject matter (within an academic discipline) that we as teachers believe students need to construct their knowledge and, 2) students’ learning styles of intellectual inquiry (Becher 1994). In this respect, Biglan’s classic model on academic disciplines and Kolb’s learning styles theory might shed some light.

With reference into the similarities and differences of academic disciplines, no other framework has been as extensively cited and used as Biglan’s classic model (Arbaugh 2013; Lam, McNaught, Lee & Chan 2014; Li, Long & Simpson 1999; Pike & Killian 2001; Schommer-Aikins, Duell & Barker 2003; Stoecker 1993).

In his model, Biglan (1973) uses the cultural and epistemological uniqueness found in each branch of knowledge to classify the nature of academic disciplines. In doing so, Biglan (1973) differentiates the academic disciplines according to their specific characteristics including the object of research, body of knowledge, theory, principles and research methods. Two dimensions emerge from these characteristics. The first dimension distinguishes between paradigmatic and non-paradigmatic fields, i.e. hard or soft respectively. For example, physical sciences are ‘characterised by the existence of paradigms that specify the appropriate problems for study and the appropriate methods to be used’ (p. 195), while social sciences and non-sciences areas like history ‘do not have such clearly delineated paradigms’ (p. 195). The second dimension perceives the subject matter in terms of ‘its requirements for practical applications’, i.e. pure or applied (Biglan 1973). On those grounds, Biglan (1973) sees academic disciplines divided into four groups: hard-pure, hard-applied, soft-pure and soft-applied.

The educational context of this study is computing science and in terms of Biglan’s categorisation, it falls into the hard-applied category (Baldwin 2011; Clark 2003). According to Becher (1994), in the hard-applied disciplinary group, the nature of knowledge is purposive and pragmatic where individuals are concerned with the technical mastery of physical environments to build products. Consequently, the effective choice of ICT in the design and implementation of computing learning and teaching activities should consider these characteristics of the computing science discipline.

Kolb’s experiential learning theory (ELT) has been instrumental in understanding learners’ preferences and the way they approach learning. According to Kolb and Kolb (2005), learning is a process where learners construct knowledge through their experiences with the environment. Kolb sees knowledge as the result of combining the way individuals grasp and transform their experiences (Kolb & Kolb 2005). According to this theory, there are two dialectically related modes of grasping experience: Concrete Experience (CE) and Abstract Conceptualisation (AC). Similarly, there are two dialectically related modes of transforming experience: Reflective Observation (RO) and Active Experimentation (AE). For example, when a learner is exposed for the first time to a concrete experience (CE), there is an initial stimulus for the reflective observation (RO) of the new experience, which in turn gives rise to a thinking process characterised by abstraction and conceptualisation (AC) to assimilate the new experience. Once the new experience is assimilated the learner is prepared to act upon and transform it into something different through active experimentation (AE). This learning cycle repeats in the construction of new knowledge and varies depending on the personality and experiences of the learner (Kolb & Kolb 2005). In other words, there is a preferred way of choosing amongst the four abovementioned modes of learning shaped by individual’s previous experiences, learning behaviours, prior learning and the learning environment. To understand Kolb’s ELT in the context of computer science, there is a need to explore first what computer science constitutes in terms of an academic discipline.

A provocative and thoughtful description of the nature of computer science as an academic discipline is the one given by the prominent computer scientist and computational theorist Juris Hartmanis (considered by many as one of the fathers of computer science education). During his Turing Award lecture on computational complexity and the nature of computer science, he stated that computer science is all about the creation of many levels of abstraction to deal with computational problems. It involves the creation of ‘intelligent tools to conceive, design, control, program and reason about the most complicated of human creation’ (Hartmanis...
In the light of Hartmanis and Knuth, and in terms of Kolb’s modes of learning, computing students are individuals with a converging style of learning with abstraction, conceptualisation, and active experimentation as the main dominant learning abilities. Consequently, the choice of ICT for learning purposes should be consistent with the learning style of these individuals.

Following Biglan and Kolb’s work, this paper builds upon our knowledge about how computing students go about learning in learning environments with ICT as an integral component in the design of transformative learning and teaching. The analysis presented below elaborates specifically on computing science students’ diverse responses to particular ICT-mediated learning activities, and through this analysis I argue that our understanding of what ICT has to offer for the design and implementation of transformative learning activities is a far more complex issue than is often anticipated, and this is so particularly in the design and implementation of learning for computer science programs.

3. About the study

3.1 Participants

This paper draws on an ethnographic study (Arenas 2012), conducted at two universities in Australia, that explored the behaviours, attitudes, perceptions and conceptions of teaching and learning found within multicultural learning environments that blend online and face-to-face pedagogies.

Data were collected from participants located at two qualitatively different sites. Within each site, two postgraduate computing courses (or units of study) were targeted for data collection: NetSec (Network Security) and SAD (Systems Analysis and Design) at Site 1; and BAM (Business Analysis and Modelling) and FOIS (Fundamentals of Information Systems) at Site 2. The first site (henceforth referred to as Site 1) was located in one of the metropolitan campuses of a multi-campus medium-sized regional Australian university, and the second site (henceforth referred to as Site 2) was located in a large metropolitan Australian university. Site 1 student body comprised international students only, whereas Site 2 was located in a university that catered mainly for domestic students with a relatively smaller population of international students. The learning management system (LMS) used at Site 1 was a purpose in-house built system whereas at Site 2 students used Blackboard™, a popular commercially available learning management system.

The purposive, culturally diverse sample from both sites comprised of a total of 18 student participants from nine countries of origin and their respective teachers. The following is a description of the sample based on participant-reported background information.

The student sample at Site 1 was comprised of twelve students. They had diverse educational backgrounds, with varying residency time in the country. Prior to the commencement of the semester term, Site 1 students had been residing in Australia for periods of between 3 months and 18 months, with half of them for less than 12 months and five students for only three months. Of the twelve student participants, six were men and six women, including nationalities from Pakistan, China, Bangladesh, Kuwait and India. Before participating in this study, six students already held a postgraduate degree and three had more than two years’ experience in the field of information technology. All students who provided information about their skills reported that they were experts at writing academic arguments in the English language. They also reported to have expert level knowledge using computer hardware and software and discussion forums; however, only three students reported to have experience using blogs (electronic journals).

At Site 2, there were six student participants: three men and three women including nationalities from Australia, Oman, Vietnam, Indonesia and China. Prior to the commencement of the semester term, except for
one domestic student, Site 2 students had been living in Australia for a period of between one month and two years, with two students residing in Australia for fewer than three months. Also in contrast to Site 1, where six students already held a postgraduate degree, at Site 2 all students held only an undergraduate bachelor degree before the conduct of this study. Three students had between four to thirteen years’ experience working in an information technology field. Only one student claimed to have only novice expertise in computer hardware and software and discussion forums compared to the rest who reported to be highly experienced using those tools. Similarly, two students reported having novice experience writing academic arguments in English, with the rest reporting to have expert level essay writing skills. Except for one student, none had substantial team work and management experience.

The teacher participants at Site 1 were two young but experienced teachers: Georgina taught NetSec and Richard taught SAD (pseudonyms are used throughout to refer to teacher and student participants). Before the conduct of this study, Georgina had more than three years’ experience teaching information technology subjects on a sessional basis, that is to say, through separate contracts for the duration of each semester term. Georgina combined her professional academic practice with full-time paid work in a senior systems administration role at a prominent Australian financial organisation. She held a Masters degree in information technology from an Australian university. Richard was a full-time academic staff member with three years’ experience teaching information systems subjects. Before his full-time academic tenure, Richard was a Site 1 alumnus and after his graduation he worked as a teacher on a sessional basis at Site 1. He held a Masters degree in information systems and a Graduate Certificate in university teaching.

In terms of Site 2 teachers, BAM staff was larger than FOIS, and included three experienced professionals with different industrial and academic backgrounds. Sophia, the principal academic teacher and teacher participant responsible for this subject, had completed a PhD in Computer Science and also a Graduate Certificate in university teaching. She had extensive experience as a research scientist in information architecture; and usability analysis and design for various industrial and research projects locally and internationally. The other two teachers did not form part of the sample.

While BAM had three academic staff, FOIS was managed and taught by a single staff member, Shane. Shane was a senior lecturer within the Faculty of Science at Site 2 with extensive experience teaching online courses. He held a PhD in Information Systems and a Graduate Certificate in university teaching.

3.2 Data collection

The study used multiple data sources to gain insights into the behaviours, attitudes, perceptions and conceptions of teaching and learning found within these multicultural blended learning environments. The data included digital textual records of online discussions, semi-structured interviews, field notes from classroom observations, a reflective research journal, course-associated documentation, and students’ assignments.

The first source of data consisted of digital texts produced by both student and teacher participants during their interactions with the online component of the learning environments at each site. During the term, teachers provided the students with various online learning activities for individual and group work.

At Site 1, student participants were required to maintain an electronic journal (blog) to reflect on their own learning experiences and perceptions of the course. The blog was based on nine topical questions spread over the last nine weeks of the semester and was assessed. The teaching staff provided structured marking guidelines to promote quality work and to ensure each student contributed the nine expected reflections. They also monitored students’ progress and provided weekly feedback. At Site 1, students also used a laboratory simulator (LabSim™), a simulation tool where students could experiment with real world problems in a virtual environment. The LabSim™ acted as a virtual tutor guiding the students through complex and technical configurations of secured networks. The system could challenge the student to conduct tasks that replicated the real world providing immediate feedback after the completion of the task.

At Site 2, students were required to use a discussion forum to extend their engagement with learning activities initiated in face-to-face classrooms. There were six discussion forums. Three of them were designed for individual participation where students were asked to challenge or critique at least one of the questions raised by the lectures or fellow classmates during the classes. There was a general discussion forum to discuss
general issues arising from the course and two group-project-related discussion boards. Of the six forums only the general discussion forum was moderated by the teaching staff. The other forums were only moderated to check students’ progress and to prevent language flaming.

Classroom observations were conducted at both sites to record reflective notes and provide descriptions of students’ face-to-face classroom activities and behaviours, stimulate personal views of participants in interview, and record events such as student consultations and class participation. The classroom observations were instrumental in the selection of the purposive sample for the student interviews.

Individual semi-structured interviews were conducted with both teachers and students. The duration of each interview was between 30 and 45 minutes. The purpose of these interviews was to gather participants’ reflective views of their teaching and learning experiences in the learning environment. Semi-structured interviews were preferred to structured interviews because this method is more consistent with the ethnographic aspect of this study. Through the use of open-ended questions, semi-structured interviews allow for the exploration of new ideas and themes, something hard to achieve with the rigorous setting of questions, commonly found in structured interviews (Creswell 2007).

The identification of potential interviewees was based on the criterion-based selection as recommended by Schensul and LeCompte (1999). Specifically, four teachers responsible for the delivery of the subjects were interviewed: two at Site 1 and two at Site 2. Student participants were interviewed in the middle of the second semester, by which point there was an opportunity to observe the students and assess the level of engagement and participation in both face-to-face and online forums. Sample diversity was maximised by choosing students from the following groups: those who were quiet in the classroom but very active online; those who were active online but not in face-to-face sessions; those who were very active in both environments; and, those who were passive face-to-face and online.

The interviews contained a range of open-ended questions that asked participants to reflect on the multicultural, pedagogical and technological aspect of the units of study.

Additional data sources were used such as a research journal, subject outlines, profiles, content and accreditation documents, and students’ assignments, to investigate the relationship between students’ reported perceptions of the subject and the documented learning aims, course content and student behaviours in the course.

3.3 Data analysis - coding

Nvivo™, a qualitative research computer program developed by QSR™, facilitated the data analysis. During the process, a large number of units of data analysis were created, managed and organised aimed to develop codes from the multiple data sources. Codes that made explicit reference to both expected elements of the study and to unexpected elements that represented unusual information to the researchers and/or participants were chosen and labelled (Creswell 2007). This coding process produced a total of forty-six nodes with direct or indirect relevance to the focus of the research.

Nodes were examined in search of themes that were meaningful in relation to the aim of the study in that they related to students’ behaviours, attitudes, perceptions and conceptions of teaching and learning within a blended, multicultural context. For each theme think-aloud and concept mapping processes were used to develop conceptions of the patterns in the nodes and refine the coding process. As a result, some of the nodes were merged and others, considered to be redundant, excluded from further analysis and representation. The resulting thirty-six nodes were hierarchically clustered into five broad themes: 1. Adapting to a new learning environment – cultural and social dimensions; 2. Preparing to learn; 3. Keeping pace with the learning activities; 4. ICT integration; and, 5. Perceptions of pedagogical practices.

It is beyond the scope of this paper to discuss each of these themes, which are reported elsewhere (Arenas 2012). Instead, addressing the research questions, in this paper the focus is on the ICT integration theme, which incorporates codes associated with the affordances of ICT in learning and the types of ICT-mediated learning activities that appear to be a better fit with the expectations and behaviours of computer science students than others.
4. Discussion of the findings

In relation to educational technology, the term integration means different things in different contexts and it is often used without precise explanations of what it might mean to different people and for different authors. In this paper, a number of ideas and practices related to integration are explored in the context of computing students using ICT in their learning activities and could be interpreted as any of the following: the way different online tools and their access are presented to students, the relationship between online and face-to-face components of a unit of study, the link between learning aims and the use of ICT, the link between assessment tasks and the way ICT is used; and the underlying assumptions of teaching and learning tasks for different aspects or components of a unit of study and how this relates to the way ICT is used.

Having said that, this study showed that the vast majority of student participants perceived the integration of ICT into learning activities as useful, convenient, flexible, encouraging reflection and good for knowledge sharing and asynchronous interactions.

These findings are consistent with those reported by similar studies (e.g. Stacey & Rice 2002), where the use of learning technologies is seen to be a positive experience for students, enabling them to engage in learning activities even when the parties are spread geographically, providing resources, idea sharing and a sense of a learning community. Let us take the case of Vert (India, Site 1) for example, who had the need to urgently fly to his country owing to family problems during the teaching period. He recognised that through the blended learning approach, he was, while overseas ‘able to keep in contact with lecturers, tutors, catch up with lectures, and lecture notes, materials and so on’ (Vert, India, Site 1, interview excerpt), which in a conventional face-to-face teaching and learning program he would have found it difficult to do, given his personal situation. But, if for Vert the use of ICT in his studies was a matter of flexibility and convenience, for Jacqui (China, Site1), an experienced user of the tools, it was necessary for learning. She referred to the discussion forums and blogs as ‘indispensable for learning’, to the extent that she would not have been able to conduct her studies without them. There was evidence of this engagement and facility with these learning tools by Jacqui through the high number of conscientious and thoughtful posts she generated during the semester term. In her interview, she particularly emphasised the ubiquity of the tools, her confidence to express feelings, and the wide audience she was able to reach with them:

> They provide you with interactivity that traditional face-to-face methods could not provide; they are also 24/7. I think that maybe people tend to be shy in modern society. Maybe sometimes when I meet you face-to-face I could not say some words directly or I feel tensed or something [like that], I do not want you to know it is me who said that, but with these tools you can solve all those problems. It can also involve large scale people, students, coordinators, lecturers and tutors that could discuss a problem together, not just limited within a classroom (Jacqui, China, Site 1, interview excerpt).

Jacqui’s words are consistent with a cluster of research (Suler, 2004) highlighting the disinhibiting effect of online text-based interactions and particularly the potential that this has for international students (Lanham & Zhou, 2003) when socio-cultural factors and English language issues might otherwise inhibit them from participating in face-to-face forums.

In terms of the affordances or action possibilities of ICT in transformative learning and teaching, the focus of this paper; two findings are relevant to the discussion: 1) the integration and alignment of ICT-mediated learning activities with students’ learning needs and preferences; and 2) students’ diverse responses to different types of digital media discussed next.

4.1 Alignment of ICT-mediated learning activities

While the integration of ICT into learning activities was seen by many students to be beneficial for their learning, many also reported difficulties with the particular array of ICT-mediated learning activities that they experienced.

Some students reported perceptions that the ICT-mediated learning environment did not give them the option to choose from learning tasks and that somehow they were misaligned with their preferences and needs. Take for example the case of Eloisa (Australia, Site2), a mature student with an extensive information technology
working experience, who expressed disappointment that the first learning task was not aligned with her immediate preferences and needs:

> I prefer not to have subjects where I have to submit a real-life situation. I do not mind if it is a theoretical problem or an essay, a case study but the fact that we have to use a real-life case, I find it difficult but mostly I find it pointless when I am working. My goals are to learn something other than workplace. I do not need experience talking to people; I do not need experience in dealing with teams because it is part of my work. It is frustrating; I rather spend the time doing the review (Eloisa, Australia, Site 2, student interview excerpt).

This time referring to the use of discussion forums, Eloisa believed that the use of ICT as part of the online learning activities turned out to be counterproductive. She was frustrated by the lack of alignment between teachers’ expectations as articulated in the course’s objectives and the students’ actual participation and collaboration in the forums. In her own words: ‘contextually, nothing happened’. In relation to student participation, she said that the discussion forums were fragmented, disjointed and hard to follow:

> The discussion forum itself is fine but not effectively used in this subject. Perhaps the way we try to use the system is not quite right … I am not sure if it is the system by itself. I think it is the way the posts are put in the discussion forums which are very fragmented and the way they are used … It is all being kind of disjointed and hard to follow up (Eloisa, Australia, Site 2, student interview excerpt).

An analysis of the online discussion data confirmed Eloisa’s perceptions showing fragmented and disjointed contributions from her peers. Many students did not appear to have skills in communicating effectively via online discussion forums. For example, simple procedures such as copying a part of the post and pasting it onto their own post before responding to it, was not taken into account by some students, making the discussion difficult to follow. Another example is that names were rarely used in posts and replies, that is to say, the social networking etiquette of initiating a post with a short greeting followed by the recipients’ name and closing the post with the senders’ name was overlooked in a vast majority of contributions. From the given examples, students appeared to be operationally literate when using the discussion forums but they seemed to lack the cultural and critical skills (Goodfellow, 2004) required to use them in a meaningful way.

Eloisa’s disappointment was evident when she talked about the effective use of the tools to promote knowledge sharing and collaborative learning:

> Even though everyone is there trying to say something and you think that it would be collaborative but I think that there is still an element of competition perhaps. I have seen in other subjects where the lecturer said that if you found an interesting article just posted it for everyone to share and no one posted anything. I cannot believe that no one found an interesting article. They are not sharing articles because they believe that should be used for their advantage. All of those things are working against the idea of sharing information, helping each other (Eloisa, Site 2, student interview excerpt).

The student data suggests a competitive culture amongst the participants, contrasting with the teachers’ assumptions and expectations of communicating in a collaborative way. The data also suggests that the assumptions and expectations held by the teacher (Sophia, Site 2), which she hoped were built into the teaching and learning environment, were not understood or shared by the students. Unfortunately, not much work was done by Sophia to make her assumptions and expectations explicitly known and understood by the students from the start of the term, which she later recognised as ‘a big mistake’.

Another situation is the one expressed by Peter (India, Site 1), who perceived the use of blogs as problematic to the extent that knowing that he had to contribute by posting his reflections became a burden and not aligned to his expectations:

> The way blogs were used in this subject was a kind of obstacle for me. For starters they were compulsory. You had to do them regardless since they had marks allocated. It should be a reflection of the subject done spontaneously and not on a weekly basis as they have been set up for this subject (Peter, India, Site 1, student interview excerpt).

From the quote, there was a reported feeling of frustration and concern in Peter’s words regarding the way the blogs had been implemented in the study of the subject matter. He did not think the way they were used...
was consistent with the spirit of reflection and was instead in favour of using them ‘spontaneously’, that is to say, in response to a self-generated urgency of recording personal reflections on topics discussed in class, and not for the sake of a mark allocated.

In summary, from the findings, the requirement to do all the learning tasks was not well received. Students would have preferred a learning environment with a higher level of flexibility in terms of choice of content management and the mode of learning consistent with their professional interests and learning needs (Biggs 2003; Cornelius, Gordon & Ackland 2009; Guest 2005; Marton & Booth 1997). The approach to learning should support program designs which include a wide array of ICT-mediated learning activities but where students are given scope to both select and pursue learning activities that align with their interests and preferences, as well as being supported to engage with non-preferred modes.

4.2 Students’ diverse responses to different types of digital media

With reference to students’ diverse responses to different types of digital media, Norman’s (1990) work in human computer interaction (HCI) along with Laurillard’s (2002) analytical framework, which identifies the affordances of both communicative media and adaptive media are both useful here in discussing this finding.

Norman (1990) argues that the affordances (or action possibilities) of an environment as perceived by an actor depend not only on the physical capabilities of the actor but also on their intentions, plans, values, beliefs and previous experience (Norman, 1990). In other words, to examine the effectiveness of ICT in learning, there is a need to understand the capabilities of the learning environment as perceived by teachers and students.

According to Laurillard (2002), particular technologies are understood to have particular affordances and constraints (Laurillard, 2002), that is, a particular technology can be analysed and understood to afford some types of usages and behaviours while constraining others.

Following this line of reasoning, this study found student and teacher participants responding differently in their perceptions of the value of different types of digital media. Take for instance the following comment from Georgina (Teacher, Site 1) when referring to effective interactions using the discussion forum in the course she was responsible for:

Through discussion forums international students may only be interested in getting solutions to the problems. Give me the answer from the collaboration point of view (Georgina, Site 1, teacher interview excerpt).

She was concerned that, within this context, students may only be motivated to use these tools to acquire or consume knowledge, and get answers without any concern for the process; defeating what she was aiming for, which was a two-way collaborative and engaging learning system.

From the student perspective, Natalie (Oman, Site 2), who found the flow of the discussions irrelevant and not engaging, the affordance of the learning technology was somehow similar. She particularly lamented the apathy, the lack of participation of fellow students and the low quality of their arguments:

I find the discussion forums superfluous and that is why I do not do participate a lot. You post interesting topics and no one replies with sound arguments (Natalie, Site 2, student interview excerpt).

It is worth noting that Sophia, the teacher who implemented the discussion forum in Site 2, took a proactive approach by implementing some changes part way through the semester to improve participation and the quality of the contributions; however, this change produced only minor improvements. Her attempt to use the forum as a discussion place for sharing and possible meaning-making was a failure. During the interviews, Sophia was asked what she thought was the cause of this problem. Even though she was not sure about the roots of the problems, she mentioned a wide array of student factors that could have contributed to its ineffectiveness; from time constraints, lack of interest and doing the minimum to get a pass, to lack of confidence in working out the appropriate argument for posting. All these explanations point to the students. In a more personal reflection, Sophia was prepared to accept part of the responsibility for flaws in her implementation of the discussion forum. Firstly, she did not manage to motivate the students to use the tools for learning purposes and, secondly, she failed to get it right from the start of the semester. Her future agenda is to learn from this mistake. She identified strategies that she could adopt in the future, including to better
cater for a range of language abilities, familiarising students with discussion forums as learning environments, and scaffolding the learning process by modelling what is expected, amongst others.

Contrary to the implementation of the discussion forums, the implementation of the LabSim™ and its integration into the wider unit was very successful. As mentioned above in section 3.2, at Site 1 the LabSim™ (laboratory simulator) was a computer learning tool integrated to the NetSec subject. Its intention was to help students experiment with real world problems typical of complex and technical configurations of secured networks. This strategy was very well received by all Site 1 students including Manuel, who praised LabSim’s capacity to guide him to construct real world scenarios without being actually exposed to them: ‘I found the LabSim very useful ... for example, in my home computer I could build a virtual environment to learn routing and networking’ (Manuel, Bangladesh, Site 1, student interview excerpt). In Bernie’s case, the LabSim™ went beyond the construction of virtual networking environments, enabling him to achieve deep learning:

> In the beginning when I planned to do this course and realised that it had something to do with security, I thought to get some basic expertise in security since that is my future goal in my career path. Once I started the course, I found lots of practical things, specially the LabSim ... very industry like. That inspired me to put more effort to get a deeper understanding and to implement the knowledge I could get from it (Bernie, Kuwait, Site 1, student interview excerpt).

Taking the teacher’s perspective, Georgina underscored the practicality of the LabSim™, particularly in those circumstances where it is not possible for the students to use a live environment where they could practice what they learn in theory:

> The integration of the LabSim in the subject was really helpful because a pure technical subject like this should have some hands on practical activities. Because we cannot give them a live environment, giving them a simulated environment like the LabSim is as close as it can be (Georgina, Site 1, teacher interview excerpt).

In summary, the use of communicative media (e.g. blogs and discussion forums) was perceived as problematic. Some teachers and students were dissatisfied with the use of these technologies, specifically in relation to supporting reflection, discussion and collaboration. The main sources of this dissatisfaction are evident in the findings of this study. First, although social constructivist theories of learning suggest that students learn best through collaboration, dialogical conversations and critical thinking, for some students their willingness to learn collaboratively and to participate in the communicative environments was inhibited by a number of socio-cultural factors such as cultural differences and attitudes towards cultural diversity. Secondly, although these types of skills and interactions are promoted at the level of policy (e.g. through stated graduate attributes), the fit between these types of reflective and dialogical activities and the culture of computing science (Dijkstra et al. 1989; Lynch et al. 2001) is not necessarily good, such that computing students do not necessarily understand the potential value of engaging in the reflective, dialogical learning activities afforded by communicative media.

By contrast, while the use of communicative media appeared to be problematic in the context of this study, the use of interactive and adaptive media in the form of the LabSim™ (laboratory simulator) was a different story. Laurillard (2002) states that interactive media support the investigating and exploring nature of the learning experience. Adaptive media support the experimenting and practising culture that is important in computing education. The learning activities that made use of adaptive media (i.e. through the use of the LabSim™) were well received by the student participants who could see their value. Further, the sorts of activities afforded by the adaptive media did not present challenges to the students’ socio-culturally laden conceptions of, and skills in, learning in the same way that the communicative media did. In essence, the findings suggest that some types of ICT-based learning activities appeared to be a better fit with the expectations and behaviours of international computing students. While some other types appear to offer much potential for developing desired learning outcomes and providing flexibility and accessibility, they may need to be actively ‘sold’ to these students.

5. Conclusion and implications

This study contributes further evidence of the complex issues associated with the effective integration of online tools in learning. The finding that some types of ICT-based learning activities appear to be a better fit
with the expectations and behaviours of computer science students than others makes a significant contribution to computing education because of the implications it has for learning design. The cultural preference found amongst computing students for adaptive rather than communicative media suggests a very significant cultural barrier to effective engagement in online dialogical exchanges, barriers that for some students are not easily overcome. The study sheds more light on the advantages and disadvantages of different types of ICT media, and the need to properly integrate them in computing education scenarios. There is a need for further exploration of the affordances of communicative and interactive media and for the appropriate integration of such media in computing learning activities that best prepare computing students.

References


Online formative assessment in higher education: Its pros and cons

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Abstract: Online and blended learning have become common educational strategy in higher education. Lecturers have to re-theorise certain basic concerns of teaching, learning and assessment in non-traditional environments. These concerns include perceptions such as cogency and trustworthiness of assessment in online environments in relation to serving the intended purposes, as well as understanding how formative assessment operates within online learning environment. Of importance also is the issue of how formative assessment benefits both the student learning and teaching within pedagogical strategies in an online context. This paper’s concern is how online formative assessment provides teaching and learning as well as how lecturers and students benefit from it. A mixed method questionnaire on formative assessment with a main focus on how formative assessment within online contexts operates was used to collect data from courses using Blackboard. Lecturers and students at a comprehensive university were the population. Various techniques for formative assessment linked with online tools such as discussion forums and objective tests were used. The benefits that were famous comprise improvement of student commitment, faster feedback, enhanced flexibility around time and place of taking the assessment task and importance in the procedure for students and lecturers also benefited with less marking and saved on administrative costs. The crucial findings are that effective online formative assessment can nurture a student and assessment centred focus through formative feedback and enrich student commitment with valued learning experiences. Ongoing trustworthy assessment tasks and interactive formative feedback were identified as significant features that will deal with intimidations to rationality and trustworthiness within the milieu of online formative assessment.

Keywords: online formative assessment, formative feedback, student engagement, learning

1. Introduction

Assessment for learning (formative assessment) has been noticeable intonation in assessment circles rather than assessment of learning (summative assessment) but the main focus has shifted; the use of online and blended learning has developed drastically in the 21st century higher education learning and teaching environment. Larreamendy-Joerns and Leinhardt (2006, 572) literature review “observed two complementary movements in the educational landscape: the merging of online teaching and learning into the stream of everyday practices at universities, and the increasingly salient role of distance programmes in institutions of higher education”. In an online setting, the non-existence of physical space and face-to-face interaction between lecturers and students leads to diverse techniques of assessing learning in a class.

Assessment is important because it has a strong impact on learning. Assessment is at the core of formal higher education (Angus & Watson 2009). Bransford, et al. (2000) concurs with that assertion as they also mention that assessment is a crucial element for effective learning. How the lecturer approaches assessment impacts on how students identify the class, the content to study, and their own work (Brookhart 1997). Teaching and learning methods must be assessment-centred to offer learners opportunities to prove their emerging abilities and receive backing to enrich their learning. What students understand as imperative is often influenced by assessment (Lemanski 2011; Russell & Barefoot 2011), and a lot of students are not eager to waste time on work that they feel will not contribute directly to their academic progress (Rust 2002) i.e. work which as far as they are concerned is irrelevant. The term ‘backwash’ refers to the influence assessment has on student learning (Biggs & Tang 2011); which means that assessment, and not the curriculum defines how and what students learn. It is clear now that the choice of assessment is critical, and properly aligning the assessment to the learning outcomes can produce a constructive learning practice (Biggs & Tang 2011), although the student is learning for the assessment. Furthermore notably, assessment practices affect students by leading their consideration to certain aspects of module material and by stipulating how to process information. Students focus their determinations towards any material or cognitive abilities they believe will be assessed (Bull & McKenna 2004). Therefore assessment influences what material students spend time learning, as well as the type of learning taking place. Various forms of assessment inspire different categories of learning. They might include formative and summative assessment. For this paper, we will concentrate only formative assessment.
Bloom (1969, 48), states that the purpose of formative evaluation is “… to provide feedback and correctives at each stage in the teaching-learning process” The distinguishing characteristic is “when (the results are) actually used to adapt the teaching to meet student needs” (Black & Wiliam 1998a, 140). Formative assessment plays a critical role in learning environments, specifically embedded formative assessment. It is very important to recognise the value of embedded formative assessment and its role in increasing student learning is essential in not only meeting the intended outcomes of the course, but also in closing the feedback loop in quality online courses. Instruction and assessment are an integral part of each other; thus, assessment should be viewed as a process which lecturers must use throughout the course, not just as an afterthought or for summative purposes at the end. With accountability in mind and the explosion of online learning environments the need for best assessment practices in online learning environments surges.

Formative assessment is usually used in the classroom as a basis of continuing feedback aiming to advance teaching and learning (Hargreaves 2008). It can also be named assessment for learning that takes place during the development of teaching with the purpose to support learning (Vonderwell et al. 2007). Formative assessment activities are entrenched within guidelines to monitor learning and assess learners’ comprehension so that teaching can be modified and further learning is informed through continuing and timely feedback until the anticipated level of understanding has been accomplished. Formative assessments are practical i.e. they improve expertise and concentrate in scheduling, minimise student nervousness, afford students an additional sense of possession as they develop, and, eventually, endorse the conception of the module contents (Smith 1997; Stiggins & Chappuis, 2005; Stiggins & DuFour 2009; Wlodkowski 2008). Unlike summative assessment, formative assessment (a) has a drive more closely tied to lecturers’ teaching outcomes; and (b) presents a potential for refining student learning that is more instantaneously obvious, as well as instructionally appropriate (Knowles 1984). The benefits of formative assessment have been well recognised and research has shown that formative assessment practices are supplementary with enhanced academic achievement (Hargreaves 2005; Hodgen & Marshall 2005; William et al. 2004).

Formative assessment is defined “as the iterative processes of establishing what, how much and how well students are learning in relation to the learning goals and expected outcomes in order to inform tailored formative feedback and support further learning, a pedagogical strategy that is more productive when role is shared among the teacher, peers and the individual learner” (Gikandi et al. 2011, 2337). The merging of formative assessment with technological perceptions conveys the idea of online formative assessment in unfolding this merging. Pachler et al. (2010, 716) used the term formative e-assessment which they defined as “the use of ICT to support the iterative process of gathering and analysing information about student learning by teachers as well as learners and of evaluating it in relation to prior achievement and attainment of intended, as well as unintended learning outcomes”. The Pachler et al’s definition incorporates how formative assessment is applied in all e-learning milieus inclusive of the complementary part of ICT in f2f settings as well as in blended and online learning surroundings. In the same tone, Gikandi et al. (2011), define online formative assessment as the presentation of formative assessment within learning online and blended situations where the lecturer and learners are detached by time and/or space and where a considerable amount of learning/teaching events are led through web-based ICT.

Several researchers (Chung, et al., 2006; Van der Pol, et al., 2008; Vonderwell, et al., 2007; Wolsey, 2008) have revealed the pedagogical prospective of online formative assessment. Nevertheless, it is also of utmost importance further make sure that the learning setting offers the learners enough chances to not only learn actively but prospects to take part in learning which replicates their real-world professional settings. As confirmed by a number of researchers within the environment of online professional learning (Correia & Davis, 2008; Mackey, 2010; Sorensen & Takle, 2005), the characteristics of learning in a community of learners and engagement in dialogue which reveals how knowledge will be applied in real-world practices are therefore crucial in facilitating these developments to support significant learning. The ultimate goal is to support learning that is transferable to changing environments that illustrate 21st century professional essentials. Effective amalgamation of formative assessment in online learning environments has the prospective to offer a suitable organisation for continuous significant collaborations among students and the lecturer, and nurture development of effective learning communities to enable evocative learning and its assessment (Sorensen & Takle 2005). Furthermore, this can deliver a systematic arrangement for effective student support through ongoing observation of learning and provision of suitable formative feedback. Continuing provision for scaffolding learning is crucial in online learning, and can basically be facilitated through continual collaborative cooperation between the lecturer and students (Ludwig-Hardman & Dunclap 2003). This is because it supports
students to engage productively, and assists them in the development of self-regulated learning dispositions. This in turn supports them to take primary responsibility for their learning which is an important requirement for success in online learning. Effective presentation of formative assessment in online learning environments might provide a state-of-the-art pedagogical approach to simplify such prospects (Gikandi et al. 2011). “Formative assessment does not benefit all students if they do not fulfill their responsibility to learn” (Smith 2007, 32). What worked in the past in face-to-face settings does not necessarily work in online environments (Goldstein & Behuniak 2012). The pedagogical theory is the same, however the implementation varies. As Vonderwell, Liang, and Alderman (2007) pointed out, assessment (whether formative or summative) in online learning frameworks incorporates diverse features as related to f2f environments mostly due to the asynchronous environment of interactivity among the online contributors (the lecturer and students). Consequently, it lecturers need to reconsider online pedagogy so that they attain effective formative assessment strategies which provide evocative deep learning and its assessment. Assessment should not merely be vital part of scheming and planning of the modules, but assessment has to start also even before the teaching commences or at the very latest within the first few weeks of class. Students need to be able to exhibit their capability to attempt tasks in an online environment, before learning the content that will be assessed later. As such, formative assessment needs to be done early in an online or blended course to make sure that technological obstacles are not preventing students from succeeding in this environment.

Kigandi (2010) identified ten design principles grounded on a critical analysis of literature in online formative assessment and reliable learning viewpoints.

- The assessment activities need to be authentic by being relevant and meaningful to the learner real life situations and experiences, and seamlessly embedded in the teaching and learning processes. The tasks must be relevant to real life examples and be part of teaching and learning.
- Assessment activities need to engage and support learners in individual construction of knowledge and meaning making them feel free and confident to use their previous knowledge and experience.
- Assessment activities need to provide learners with opportunities to construct knowledge. Students should be allowed to share information with their peers online like in discussion forums.
- The assessment activities need to be accompanied with opportunities to provide formatively useful, ongoing and timely feedback. Elaborated, timely feedback not based on marks should be provided to students by both the lecturers and peers.
- The assessment activities need to be accompanied by analytical and transparent rubrics that assist the learner to clearly understand the expected level of achievements. Such rubrics enhance student preparation for the submission of tasks and builds confidence in students to know that marking will be transparent.
- The assessment activities need to create opportunities that engage learners in meaningful reflection. Students must be allowed to reflect on their own understanding, i.e. self-assessment to motivate them towards achieving set outcomes.
- There is need to provide opportunities for ongoing documentation and monitoring of learner achievements and progress over time. This will nurture students to be self-sufficient and the lecturer will also reflect on students’ progress.
- Teachers need to be more explicit in stimulating shared purpose and meaning of learning and assessment activities. There should be evidence of alignment of teaching outcomes and assessment criteria.
- The assessment activities need to involve learners in multiple roles. Students should be part of planning assessment like choosing which rubric or what design of the rubric should be used to assess their tasks.
- The assessment activities need to be flexible and provide room for multiple approaches and solutions. Opportunities must be provided for students to reflect by looking at the rear mirror of their understanding of the topic as well as how they have developed to be independent thinkers.

These principles were very useful is the design of the assessment tasks used by lecturers in this paper.

Wilson et al. (2011) also found that use of computer-administered multiple-choice questions as formative assessment had an encouraging influence on student enactment. Marriott and Lau (2008) used e-assessments, and established that they are useful in the development of student engagement and motivation for learning.
Results revealed that e-assessments had a vital role in the teaching and learning practice (Marriott & Lau 2008). There is an ongoing argument as to whether e-assessment, particularly in the commonly used form of multiple-choice questions, can benefit deep learning (Jordan 2009), however research has established that well-designed assessments, including multiple choice questions, let assessment of higher cognitive functions, such as critical thinking and analysis skills (Brady 2005; Leung, et al. 2008; Draper 2009). It has been brought to light that students learning for a multiple-choice assessment concentrate on understanding and comprehension, whereas when preparing for a long-answer-type assessment they concentrate on recollection of facts to replicate in their answers (Leung, et al. 2008). Multiple-choice and continuous-assessment approaches were noted to be the favoured techniques of assessment by students (Furnham et al. 2011), therefore it is anticipated that they will inspire engagement, and escalate motivation and learning (Trotter 2006). Dermo (2011) found that student engagement with formative assessment, particularly the feedback, was a challenge and proposed that students can be engaged with low-stakes grades with formative tasks.

In addition, the delivery method in online learning environments allows for opportunities in student learning that are unique to this type of learning environment. Technology plays a positive roll on student learning (Bakerson & Rodriguez-Campos 2006), and provides an opportunity for closing the feedback loop. If done correctly, online learning environments can “provide student and lecturer with richer, more immediate feedback” (Bajzek et al. 2008, 1) which, in turn, will increase productivity and learning. Assessment in this type of environment benefits students and instructors (Dewald, et al. 2000). At all levels of education from pre all the way to higher education, accountability has a firm grip that is not going to loosen anytime soon.

Reliability and validity issues surmount in online assessments, however interactive, formative embedded feedback address these threats of reliability and validity. For All aspects of embedded formative assessment, technology can be used for implementing and fostering enhanced student engagement through learning experiences. The following discussion is the procedure followed in investigating how and if formative assessment in an online course improves learning.

2. Methodology

The lecturers and students using Blackboard, a VLE platform in a comprehensive university in Eastern Cape comprised the population. The sample included 2 modules, one form Faculty of Education and the other from the Faculty of Science, Engineering and Technology made up of two lecturers and 220 first year undergraduate students in 2013 term 2.

In both modules, online discussion forums and multiple choice tests were introduced in Blackboard as modes of formative assessment. Two processes were followed firstly; topics were posted in the discussion forum for interaction after class activity based on that particular learning outcome. Only participation in the discussion forum had grading not the content. An assignment then followed for individual/group submission and grading. Secondly, a pool of objective questions (multiple-choice, true/false) was uploaded online. Students were allowed two (2) attempts to answer after getting feedback online. They also had time to revisit their reading material before making next attempt based on the scaffolding their received from the automated online feedback. The test items were randomised to avoid memorising answers. Feedback was immediate after submission but only included submitted answer and feedback, no correct answers in the first attempt, and then the correct answer would be shown in the second and final attempt. These tasks were not graded. A summative test would follow a week later based on the same learning outcome. Then at the end of the semester, students and staff surveys were conducted on how both the lecturers and students felt about the process with questionnaires that were given to students and staff after the summative assessment. An interview was also held with a few students to confirm or expatiate on some responses from the questionnaire.

3. Results

Responses from students on the use of discussion forums were mainly positive although there were some challenges identified. Mostly students praised online discussion forums as informative and guiding in concepts dealt with in class. By the time they have to write the summative assignment, such discussion forums have moulded their thinking to be more focused and intended outcome oriented.
Examples of such positive comments are:

“I have certainly learned a lot through this discussion not just from my own work but also from the other students”

“It requires us to think out of the box”

“It contributed to the communication between fellow – students”

“It encouraged me to read more”

“It kept me focussed and curious”

“It made me understand concepts much easier”

“A relaxed atmosphere to ask my peers”

“Could respond anytime, anywhere”

“Guidance from the lecturers kept me on track”

“Comments from peers helped a lot towards preparing my assignment”

Negative comments included:-

“Challenge to access internet”

“I had to filter good facts from bad ones when compiling my assignment”

“Some peers said negative things in their responses”

On the use of formative objective tests, the table below shows the students’ responses in % using Likert scale ranging from strongly agree (SA), Agree (A), Not Sure (NS), and Disagree (DA) to Strongly Disagree (SDA).

**Table 1: Students’ responses on formative tests**

<table>
<thead>
<tr>
<th>Items</th>
<th>SA</th>
<th>A</th>
<th>NS</th>
<th>DA</th>
<th>SDA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online tests are more accessible than paper-based exams.</td>
<td>70</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marking is more accurate, because computers don’t suffer from human error.</td>
<td>80</td>
<td>20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The technology used in online assessments is reliable.</td>
<td>55</td>
<td>25</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Online assessments favour some students more than others</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Randomised questions from a bank means that sometimes you get easier questions</td>
<td>55</td>
<td>20</td>
<td>25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feedback given was fast</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feedback was easy to understand</td>
<td>60</td>
<td>40</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feedback scaffold my learning</td>
<td>22</td>
<td>70</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multi attempts were helpful</td>
<td>68</td>
<td>32</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improved my engagement with learning</td>
<td>70</td>
<td>20</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Took serious preparation for test 1st attempt than 2nd one</td>
<td>20</td>
<td>60</td>
<td></td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Online assessment can do things paper-based exams can’t</td>
<td>50</td>
<td>10</td>
<td>40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Online assessment can add value to my learning</td>
<td>20</td>
<td>70</td>
<td></td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Online assessment is just a gimmick that does not really benefit learning</td>
<td>10</td>
<td>40</td>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Online assessment goes hand-in-hand with e-learning (e.g., using Blackboard)</td>
<td>20</td>
<td>60</td>
<td>10</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

There was larger inclination for online (83%) assessments, with only a few students declaring a preference for traditional assessments. Students, who favoured traditional methods of assessment, also indicated that “the online assessments are valuable to strengthen knowledge. Nonetheless if the computer crushes or if your
international disconnects, that can be very painful. For this reason I favour traditional assignments”. The most frequent reasons students gave for the preference of each type of assessment are given in Table 2.

Table 2: Reasons given as to student assessment preference.

<table>
<thead>
<tr>
<th>Traditional Assessment</th>
<th>Online Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Used to these types of assessments</td>
<td>Less stressed/less stressful</td>
</tr>
<tr>
<td>Might forget to do the online assessment</td>
<td>Less pressure/more relaxed</td>
</tr>
<tr>
<td>Easier</td>
<td>Convenience</td>
</tr>
<tr>
<td>Prefer preparing for larger assignments</td>
<td>Can do it at home</td>
</tr>
<tr>
<td>Less affected by computer problems</td>
<td>Can get feedback quickly</td>
</tr>
<tr>
<td></td>
<td>Can organise the time to complete it/do it in own</td>
</tr>
<tr>
<td></td>
<td>Easy to access and submit</td>
</tr>
<tr>
<td></td>
<td>Easier to focus</td>
</tr>
</tbody>
</table>

Responses from the lecturers were:-

All the lecturers were positive about the advantages in terms of less marking time (65%) the reduced marking load (88.3%). Their perception was that online assessment is better than pencil and paper assessment. These must be the innovators, early adopters which are the first group of people who accept an innovation and are able to work within the technological arena.

The academic staff perceived other advantages they observed in e-assessment, for example what e-assessment has changed or improved in students’ learning, responding to the question whether e-assessment helps students to learn better. Group work in assessment tasks seems to have been made easier and they also retain more knowledge, which shows that e-assessment is more learner-centred and there is more practice, especially if it used formatively.

Table 1: How has e-assessment affected your marking load?

<table>
<thead>
<tr>
<th>Item</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>It has reduced it dramatically</td>
<td>68.3</td>
<td>31.7</td>
</tr>
<tr>
<td>Marking essays is quite challenging because you have to download</td>
<td>75</td>
<td>25</td>
</tr>
<tr>
<td>Easy to mark objective tests</td>
<td>93</td>
<td>07</td>
</tr>
<tr>
<td>Time is reduced</td>
<td>65</td>
<td>35</td>
</tr>
</tbody>
</table>

As for compatibility the results suggest that e-assessment accommodates the needs of academic staff and they feel comfortable in using the innovation.

4. Discussion

Formative assessment was used as a central part of teaching as the students were given two attempts on their objective tests. Implementing this system of formative assessment during the semester provides students the prospect to: study before each of the first attempts on the tasks; complete the task, view the results and feedback, and make use the feedback to study further before attempting again; retake each question; and use the results as final preparations for the summative test. In addition, because all items on the summative final test are drawn from the formative quizzes, the prospect for students to master the content is considerably high. It has been proven that utilising the same content from the quizzes as ‘feeder items’ for the summative test, is exceptionally valuable.

From the comments and results above, like “Comments from peers helped a lot towards preparing my assignment”, it shows that students appreciated and enjoyed online formative assessment. The majority of them are very positive about the process as it has nurtured them to better understanding and more learning. Students’ success rate can be affected by a lot of factors even when using formative assessment. These might include opportunity to (a) realisation of gaps in content; and (b) revisiting certain topics that had been covered.
but unclear. This then serves as an important factor influencing students’ definitive achievement. As stressed by Smith (2007, 32), “formative assessment does not benefit all students if they do not fulfil their responsibility to learn”. For instance, if students are given a specific number of attempts, and the lecturer uses the average scores rather than substituting taking the highest mark, students are encouraged to study before each attempt.

As much as some academics have a feeling that giving students second attempts is compromising the reliability of the assessment’s results, as well being inappropriate and, at worst, as tolerating students’ dishonesty, actually, affording students a chance to learn from their mistakes encourages the fundamentals of the educational system and in so doing developing honest competency (Chappuis & Chappuis 2008; Phelps 2010; Renfro & Grieshaber 2009; Smith 1997). Strategically, students also end up believing that the institution and lecturer support their learning. It promotes emphasis on student development, rather than on just examinations. This strategy inspires students to study numerous times, as well as it fights anxiety that might restrict the student’s exact demonstration of his or her understanding. Such efforts guarantee that the summative final test is an assessment which measures the students’ achievement of the intended outcomes of the module. Such a tactic also ensures that the final assessment is representative of the module’s efficiency; it works out as an exact summary of the content learned. The lecturers also felt closer to their students during the discussion forums as a result even shy student asked questions for clarity and there was better engagement with them than in a normal class.

5. Conclusion

Although formative assessment can help all students, it produces predominantly good results with low achievers by focusing on specific glitches with their work and providing them with a clear comprehension of the mistakes and how to correct them. Good formative assessment is not easy to achieve, taking into account the pressure from the public/parents, students themselves to produce results, and requires a jump of confidence by the teaching fraternity. The Blackboard selection is just one of the good effects of our technology focused eras. Some of the benefits of implementing e-learning for formative assessment can be specified as follows: It provides immediate feedback to the students so that the learning route ensues without deferment compared to traditional classroom based method, the possibilities to generate comprehensive feedback supports the student to find a solution for his/her slip-up, with appropriate clarification, it creates an attractive learning feature for the students as they do the assessment online and it shows the scores to the students so that proper assessment on one’s situation in terms of topic knowledge is clarified.

Learner and assessment-centered approaches can offer a framework for moving away from the traditional viewpoint of attaining knowledge towards a new viewpoint that is compatible with active learning relevant to the 21st century learning. While acknowledging that there may be other ways of creating such a learning environment, application of formative assessment within the context of online learning is a viable option to achieve this. Online formative assessments are, somehow, more privatised efforts to learn; and, especially if students are afforded several attempts and average scores are used, they offer a much greater prospect to great achievement (Rovai 2000). I have observed that, with undergraduate students, the use of formative assessment is an irreplaceable and extremely valuable technique to enhance student understanding and supporting achievement. In essence, formative assessment leads to students being able to measure their own progress. It is also a tremendous value to lecturers as it can provide very important feedback about what exactly students are learning; the exact nature and extent of their difficulties.

Lastly, in recent years, as e-assessment tools become progressively used, lecturers benefit in both marking time and administrative costs of mark compilation, while for students, online quizzes give prompt and comprehensive feedback and prominently enhanced flexibility around the time and place of taking the assessment task. To enhance the feedback or online correspondence expected from the part of the lecturer, other Blackboard tools like discussion forum and virtual class room can be used.

References


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It Takes a Community to Develop a Teacher: Testing a New Teacher Education Model for Promoting ICT in Classroom Teaching Practices in Chile

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Abstract: This paper adds to the emerging dialogue on best practices in teacher education for preparing future teachers to use technology to promote grounded theory-based practices in their classrooms. In it, I report on an evolving model for such training that resulted from a longitudinal case study examining how teacher trainees' identities, learning and teaching practices changed when exposed to the use of a variety of social networking technologies for language learning in the context of their teacher preparation program. The 12-month classroom-based case study was conducted at a private university in Chile, using a variety of ethnographic tools. I investigated how the integration of certain ICTs into content courses, as opposed to more traditional stand-alone courses on technology use, mattered both in terms of the way the participants viewed themselves as learners and as future teachers of language, as well as of their evolving perspectives on the use of technology for learning and teaching. My aim in conducting the study was twofold: 1) to determine whether innovative technology-infused (TI) courses would serve to enable the beginning teacher participants to shed their traditional, passive, rather narrow cultural mindset as individuals and learners that are contrary to the identities of effective, 21st century teachers; and 2) to see whether opportunities to use a variety of innovative technologies for learning would have an influence on the pedagogies these individuals employed in their teaching practices. While the longitudinal study provided encouraging signs on both accounts within the teacher preparation program, questions remained about whether the model would be supported where it mattered – in ‘real’ classroom teaching. In this article, I report on follow-up qualitative and numbers-based findings that suggest that, generally, the positive changes were not sustained. These findings provide strong support for the need for teacher education models to be tested in ‘real’ practice. Importantly, they also uncover the essential ingredient for promoting future teachers’ uptake of effective use of ICT’s – collective support from all stakeholders within the Teacher Education community.

Keywords: ICT in Teacher Education, 21st century teacher identity, ICT-based Teacher Education model, ICT in practice teaching, community-supported teacher training, Teacher Education reform in Chile

1. Introduction

‘I hope Chilean organizations ‘would’ have a better role in the future. Nowadays, Chilean people are losing their fear to defend what they want and think if its (sic) correct or not. What we really need as a country is to open our minds to the different opinions and try to be tolerant ...and aware of what is happening around us.’ (Online post, Marcela, April 2013)

Marcela is a student in a group of pre-service teachers, participating in a 4-year teacher-training program at a large university in Chile. Her comment was posted in an online forum, a virtual site that played a central pedagogical role in a 3rd year English as a foreign language (EFL) course that formed part of the teacher training program. Her words, which are at the same time critical and informed, are atypical of Marcela and many of her classmates. She, like her peers, often struggled to speak in class and to share her views especially on subjects related to political and social issues. Marcela explained her lack of voice in the classroom to her feelings of linguistic inadequacy in front of others and her lack of knowledge and interest in issues beyond her own immediate life. Yet, later in the course, in the online forum, when asked to respond to an article and video on Civil Societies, Marcela adopted a different identity – one of a more empowered, critically-minded and informed individual, when she speaks about the roles that Civil Societies should take and how her Chilean society is changing. Whatever the reason for the dichotomy in learner identities that Marcela displayed earlier in class and then later online, it was clear that the ‘in-class Marcela’ did not reflect the kind of teacher identity that teacher education (TE) courses are trying to foster. Indeed, Marcela’s ‘in-class identity’ put her at risk of failing to become an effective teacher who would be able to provide the right kinds of knowledge and experience that her future students would need, to become ideal 21st century citizens.
From March, 2013 to July, 2014, over three semesters, I conducted a study of Marcela and her classmates in an attempt to uncover what influence introducing ICT through my technology-infused language courses would have on Marcela and her classmates’ emerging teacher identities, as well as on their perspectives of teaching with technology. While technology is being increasingly understood as the driving force in educational change, its importance and influence on pre-service teachers’ identities and their own learning and evolving teaching practices, seems to be overlooked in many teacher-training programs. This lack of in-depth discussion on the philosophical and practical issues surrounding technology use that teachers require in the 21st century, is a critical oversight especially in contexts where educational reform, amid other changes, is most needed. Chile is such a context. Despite the relative economic stability Chile enjoys in Latin America, resounding cries for reform in education resonate across the country and are being heard worldwide. The cries reflect a system rife with inequality and caught in traditional industrial-age teaching approaches where information transfer and memorization are still common. Literacy levels are well below international standards and results from OECD standardized tests in many subject areas, are often disappointing. Not surprisingly, teachers are bearing much of the blame, and initiatives to improve teacher training are only beginning to receive government support (Charbonneau-Gowdy, 2012). Regardless of the good intentions of these efforts, technology seems to be off the radar in such teacher preparation programs, or limited to a chapter or two in methodology courses. Without an emphasis on technology, or worse, a critical awareness in the selective use of technology, teacher trainees in these programs risk repeating the very practices that the system is hoping to change. Ignoring such a risk represents a significant concern given that many of these individuals are in the process of forming pedagogical, and importantly, personal beliefs that could potentially influence thousands over the life of their careers.

The aim of the classroom-based study in which Marcela and her classmates participated, was in part to determine if the TI content courses in language learning with a hands-on selective use of technology, would lead to signs of Marcela and her classmates constructing evolving 21st century identities as language learners and future teachers. It was also aimed at determining if the exposure to opportunities to develop 21st century skills supported by technology would have implications for their own use of technology in their teaching practices. The study focussed on developing a preliminary model for course design that could offer a practical example of how TE programs might incorporate the use of technology in their curriculum planning, in order to exploit and promote its advantages in preparing teachers to be effective educators and users of technologies in their own classrooms. The rationale behind developing the model is that conventional teacher-education programs in Chile in particular, may have limited relevance in preparing teachers for responding and teaching students, who are increasingly mediating their social, communicative and informational needs in digital spaces. I also argued that without offering practical hands-on guidance towards meeting these needs during the teacher formation stage, the prevailing practices of analog epistemologies and classroom hierarchies would most probably continue to flourish (Thorne & Reinhardt, 2008: 562) – not the fertile ground for developing critical thinking, innovation, teamwork and the strong communication skills that success in this new millennium is demanding. Nor would this prolonging of the current educational scenario lead to developing the kinds of citizens that social change agents in Chile, as elsewhere, are so desperately seeking.

2. Perspectives/theoretical framework

Facing the new realities of teaching offers multiple and complex challenges as anyone involved in education can attest. In a recent study of five novice teachers, He and Cooper (2011) observed that novice teachers bring their personal experiences and beliefs with them into TE programs (Beijard, Meijer & Verloop, 2004; Levin & He, 2008). Understandably, for teacher candidates torn between developing content knowledge and facing classroom practice for the first time, it is little wonder that many assume the teaching methodologies of their past or have much time for reflecting on the teacher identities that they assume in their first teaching in classrooms. The theories they are being exposed to in their TE programs and the personal resources they bring to their first practice classrooms seem to take a backseat. Instead, intuition and repeating practices that they are most comfortable with from their own previous schooling seem to take precedence. For example, in my experience as a teacher educator, while many of the pre-service teachers attest to spending considerable time interacting and discussing online with friends and acquaintances or working on a project that is due in the context of their university program, when they enter the classroom as practicing teachers they seek silence and demand students to quietly work alone, often banning the use of digital devices. Or even more surprising, while students in my TE courses will claim to be digital natives, at the same time they will plan their lessons for their teaching practices entirely based on textbook exercises and paper-based resources.

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Despite the pressure that the explosion of new technologies is having on traditional learning practices in our everyday lives (Lund 2014), the use of these networked-based technologies still seems to be ignored or misunderstood in some of the TE programs with which I am familiar. Yet, educational theories that have emerged over the last thirty years and that have led to deep shifts in the way we view learning, point directly to the value of some, although not all, of these technologies in promoting the kinds of changes to which 21st century educational aims aspire. The highly influential theories that emphasize the social-based, dialogic nature of learning (Vygotsky, 1978; Bakhtin, 1994) and that view learning as an act of moving peripheral participants to legitimate participants through promoting of a community of practice (Lave and Wenger, 1991), are deeply reflected in many social communication technologies currently available and their expanding affordances – blogs, wikis, gaming, audio/video web conferencing and virtual worlds. Also, in the context of the use of these tools, theories of identity, especially of interest in the field of language learning (Norton, 2011), have helped to draw a close connection between the use of technology and social change. Indeed, it is being increasingly recognized that the use of technology in our everyday lives is not only profoundly influencing what and how we learn, but also who we are as individuals.

Given the grounded theories mentioned above that would support and promote the use of certain technological tools in formal education settings, as well as a cross-section of more recent research support, (see Varli 2013; Carpenter & Krutka 2014; Kop et al. 2011, for example), the adoption of technology in classrooms has not been without challenges. In many cases, these challenges are deeply imbedded in traditional perspectives of learning at the teacher level and TE programs that fail to alter such views. Recent discussions around the limitations of teachers employing technologies in their practices has led to models targeted at teacher educators, such as the Technological Pedagogical Content Knowledge (TPACK) Model (Misha & Koehler, 2006; see figure 1). The model has been considered promising especially for pre-service teacher instructors who are seeking answers to the challenges they face in preparing teachers to use technology (Polly & Brantley-Dias, 2009). The model supports the idea that at the basis of effective teaching lies the complimentary combination of pedagogical, content and technological knowledge in a way that requires an understanding and the negotiating of all three.

![Figure 1: The technological, pedagogical content knowledge model (TPACK). From http://tpack.org, Used with permission.](image)

Yet, while models such as TPACK help us to explain the rationale in incorporating content and pedagogical knowledge building with technological training in TE for example, they fall short in providing what that training would look like in ‘actual’ TE practice. Calls for further research to determine activities and course designs that would support the kinds of advantages that a teaching framework such as TPACK could lead to, underline the urgency of adapting such a model to specific contexts (Cox & Graham, 2009; Wetzel et al., 2014). Part of this call is in response to the emerging recognition since the beginning of the century that stand-alone technology training courses, where they do exist, are not providing optimal incentive for teachers to incorporate technology into practice (Bielefeldt, 2001). Increasingly, seeking alternatives to stand-alone course approaches are resulting in discussions around the value of incorporating technology practices into content and/or methodology courses.
As a follow-up on the TPACK model, in an effort to connect theory to practice, a number of studies have been conducted to determine the development of TPACK in pre-service teacher candidates. Some of these studies, (Pamuk, 2011; Chai et al., 2010) have had rather limited application. They have been confined to examining teachers in a narrow subset of the teaching field, for example, future teachers of technology, or future secondary teachers only. Among these studies and relevant to our own preoccupations in the Chilean context, is Ögün Koca et al’s (2010) inquiry. In their attempts to combine concurrently the development of pedagogical, technological and content knowledge in a course for pre-service secondary teachers of mathematics, data from participant surveys and assignments indicated that development was connected to changes being constructed in the identities of the participants from learners to teachers of mathematics. Also and more recently, Wetzel et al., (2014) seeing the need for studies that are longer term and that are not contained only to pre-service secondary teachers, examined the transition from stand-alone technology programs for teachers from K-12 to two technology-intensive methods courses. Data collected through recorded interviews clearly indicated that “greater modelling of hands-on learning with a focus on content and pedagogical uses of technology from trained instructors” (2014: 89) was required for pre-service teachers becoming more confident teachers of content with technology. In other words, their findings suggest that there is a potential for positive identity changes, i.e. confident teachers, and the adoption of technology in teaching practices of future teachers, if the conditions of teacher instructor modelling and sustained content-based hands on practice with technology are met. Yet, their study’s findings were limited only to the pre-service teachers’ perspectives of whether they would incorporate technology into their future teaching practices. No evidence was sought on actual teaching on the part of these individuals. Indeed, at this point, little follow-up of pre-service teachers’ adoption of ICT in their actual classroom teaching has been conducted (Gao & Mager 2013).

A recent study in TE for English as a foreign language, conducted in Taiwan by Tai (2015), was also based on the TPACK model. It investigated the impact of TE workshops on 24 teachers’ classroom practices. Her findings revealed there was an impact on the teaching practices of the participants, in terms of their competencies and motivation to use technology in their teaching. On the other hand, the results weighed heavily in favour of teachers using ICT tools for content learning and rote practice of language skills. Findings were less impressive in terms of the teacher participants using tools to promote 21st century skills, not surprising given that the majority of tools that were modelled in the workshops favoured language practice tools rather than social media-based, communicative ones. It is these latter social media-based tools, on the other hand, that have the most potential for fostering 21st century learning and identity changes.

This connection between identity change and the incorporation of technology into teaching practices suffers from a dearth of attention in the research in technology in general, not to mention in TE. Yet the connection is an interesting and a crucial one (Warschauer, 2011 Gee, 2003). Indeed, in the educational contexts of evolving countries, such as Chile, where TE and its success are determined by the extent to which these TE programs produce individuals who can be the drivers of deep social changes, the degree of empowerment of these future teachers to combine their pedagogical, technological and content knowledge and skills in their practices at the classroom level is essential. As Wetzel et al. remark (2014), the alternative of: “waiting for the ocean liner ...to turn” (p.101) in referring to expecting direction for change to come from above at the institutional or ministerial policy level, requires accepting only distant hope (Charbonneau-Gowdy et al. 2012).

In the field of language learning wherein lie our particular research interests, Warschauer (2003), for example, has shown through his extensive work in K-12 schools, including those in low socio-economic status (SES) classroom environments, that improved integration of technology in schooling combined with teachers’ abilities to promote critical thinking, entrepreneurship and innovation among their students, are key factors in tackling the major challenge that formal learning contexts face today. The challenges he refers to are in updating teaching and learning practices to meet the demands of the 21st century (2003: 17). Warschauer’s findings offer further evidence that those teachers who themselves have the identities of enlightened 21st century citizens and who use technology in their teaching practices to promote the skills that are needed for this century, will be the leaders of social change. His work opens the door for research that is needed to find ways to promote the development of teachers with such a profile.

Warschauer, like a growing number of educator/researchers, is aspiring to promote 21st century effective teaching approaches with technology based on a sociocultural view of learning. A sociocultural approach assumes that learning is a context-specific social-based activity. From this perspective, learner agency and interaction with more capable others, including peers is critical to cognitive and human development as well as
to autonomous and life-long learning. Recent research in technology in foreign language education has also underlined the essential role of TE in fostering the kinds of teachers with profiles that reflect a sociocultural approach to teaching/learning with technology. This research points to the need to form teachers that can a) incorporate learners’ recreational, non-institutional digital practices into formal and instructional activity (Meskill 2013), b) who view technology as an opportunity for learners to develop socially and psychologically throughout life, rather than finished products or commodities (Norton and McKinney 2011) and c) who see the value of social media technology to promote collaborative dialogue and collective cognition and where learners can experience new ways of being (Lund 2013).

In the Chilean study that I conducted, I described and shared the results of my individual researcher/instructor’s initiative to put in place such conditions in TE and to foster such a teacher profile in my pre-service teacher students. This initiative included my instructor modelling of the pedagogical use of technology within a content course on language learning. I sought to offer the pre-service teachers opportunities to participate in the hands-on use of various social-based technologies in constructing their knowledge of content and pedagogy as well as their 21st century learning/teaching skills. The research questions that guided that study were:

1. In what way do the technology-infused activities and assignments that form the basis of language learning courses for pre-service teachers of English as a foreign language influence their learner and teacher identities?

2. What are the implications of these technology-infused courses on the pre-service teachers’ learning and teaching practices?

3. Method

In the study, I used a case study methodology from the qualitative research paradigm because of the opportunities this research method affords to describe and explore a phenomenon and where context is essential to that exploration. Meskill (2013) argues that when it comes to researching learning and teaching with technology from a sociocultural perspective, the tools used to observe and study these contexts must be sensitive to the complex local as well as multi-contextual factors – for example, social, cultural, institutional, historical and political factors operating within these human activity settings. Such tools are available within the qualitative, ethnographic paradigm.

An explanatory case study methodology allows practitioners to examine communities and programs through a variety of lenses or data sources, and thus to evaluate them (Yin, R. K. 2003) which was a partial aim of the study. A qualitative case study supports the process of deconstructing a phenomenon, in this case the innovative series of courses, and reconstructing it in order to understand its multiple facets and the program effects. Another advantage of this approach is the collaborative relationship between researcher and participant and the emphasis it places on participant voice (Baxter & Jack, 2008). A collaborative relationship was fostered through shared researcher/participant responsibility for the teaching activities during the courses and six hour per week contact hours. Formative data collection and analysis allowed me as researcher/practitioner to adjust and improve the course design over the research period. The phenomenon that was explored in the study was a series of three innovative TI language-learning courses and the influence of these courses on students in the TE program. The view of this long-term initial study was confined the influence on participants as they mediated their learning and development as teachers within the context of the TE program. Reference to what was happening in actual practice teaching sessions in schools was reported by a few of the participants, but only anecdotally.

In a second follow-up phase of the study (See Table 1), ethnographic tools – individual and group interviews plus a questionnaire, were used to further elicit data with a group of 23 of the participants, and focussed on 16 of whom had been part of the original study. At this point, these individuals were in their final semester and were spending 24 hours per week in elementary and secondary school classroom teaching settings. The aim of this phase was to widen the research lens and examine whether there was an influence of these TI courses on the teaching practices of the participants in ‘real’ classrooms. In this phase, a Practice Teaching Supervisor (PTS) was also interviewed. The PTS observed the pre-service teachers’ classroom teaching on two occasions during the semester as well as offered individual guidance and support to the participants. The recorded and transcribed data from the PTS interview provided a further “insider” perspective to the findings and served to help prevent researcher bias.
In the next section, I describe details of the longitudinal study and report both the findings of that study and then of the follow-up phase.

3.1 Context

The longitudinal study began in 2013 with the first in a series of 3, 4-month courses in language learning, based on the theme of Global Issues. The participants involved 3 successive groups of 16, 24 and 18 pre-service teachers respectively, although a core group of 12 students assisted in all three courses. These groups collectively consisted of 8 males and 50 females. The students began the series of courses in their 5th semester of an 8-semester program. The courses, which took place at a large private university in Santiago Chile, were innovative in theme and design. Generally, other Program courses, including earlier language courses taken by the pre-service teachers in the English Language Pedagogy Program, were textbook-based and the use of technology was limited to PowerPoint and audio/video resource materials. It is important to point out too that previous to the IT-infused Language courses, the participants had had only 2 brief stand-alone courses in the use of technology. These courses offered didactic instruction on how to use Microsoft Word, Excel, PowerPoint and Videomaker for editing videos.

The content courses that I initiated sought to exploit social-based technology tools for language learning. Emphasis in the teaching approach was on student-driven and generated ICT materials. The technologies used to support the innovative pedagogy that I was implementing in the Language courses included: a) a student and instructor built class blog for weekly discussion and comments; b) group Skype calls with native speaking subject experts for student-led discussions; c) cellphone recorded audio rants on global themes; c) Web-based reading, writing and listening activities; d) use of MS Office for peer feedback and evaluation; e) individual weekly journals shared through group e-mails.

To help answer the research questions, data was collected from a variety of sources (see Table 1). These multiple data sources served to clearly enhance the credibility of the findings and each source served as a piece of the puzzle (Baxter & Jack, 2008: 554), which contributed collectively to understanding the whole innovative course phenomenon and its implications for the pre-service teachers.

Data analysis

In the first phase of the study, data collection and its analysis took place concurrently throughout the 12-month period of the study. To ensure credibility, ongoing discussions with students in the program were conducted to verify that the assertions and conclusions that were being made in the analysis reflected the views of the participants. The data from all sources was organized around three themes that surfaced in the initial stages of the analysis. In the second phase, data was collected over a 4-week period in the latter part of the semester. This data was also coded and examined for emerging themes. In the following sections, I briefly describe the results under those themes.
### Table 1: Research design, data collection and analysis overview

<table>
<thead>
<tr>
<th><strong>PHASE 1</strong></th>
<th><strong>RESEARCH QUESTIONS</strong></th>
<th><strong>METHODOLOGY</strong></th>
<th><strong>INNOVATIVE COURSE DESIGN AND TIMELINE OF IMPLEMENTATION</strong></th>
<th><strong>DATA SOURCES ANALYSIS</strong></th>
</tr>
</thead>
</table>
| 1.         | 1. In what way do the technology-infused activities and assignments that form the basis of language learning courses for pre-service teachers of English as a foreign language, influence their learner and teacher identities? | Qualitative Explanatory Case Study | Series of EFL courses using innovative program design infusing the use of technology | - Observations  
- Blog conversations  
- Group Interviews  
- Student journals  
- Audio files  
- Field Notes  
- Formative analysis linking data to propositions |
| 2.         | 2. What are the implications of these technology-infused courses on the pre-service teachers’ learning and teaching practice? | | 3 Courses offered, 4 months each during a period of 18 months, 12 months total instruction | |

<table>
<thead>
<tr>
<th><strong>PHASE 2</strong></th>
<th><strong>RESEARCH QUESTIONS</strong></th>
<th><strong>METHODOLOGY</strong></th>
<th><strong>INNOVATIVE COURSE DESIGN AND TIMELINE OF IMPLEMENTATION</strong></th>
<th><strong>DATA SOURCES ANALYSIS</strong></th>
</tr>
</thead>
</table>
| 1.         | 1. How has a group of learners’ pedagogical experiences over the course of a 4-year teacher education program prepared them to use SM technologies in their teaching practices? | | | - Questionnaire  
- Group and Individual Interviews  
- Theme-based coding and analysis |
| 2.         | 2. How has this group of pre-service teachers applied, if at all, the knowledge and experience that they have gained with regard to SM, to their intensive practice teaching sessions in their final semester of the program? | | 12 weeks | |

### 4. Results

‘In order for outsiders or newcomers to begin towards becoming “insiders” they need to begin by participating somewhere.’ (Lankshear & Knobel, 2011: 3)

Reporting on the complex phenomenon that takes place over the period of a qualitative case study, especially within a classroom setting, is extra challenging. This is particularly the case when we compare this reporting to that for more numbers-driven research reports (Lincoln & Guba, 1985). An important factor in the reader appreciating the results of qualitative inquiries involves having a comprehensive understanding of the contextual factors that were at play in the lives of the pre-service participants and that were revealed through the data collection process. These factors, based on my proximity and considerable time spent with the participants, are woven throughout the explanation or analysis of the findings and should help the reader to understand conclusions that I have reached. At the same time, I recognize that my account is not the sole way that this data could have been interpreted.

In order to help the reader gain a better understanding of the results, in the next section I present categories that were used to organize the data. Within each category, the key themes that evolved in the data are...
described and examples from the data sets are provided to support the claims made. The themes are organized and listed according to the phases of the study: Phase 1, the longitudinal study and Phase 2, the follow-up to the larger study. After each section, an analysis of the findings and a reflection is provided.

4.1 PHASE 1

4.1.1 Changes in identity

Marginalized Learner Identities

Many of the participants in successive groups of pre-service teachers taking the TI courses displayed learner identities that reflected a reticence to engage in the course in-class activities, especially those that involved discussion. Online data from the forum conversations mirrored a similar lack of engagement – only 7 of 16 students chose to write on the first and second themes. Some of this evidence of what I have come to recognize as a feeling of being marginalized in the classroom, was explained by the participants as a lack of linguistic confidence – or knowledge of content, in this case English. When writing in their initial Expectations Forms for the courses, students expressed what I heard over and over again from other participants:

‘I didn’t talk too much in English because I’m afraid of make a mistake.’

‘[I] don’t [want to] be behind for [from] the rest of my classmates.’

‘I hope [to] stop feeling uncomfortable with my level of English.’

‘[I would like] to learn how to communicate with others.’

‘I think and I hope that they’ve [teachers] got to know that each class has different levels of English because not all of us have the same education so they have to be patient and not ignore that there are many people who are lack[ing] of knowledge.’

Most participants also reported that their previous language education experiences were characterized by information transfer, teacher-led approaches, and that their role was to memorize facts. These approaches led many to lack faith in their ability to express what they wanted to say and thus remained silent. Or, as in the case of Marcela above, they failed to believe that they had any valid opinions at all. Many indeed admitted that prior to the courses, they rarely or ever read newspapers in English or even in their own language.

As the Language courses continued, the daily requirements for participants to read, view and react in writing in weekly journals and to online media news stories appeared to have a dramatic influence on the identities of many of the participants. Lively debates in class and higher order thinking and analysis were evident in online conversations among students even when input from the instructor was less apparent. I observed that growing linguistic confidence coupled with critical and more worldly views were outward signs of some participants developing empowered identities as language learners and increasingly globally aware citizens.

Evolving Learner and Teacher Identities

Over the period of the successive TI Language courses, the course participants took increasing responsibility for choosing the course materials and activities and had access to greater opportunities to use various technologies. Many of these individuals began to display signs of the confidence and leadership qualities that are reflective of good learners and effective teachers as well. Examples of these evolving effective teacher identities were evident in the kinds of feedback they gave to one another after group presentations. Whereas earlier on in the courses, they tended to give automatic top marks and few comments to their peers, later they were more constructive in their feedback and more careful to have their marks reflect their views of the activities being conducted by their peers. I saw these behaviours as evidence of participants having a greater sense of seeing themselves as teachers working to develop their craft rather than passive learners of methodologies. Some spoke of being more empowered in their teaching practice and insisting on certain strategies and approaches despite resistance and hesitancy on the part of their teacher supervisors who were responsible for them out in the schools. Others became more proactive in improving their language skills in an effort to be better able to conduct their classes. When an optional guided technology-based reading program was offered to students in the second course of the series, 10 of the 24 signed up and sustained interest in
more active reading for over 3 months despite the added commitment it meant to their already busy schedules. As the series of courses in the study came to an end, one student had already left for a job in the US to improve her language and be better prepared as a teacher; several others in the group were making similar plans. These and other signs of the general growing self-directed nature of some of the participants’ evolving teacher identities were encouraging indications of future effective educators.

4.1.2 Changes in teaching practices

*Traditional Teaching Practices*

As stated above, the content courses were designed to be a source of development for the participants not only in terms of content knowledge but pedagogically as well. Earlier in the study, despite the various social learning technologies that were being modelled for the participants in the context of the course, many chose to simply use PowerPoint presentations to present their Global Issue topics. Several participants continued to show signs of preoccupation with providing teacher-generated question periods and passive video viewing in their class presentations. I observed that this clinging to old traditional ways of practicing teaching among many of the participants was difficult indeed to relinquish. It was only in course 3 in the series that I saw encouraging signs of change.

*Teaching with Technology*

The changes that began to occur in the teaching practices of some of the participants in terms of pedagogical approaches evolved in tandem with a growing use of technology. This use of technology was evident in the context of their course work. Technology supported games and interactive videos were examples of the kind of tools that some participants used. Importantly, several of the pre-service teachers mentioned that they were beginning to routinely incorporate technology into their practice teaching sessions. I observed too that a few of these individuals seemed more enthusiastic about their teaching, urged on presumably by the apparent engagement of their students in their technology-supported lessons. As Piero and Constanza, students in all three TI courses, expressed:

> Before, I used to just use the textbook to teach my classes, now watching the way you teach listening activities (with the news), I am copying the same strategies. The students really like what I am doing. (Piero)

> This course is more than just about learning a language; it’s about learning good teaching strategies as well. (Constanza)

Based on these comments, Piero and Constanza seemed to recognize the advantages they saw to their teaching practices of the prolonged modelling of effective teaching approaches that they were exposed to and that included the use of technology.

4.1.3 Reflections on Phase 1

> ‘Last semester, I finished my teaching practices. Obviously, I used a lot of technology. I really enjoy (sic) planning my classes and using different tools to engage my students. Sometimes, I tried to imitate your classes. I learned that my classes have to be focus (sic) on my students.’ (Marcela, e-mail August 2014)

The substantial data that was collected and analyzed over the period of the study allowed me to conclude that the sustained modelling of the use of technology had positive implications both for the participants’ evolving teacher identities as well as their teaching approaches. The excerpt from Marcela’s written post-course feedback indicated that she was aware of such changes in herself. The combination of social learning technologies with innovative social cultural-based pedagogy in the context of a content course provided substantial evidence to support the fact that for several individuals in this group of pre-service teachers at least, there was significant development in their approach to teaching and to their professional development as teachers. I based those claims on the dramatic changes to many of the individuals’ ‘ways of being’, i.e their identities, both in terms of learners and as teachers of language that were evident in the data analysis. At the same time, it was clear that the data was collected exclusively in the context of the TE and any reference to teaching in the classroom, as in the case of Marcela, although encouraging, had not been substantiated with follow-up or in-depth research.
The longitudinal study provided valuable insight into a preliminary new model for TE (see Figure 2). The new model goes beyond the earlier TPACK version. In the TPACK model, the three overlapping concentric circles representing pedagogical, technological and content knowledge illustrate the value of combining all three knowledge-making processes in one course. The data findings from the longitudinal study, while supporting the TPACK, clearly indicated the importance of context and personal and professional identity in this 3-pronged knowledge construction process. I argued that these factors are critical in TE planning. Important as well is the fact that the sphere of identity is dynamic in the model, ever moving either forward or backwards in tandem depending on the complimentary growth and development of the connected knowledge spheres and the specific context where that process takes place. From the data findings generated by the longitudinal study and the experiences gathered as instructor/researcher in that process, I saw encouraging hope, albeit hinging closely on further study of the model, for social and educational change.

Figure 2: Adapted TPACK Model for Fostering ICT in Teacher Education

4.2 PHASE 2

4.2.1 Findings in Phase 2

At the conclusion of the longitudinal study, I responded to my own call for further testing of the adapted model (Figure 2). I sought to determine what would happen if that hope was followed-up on with the study of the participants in 'real classroom teaching practice' in their final semester of their TE program. The following are the themes that emerged in the analysis of the data sets (see Table 1) that resulted from the follow-up study.

4.2.2 Power structures in learning with technology

Power structures that existed within the participants’ teacher education program and in their practice teaching context determined the extent to which the participants showed that they were inclined to see technology as an effective learning tool in sustained practice both for themselves and their students. Poor technology infrastructure at the university, as well as heavy academic and personal demands, generally left them with little time to envision technology as a viable learning tool in their classrooms. This apparent lack of inclination to consider technology was further compounded in their practice teaching. In these settings many mentor teachers demonstrated an unwillingness to “allow” their student teachers the opportunities to experiment with current ICT tools in their practice teaching sessions. Kathy, the PTS, reported that in many cases mentor teachers felt threatened by the pre-service teachers presence and abilities to use technology. While lack of technology infrastructure in all but the exclusive private schools could be also be viewed as an important factor, Kathy explained:

‘It’s not really a matter of not having the resources; those things are not expensive. They [the teachers] don’t see how they [using social-based technologies] motivate students for learning.’ (Interview, January 4, 2015).
I understand from Kathy’s unique perspective derived from extended personal contact with all the schools where the practice teaching took place, that the lack of support for viewing technology as a learning tool is intertwined with a lack of insight and fears of a loss of control of one’s established ways of doing on the part of the mentor teachers. The pre-service teachers were not only exposed to poor opportunities to learn best practices in the context of their practice teaching from their mentor teachers. They also had scarce opportunities to use technology for learning in their own academic lives, due to university infrastructure and academic demands beyond their control. Just one semester later, the data sets in the second phase not surprisingly revealed that the participants displayed little evidence of viewing creative possibilities for using technology for the kind of learning that they had had during three semesters in the TI courses.

4.2.3 Power structures when teaching with technology

Questionnaire data, coupled with data from individual and group interviews indicated that the participants had limited modelling of teaching with technology in their TE courses during the 3.5 years in the program. Their courses were mostly characterized by the routine use of PowerPoint, audio files, textbook multimedia materials, You Tube videos or movies for listening comprehension purposes. Examples of social-media-infused teaching, as was the case in the courses that I offered, were barely mentioned in the various data sets. Roxana, one of the participants remarked:

‘Just a few teachers used technology in their classes [sic] and even fewer were willing to teach us how to incorporate [social-based] technologies in our own classes. What we know about technology comes from our own experience from life and friends.’ (Questionnaire, Roxana, December 2014)

Roxana’s comments, while deeply critical in nature, expose her disappointment in the quality of guidance, either direct or indirect, for integrating social-learning-based tools in teaching that she received during her years in the TE program. At the same time, she reveals what Downes (2010) has observed, that increasingly as teachers, or teacher educators, are unable, or indeed unwilling to risk providing responses to learners’ pedagogical needs (Howard, 2013), learners go elsewhere to other communities, other ‘experts’, including those in online spaces, for aid in scaffolding the skills they require.

In their practice teaching, most expressed feelings of powerlessness to make even the most basic changes to the kinds of traditional, information and text-based teaching that were being practiced in their schools. Only three of the novice teachers claimed they used community blogs, interactive online games and Facebook – tools that reflected community-sharing advantages of technology that they had been exposed to in their language courses. The remainder of the participants reportedly considered Power Point and videos innovative and effective enough in gaining the interest of their students, in view of mentor teachers who restricted themselves to the textbook or radio and infrastructure limitations. These tools seem appealing perhaps in terms of using technology, per se. Yet, from a sociocultural perspective, and in my fifteen years experience researching technology, such tools are often employed to support passive learning and information-transfer pedagogies that undermine 21st century teaching approaches. When Carlos, one participant who made active use of more collaborative-based technologies in his teaching, was asked why others are reluctant to do the same, he explained: “We don’t live in a society that fosters creativity, so I guess you lose it.” (Interview, January 2014). Indeed, many students spoke about their marginalized positions as ‘outsiders’ in the mentor teacher’s classroom with little or no power to make creative, technological and pedagogical decisions.

5. Reflection and Conclusion

‘Human agency may be frail, especially among those with little power, but it happens daily and mundanely, and it deserves our attention.’ (Holland et al., 1998)

After three semesters of teacher modelling of effective use of technology for collaborative learning and learner-centred teaching, on their first opportunity to “immerse” themselves in ‘real’ classroom teaching, the effectiveness of this group of novice teachers in terms of their capacity to be innovative with SM tools could be considered disappointing on many levels. Powerful structures that existed not only in the context of their practice teaching sessions but also in their formal teacher education courses, denied them the agency to take advantage of their highly developed technology capacities to exploit technology tools for learning and teaching. Like Marcela in the longitudinal study, in the follow-up study some of the pre-service teachers spoke
Thus, as the follow-up evidence clearly indicates, the most valuable conclusion to draw from the latest findings is that in order for new teachers to take advantage of their own technology facilities in their teaching practices, developing empowered teacher identities and 21st century tools such as PowerPoint and videos in their teaching. I had witnessed many of these individuals willingly, adeptly and innovatively using various innovative learning and ‘teaching’ tools in the classroom projects they organized at the university. Yet, it became apparent that they did so presumably because those experiences took place within the safe setting that included classmates and an approving teacher/promoter of social learning technology tools, and in view of a ‘carrot’, i.e. their grade on the course, at stake.

In their practice teaching contexts where the community structures were more threatening in terms of the risks of uncontrolled young learners or more powerful and disapproving teacher mentors, most novice teachers expressed that they took on powerless and self-effacing subjectivities which prevented them from being creative or innovative. Their choice to avoid using technologies that supported more social learning activities, I understood was predicated on their fear of loss of face or negative reactions from their mentors. A few did attempt to include technology in their lessons but avoided creative use of innovative social communication-based tools, despite the prolonged exposure to those tools they had had in the TI courses and in one or two random lessons in other courses. Instead, they reverted to basic PowerPoint and videos, reflective of teacher-fronted modes of didactic practices that were most commonly employed by many other faculty members in their university Pedagogy Program.

It is often remarked in education circles that it takes a community to raise a child. The same apparently is the case for novice teachers. The longitudinal initial study offered great hope for fostering empowered teacher identities and agency to use technology through TE modelling of ICT in content courses over a sustained period of time. The evidence and the new model that ensued while underlining the importance of context, laid bare as well the essential need for that the modelling to be sustained over time and importantly across disciplines. Thus, as the follow-up evidence clearly indicates, the most valuable conclusion to draw from the latest findings is that in order for new teachers to take advantage of their own technology facilities in their teaching practices will require the support and involvement of the larger TE community, as opposed to one or two mavericks. If our goal as teacher educators goes beyond simply content-based acquisition to being instrumental in developing empowered teacher identities and 21st century teaching and learning approaches in our students, then our TE community will need to align with school and university administration communities to foster such goals. I consider the individual and community knowledge building as well as the democratic settings that these technology tools support, if “allowed” into education contexts, can help break down powerful barriers that stand in the way of such sustained pedagogical and ultimately social changes. Further social cultural-based research within these settings is clearly called for to mediate such changes.

References


Adding Value: Open Online Learning and the MBA

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Abstract: Evidence suggests that MOOCs are being used as a strategic tool to explore alternative models of course delivery (Allen & Seaman, 2013) and this paper shares insight into an example of such innovation for Business School Education. Gateway MBA draws on examples of open learning worldwide to create a MOOC to extend the MBA distance learning programme for Northampton Business School. The Gateway MOOC offers open online access to MBA education to develop recruitment to the MBA internationally and to raise the profile of the university. While there are risks in this strategy, the Gateway project team see potential to introduce and market the MBA to a global audience through open online learning, raising the university brand profile and expanding the eLearning horizons of those involved in the project and beyond. This paper will consider recurring themes in the literature in the context of the design and delivery of the Gateway MBA. It is clear that reconciling MOOC values and aims with educational quality and learner satisfaction standards is problematic so this paper considers how we develop and embed innovations in the areas of technology and academic cultural practices in order to meet this challenge. Finally, we will consider the issues and challenges in the use of the Carpe Diem (Salmon et al, 2013) as a model for the design and delivery of a MOOC and will offer further considerations for sustainability.

Keywords: MOOC, open practice, peer collaboration, disruptive technologies, MBA, online curriculum design

1. Background

“Smart Universities will embrace MOOCs ... to advance innovations in teaching and learning, and expand markets for education.” (Nutbeam, 2013)

A Business School should act as a gateway to technical and social innovation for managers of the future (Starkey et al, 2004). Offering open education provides an interesting opportunity for Business Schools to explore new business models while contributing to innovative practice. Northampton Business School at the University of Northampton identified a financially viable opportunity to explore the rise in open learning for innovation and develop new business opportunity. The result is the Gateway MBA, a free open MOOC (Massive Open Online Course) conversion of the introductory module of the MBA Programme.

The MBA is a global degree, that is relatively homogenous worldwide, (Mintzberg, 2004). Because of the global recognition of the degree, an International Business School will almost always offer an MBA programme of study, and the University of Northampton is no different; students can study an MBA full time, part time and distance (online) learning. The question for the Northampton Business School is how to make the Distance Learning MBA stand out in a crowd, to add value and encourage students from a global market to choose the Northampton Online MBA over others. Gateway MBA offers potential students an opportunity to try MBA study for free with accreditation if students decide to continue their studies.

The rationale is that MOOCs are a form of open learning that generate attention and have global reach, (Ernst & Young, 2012). There is also evidence that MOOCs have the potential to attract new students while acting as a brand extension for their providers (Yuan and Powell, 2014). While the concept of open online learning is not new, university online delivery is often found to be content driven - facilitative, sometimes participative but rarely collaborative, a design that has emerged in the original disruptive model of the cMOOC. The Gateway MOOC is an example of an adaption of peer assisted learning and connectivity (Bayne and Ross, 2014). Using the Carpe Diem Curriculum Design approach (Salmon et al, 2013), the Gateway MOOC was designed around peer led discussion inspired by TEDx style topic introductions. The module, behind the Gateway Project is Critical Issues in Business. Redesigning this module into open online study raised a number of issues regarding open online learning design. What the literature identified is that the design needed to consider motivation

and peer engagement, understanding of academic study skills, limited access to resources and retention issues in addition to the learning development.

Core to design was the need to ensure that MOOC participants could connect with each other and with academics and industry experts that are connected with the school. It was decided to run the MOOC over fixed time instances (not to leave the module continually open) to encourage a number of participants to connect at the same time. This adds value to the experience as it enables participants to connect with peers from anywhere in the world to discuss issues and facilitates peer support for learning.

Another core area to address was enabling success. Students interested in studying in an online environment often underestimate the level of reading and participation required for success. Occasionally, managers enrol onto the programme with vast management experience but without recent academic experience, and find their study skills are not quite ready for the challenge. Gateway gives those who are interested in MBA study, insight into the actual demands of postgraduate study. Offering a module from the MBA in an open environment allows participants and potential students an opportunity to test the water, see what is involved at this level of study and to identify any weaknesses and address them before continuing.

Developing this MOOC through the Carpe Diem model (Salmon et al, 2013) offered the academic staff involved a fresh approach to digital curriculum design, and incorporated the peer design storyboard process with other professionals from the university such as academic study skills staff, IPR experts and technology enhanced learning professionals. Learning to design without access to common resources, embedding academic skills into learning activities, re-evaluating formative assessment within the module and addressing copyright and IPR issues brought specific issues to the project team while offering a real insight to the experience of the online student, particularly in open education.

Finally, this MOOC awards an opportunity to raise the profile of transnational education and promote programmes at the university on a global scale. This opportunity for brand promotion means that quality is paramount and marketing critical to engage potential learners. Offering open education appears to offer an innovative way to share practice with potential education with others such as franchise and distance education, and to reach new student groups that may not have the resources for studying at MBA, (Christensen et al, 2013)This paper reviews current thinking and key challenges within MOOC development and based on this understanding, offers insight into the process of design for open online, with a review of how the initial run of the MOOC has addressed some of the key issues in MOOC development and design.

2. Literature review

Given the relative nascence of the core concept, it is perhaps not surprising to note a concomitant paucity of past published work identifiable in this domain. With this in mind, the review has adopted a holistic and eclectic search approach and in common with much research conducted to date in the area (for example, Bayne and Ross, 2014; Gaebel, 2013 and Yuan and Powell, 2014) draws upon sources from academe, professional journals and industry reports. It also incorporates research on a geographically unrestricted basis. The review proceeds as follows: firstly, the concept of the MOOC is explored and its historical development traced; secondly, the business models employed in their operation are discussed; thirdly, the key challenges facing the operationalisation of MOOCs and key lessons learned (where available) from existing MOOC programmes are considered.

3. Definitional issues and historical development

Definitional consensus appears to be lacking in the study of MOOCS (O’Prey, 2013; Papparo, 2012) and it is clear that development is still in the embryonic stages. However it is widely accepted that, on an operational level, MOOCs usually exhibit the following core features: open access, free to enter, are credit less and offer asynchronous learning (O’Prey, 2013; Papparo, 2012). However there is evidence that even these accepted identifiers are subject to violation. For example, a number of US based institutions are trailing credit-bearing MOOCs (Bayne and Ross, 2014, O’Prey, 2013) and some platform providers are now charging for programmes. Furthermore, the boundaries of MOOC activities are still fluid. Whilst the traditional definitional conception centres on a novel and bespoke open programme, there is some suggestion that educational practitioners maybe be fusing some MOOC mechanics with traditional programmes thus creating hybrid or semi-MOOC offerings (Boyatt et al, 2014) This has led loosely to a bipartite classification of MOOCs: The xMOOC which
retains much of the style and delivery stance of a traditional programme with a clear emphasis upon knowledge transfer and the more radical cMOOC, which places much more emphasis upon participant connectivism (Downes, 2005; Yuan and Powell, 2014), andagogy (Salmon, 2003) and peer assisted learning (Rodríguez, 2013; Stacey, 2014).

It is possible to conceive of the cMOOC being the most pure incarnation and the xMOOC as the beginning of the marketization of the MOOC with an emphasis upon scale, objectivity and a more didactic ethos (Daniel, 2012; Stacey, 2014).

It is however dangerous to assume that the xMOOC v cMOOC classification is emblematic of clarity and stability in MOOC development. Indeed, more recent research suggests that even this bipartite classification system may be too simplistic as providers of MOOCs continue to experiment with different approaches including: the student – teacher interface; class sizes and levels of interaction (Bayne and Ross, 2014). This inherent taxonomic dynamism and operational ground shifting thus argues for MOOCs not to be defined on an operational basis but on philosophical grounds where there is more clarity and consistency regarding the precepts.

Philosophically, MOOCs may be considered exponents of Connectivism Theory (Downes, 2007). This position envisages learning in an environment that is not linear but clustered thus necessitating the learner to orchestrate their own educational trajectories in an autonomous manner using interactions with their peers as supports (Downes, 2009). Connectivism therefore extols the virtues of choice, autonomy, interactivity, connectedness, diversity (amongst learner groups); (Downes, 2009; Kop and Hill, 2008).

This philosophy and the growth of MOOCs can be traced back to Bagely’s seminal views on interactivity in education (Bagely, 1911). However the enabling role of informational technology (IT) as a catalyst for operationalising Bagely’s beliefs cannot be ignored or underestimated; accordingly MOOCs can be conceptualised as part of the ongoing digitisation of education which has included innovations such as online assessment (Singh et al, 2012) and algorithmic assessment designs (Piech et al, 2013). An early and influential adopter of IT led open education was the MIT open courseware unveiled in 2001 which may well have acted as a catalyst to MOOC development (Byerly, 2012) as might the promotion of peer based learning (andagogy) by academics such as Roberston (12008) and Salmon (2003). Further IT enablement can be observed in the areas of global broadband diffusion (O’Prey, 2013) and the increased spending on global education technology which increased from $204m in 2008 to $900m in 2012 (O’Prey, 2013).

The first notable MOOC is widely considered to be the open programme based at the University of Manitoba launched by Downes and Siemons in 2008 (Mackness et al, 2010). From these beginnings MOOC expansion has been significant with 43% of US based universities either having or developing MOOCs as at the end of 2013 (Stine, 2013). To some commentators this growth represents a veritable tsunami of change to educational delivery (Thun, 2012) perhaps encapsulated mostly vividly by the New York Times who declared 2012 to be the year of the MOOC (Stine, 2013). To other authorities, a more circumspect position has been taken, for example, Youngberg (2013) who suggests that it is premature to assess the value and contribution of MOOCs at this nascent stage of their development.

4. Business models

It is generally accepted that MOOCs in their current incarnation are not satisfactorily financially viable (Matkin, 2013; Nowrot and Doucet, 2011). This is hardly a surprising observation. MOOCs, in common with many e-enabled business concepts have to grapple with a core business conundrum: how to be financially sustainable whilst still provide free (or at reduced priced) and open services? (Daniel, 2012). The question is therefore raised as to what is the business purpose of a MOOC? According to Byerly (2012) there are two chief orientations taken. Firstly, a strategy may be adopted along not for profit (nfp) lines and the focus of the MOOC presents as being purely philanthropic, for example, opening up learning to disenfranchised groups or hard to reach educational markets (O’Prey, 2013). Secondly, the focus may indeed be on profitability and there is some evidence to suggest platform providers are experimenting with ways of monetising MOOCs. Initiatives attempted so far include: payment for courses (in direct violation to one of the commonly held principles of MOOC design), licensing of materials, and placement opportunities for participants and selling participant personal data (Matkin, 2013; Stine, 2013). MOOC platform development has therefore tended to
followed one of these paths: the Coursera, Futurelearn and Edx platforms have followed the nfp route whilst the Udacity variant has sought to be profitable from its inception (Baggerley, 2013).

MOOCs have perhaps most successfully been used to identify and harness the potential for new student segments and brand extensions (Yuan and Powell, 2014). Research by Christensen et al (2013) indicates that Universities have had some success at extending their reach into new student segments most notably: overseas students from the developing world, students born overseas and the unemployed (Christensen et al, 2013).

There are therefore a number of issues for would-be MOOC providers to consider.

It is clear that financial sustainability is far from secure and addressing it may indeed may indeed detract from the core defining principles of the MOOC. This may limit the range of Universities able to successfully engage with the core concept. Well financed and established brands such as Harvard or MIT may be able to follow the nfp pathway via an act of corporate social responsibility (CSR) although, there are also likely to be spill over benefits (towards the marketing of other branded products) and so the MOOC may also become a product loss leader in the institution’s portfolio. Smaller and less opulent institutions, even those who are attracted to the CSR benefits associated with MOOCs, may however find the sustainability and costing question marks too risky and this fact combined with other challenges, may actually act as a disincentive to engage with MOOCs.

It is also apparent that in order to harvest the developmental opportunities presented by new educational segments, providers will have to deploy new marketing initiatives particularly in the areas of social media marketing and pre and post MOOC consumer evaluations (Hollands and Tirthali, 2014).

5. Challenges and lessons learned from existing MOOCs

Research into MOOC delivery has revealed a number of pedagogic and strategic challenges in the areas of: completion rates, academic quality, fit with conventional offerings and disruption.

To date, unsatisfactory MOOC completion rates remain an omnipresent problem that bedevil the majority of programmes. MOOC completion and retention rates tend to average c10% (Clow, 2013; Jordan, 2013; Kolowitch, 2010; Stine, 2013) and are therefore a primary concern. More detailed analysis reveals a significant steep decrease in continuation occurs immediately after registration which suggest many applicants maybe be doing no more than fishing for information or following a herd instinct in enrolling (Kolowitch, 2013) and then losing interest thereafter; in part, this is understandable in the light of the considerable media hype regarding MOOCs since 2012. Nawrot and Doucet, (2012) have identified a number of reasons for drop-outs including: poor time management, loss of impetus, difficult subject matter, hidden costs such as having to buy textbooks and perceived uninspiring study materials.

There is some evidence however, for example, (Milligan et al, 2012) that attrition rates are less poor amongst those MOOC students who have previously engaged in a MOOC suggesting that there are student confidence issues to overcome and that network effects might encourage completion (Milligan et al, 2012). This advises MOOC designers to consider helping learners learn how to participate and study in MOOC format as a preamble and perquisite to commencing disciplinary study.

More research is therefore vital in order to fully comprehend how these worrying statistics and explanations for drop-outs apply in the various MOOC contexts and how educators may help learners to assimilate to the MOOC format. Unfortunately however, the inherent diversity and heterogeneity of MOOC participant populations will clearly make it difficult to deconstruct and delineate all of the key demographic, social and economic variables impacting MOOC classes. Similarly, the relative paucity of research conducted on a cross-contextual basis provides few steers regarding contextual trends and therefore argues for an increase in case study research studies in order to help promote more effective meta-analyses from aggregated data returns in the future.

Despite these limitations, it is possible to identify a number of design pointers or tips from the literature that might improve continuation rates. Firstly, it is evident that MOOC delivery favours a bite-sized format that checks complexity blockages and maintains participant interest (Adamopopulous, 2013; Papparo, 2012). Secondly, attention needs to be dedicated towards incentivising and promoting attendance and participation. The use of discussion forums and other online backspaces have been positively associated with retention.
Reward systems such as badges (Cross, 2012) and Peer Rating Awards (Cross, 2012) have also been explored and more experimentation with and research on these interventions is needed. Serious concerns have also been articulated around academic quality issues and the need for oversight of MOOC standards (Morris, 2013). It has been observed (Papparo, 2012; Youngberg, 2013) that academic misconduct may be rife in the MOOC arena and indeed the expressed desire for peer collaboration may invite this via joint-working and collusion on assessment tasks (Daniel, 2012). There have been further apprehensions voiced regarding assessment. The use of standardised computer generated grading systems may not sit well in more subjective and discursive subjects in the arts and social sciences that require a greater degree of individual judgement (Papparo, 2012). Similarly, the intrinsic one size fits all philosophy, for example, with respect to grading criteria and required participant outputs may make it hard for star pupils to shine and be recognised which might limit the potential for MOOCs to gain recognition by employers and therefore compete with more traditional programmes (Youngberg, 2013). Papparo (2012) has recognised all of these impediments and suggested that more intelligent software needs to be developed, for example in the areas of peer marking reliability and cheating detection, that simultaneously retains the open and peer driven nature of the MOOC and also provides a degree of quality assurance.

A further concern centres on the open nature of the MOOC. It may, as has been observed by Baggerley (2013), promote a degree of waywardness, unhealthy digression and mob-rule amongst the participants thus greatly increasing the risk that learning outcomes and content cannot be adequately covered in the programmes. This is yet another example of the central philosophy of the MOOC potentially working against itself and raises the question of the agency and structure debate (Bandura, 1977) with respect to the respective roles of instructors (as guides and enforcers) and participants within MOOCs. It maybe that totally open and lawless programmes need to be rebalanced and a degree of structure and legislation installed in order to safeguard academic standards and quality (Mackness et al, 2010, Morris, 2013).

Much research on MOOCs has addressed the issue of learner satisfaction with programmes. Distillation of the research base suggests that there are two main areas of disquiet.

Firstly, studies have oft indicated a degree of dissatisfaction with the level of academic support offered within MOOCs (Mackness et al, 2010). This of course is to be expected given the mass nature of the MOOC format and the highly diminished staff-student ratios that result. The key dilemma facing all MOOC providers is therefore how to engineer a MOOC offering that manages to develop a degree of intimacy, individualisation and personal touch within a mass and virtual classroom (Cross, 2012; Papparo, 2012).

Secondly, some work has indicated that individual learner needs have not been met in the MOOC environment (Mackness et al, 2010). Once again we can identify another example of the values and philosophy of the MOOC, in this case diversity, working in a negative way. Given the heterogeneous nature of the mass participant population it is unsurprising that all individual needs and aspirations can be significantly accommodated and instead, the one size fits all outcome is presented, which may generate only a mediocre learner experience.

MOOCs have frequently been assigned the mantra of a disruptive technology (Matkin, 2013); specifically, it is suggested that they threaten the status quo of traditional teaching dogma (Armstrong, 2012; Stine, 2013) and offer a seemingly overly radical advancement of teaching delivery (Youngberg, 2013). Of particular concern is the research body that is developing regarding actual and potential staff alienation as regards MOOCs (Matkin, 2013); the most notable instance of this occurred at San Jose State University where academics refused to deliver philosophy MOOCs claiming that they diminished the role of the academic and compromised learner experience (Matkin, 2013). It is possible that concerns of this nature are rooted in a lingering fear that MOOCs might in some way reframe or even supplant traditional delivery models with the concomitant loss of revenues (Youngberg, 2012) although there is little evidence, to date, that this is happening (Christensen et al, 2014). It is however plausible that MOOCs could be effectively and economically deployed to replace some of the standard parts of traditional programmes (Hollands and Tirthali, 2014).

These fears paint a ‘drone’ warfare analogy that might be taking place in education; in the military frontline fighting troops are currently being augmented by the use of mechanical drone devices and in parallel, educationalists are seeing part of their roles being undertaken by digital platforms as is the case with MOOCs. Future MOOCs developers therefore need to be sensitive to these tensions and Institutions may need to
embed counter measures to manage the concomitant technological and cultural changes that ensue. It has, for example, been suggested by Papparo (2012) that working patterns need to be revised in the MOOC environment and that traditional academic input should now take place up-front in the content design stage whilst MOOC instruction (the second part of the process) may favour non-traditional educationalists who have a skillset anchored in learning technology and multimedia (Daniel, 2012; Yuan and Powell, 2014). MOOCs therefore may threaten the sustainability of traditional academic roles and require Institutions to reconsider and redefine the role profiles and person specifications of the various academic contributors.

6. Conclusion

It is immediately apparent that the study of MOOC development is located firmly within the introduction stage of its product lifecycle. As such it is clearly risky to ascribe too much reliability towards the research findings that have been published to date. It is therefore injudicious to look to the literature for definitive guidance or blueprints when formulating the design of a new MOOC. Future MOOC development therefore has to be regarded as a high risk venture until a sufficient stock of knowledge is harvested that provides reliable guidance on the key success factors.

Despite these limitations, a number of recurring themes have been identified in the emerging literature.

Firstly, Brand is a key feature of MOOCs and may thus help explain the commendable uptake of MOOCs since 2008. It is probably not a coincidence that the key platform providers are backed by Institutions such as Harvard, MIT and Stanford and that the first open courseware initiative, the effective forerunner of the MOOC, was launched by MIT.

Secondly, MOOCs have the seeds to sow their own destruction. Their defining philosophy grounded in mass education, peer collaboration and diversity has also led to pedagogical challenges in the areas of cheating, lawlessness and unmet learner needs. It is clear that reconciling MOOC values and aims with educational quality and learner satisfaction standards is proving problematic and a callout is made to Institutions to develop and embed innovations in the areas of technology and academic cultural practices in order to meet the challenge.

Thirdly, MOOCs are potentially highly disruptive and present challenges to Institutions to overcome issues connected to staffing tensions and role alterations; relationships with traditional academic products; acceptability to external stakeholders such as employers and public perception.

Fourthly, MOOCs may indeed prove to be a passing trend and their initial popularity explained by marketing intensity and a resulting herd mentality. In order to prevent the bubble from bursting, platform providers need to develop innovations designed to imbue MOOCs with a degree of mass customisation and tackle the problem of completion rates that are currently highly unsatisfactory. If however MOOC development does start to fade, it is unlikely that the endeavour will have been in vain. MOOC applications, research and debates have forced providers to reconsidering teaching and learning strategies in general (Yuan and Powell, 2014) which can only be beneficial in the broader context of education.

7. The gateway project

Retention issues have emerged as a real problem for MOOC developments. The project team chose to base the MOOC on an existing module, Critical Issues, which is the introductory module on the MBA programme. The rationale for choosing this particular module was twofold; firstly the module introduces key, current business issues, secondly the module incorporates elements of required post graduate study skills and personal development skills. Therefore it was envisaged that this module would appeal broadly to business students on a global level and would offer a “taster” of post graduate study and insight to an MBA programme. Participants who wish to continue will be able to register on a university short course to complete a reflective piece of assessment, accredited for the MBA. This would allow participants to receive credit for their MOOC learning and continue on with the MBA (subject to normal admission requirements). The opportunity to undertake this module ‘for free’ and then undertake a piece of assessment to accredit learning on the module for the full MBA was seen to be a real incentive for retention and completion of the MOOC.
As there were already pre-determined learning outcomes and some online material for the module, the focus for the team was to maximise engagement through open curriculum design, assessment and accessibility. The project team consisted of three academic members of staff, a learning technologist, a librarian and an e-learning specialist with design input from the study skills staff and current MBA students. As a MOOC could grow exponentially, the design of the learning needed to support scalability therefore the curriculum design of the MOOC module was facilitated using a CAiRO process, a model based on the Carpe Diem model, underpinned by the research of Gilly Salmon and Alejandro Armellini, (Salmon, 2013). This particular model of curriculum design supports the institutional capacity and can foster scalable pedagogical intervention (Salmon et al, 2008).

The first stage of this process required the team to determine overall MOOC aims. The project team agreed that aim was: “to provide participants with an experience of studying on an MBA level programme through the introduction of key pervasive issues in business. This module will encourage participants to think critically and to form evidence based arguments”. The CAiRO process promotes diversity in module teams, the inclusion of academics, professional support staff and students enables a range of different viewpoints, ideas and opinions.

“Good teaching means seeing learning through the learners eyes” (Ramsden, 1998), the “student voice” can bring valid and valuable perspectives to learning and teaching practice and this project is an example of this in practice. The first project team design meeting had a range of input from three current MBA students who had recently undertaken this module and could provide the value of the ‘student voice’, (Stoncel & Mayes, 2012).

The next stage in the process was to create a storyboard using a set of pre-determined criteria cards which deliberately restricts choice to nine overarching statements which determine the look and feel of the module. Those chosen being: Student Choice, Guided Learning pathway, Active Discovery, Innovative (for the team/faculty), Enquiry based, Reflective, Collaborative, Applied and Peer supported. This gave the project team a clear focus for the design of learning activities throughout and enabled technical staff to be clear about the design requirements.

There were a number of issues in MOOC design that emerged. The Project Team agreed a format of using expert speakers to introduce key concepts (in TEDx style) for each of the critical business issues. Ensuring that the videos were copyright free and that the university held the intellectual property rights took time and needed supporting technical expertise. The key concepts were then supported by reading material but within a MOOC there are access issues; participants would not be students of the university so could not access libraries or other resources – so identifying, creating or acquiring suitable supporting resources was time consuming. Using Blackboard Coursesites as an open learning platform, the project team worked on developing eTivities. Based on MOOC research, the learning activities are designed to be specific and bite-size with opportunities to test understanding, as this has been established as a method to maintain participant interest (Adamopopulous, 2013; Papparo, 2012). Reflective activity from participants is also a key feature through the use of supervised discussion forums as this addresses the need for peer engagement and retention. The Project Team considered the ‘appropriateness’ of e-tivities based on the former nine statements. Concepts and reflective eTivities include quizzes, discussion forums and formative tests. Throughout the design process, the learning technologist worked closely with academic staff to create appropriate eTivities for the purpose of the activity.

8. Participation and activity

The MOOC went live in Autumn 2014 and through the collaborative curriculum design approach, MOOC participants had the opportunity to engage with learning activities which had embedded study skills and opportunities for peer interaction and access to a network of Business Expertise. Participants who wished to complete the MOOC and go no further could receive a certificate of attendance. Embedded into the Gateway MBA MOOC eTivities were core personal and academic skills, through this it was expected that participants would develop understanding of issues related to academic quality and integrity. By allowing participants to engage with an assessed activity in order to ‘progress’ to the MBA, the team were able to measure the extent of issues in this area. The initial run of this MOOC module was undertaken as an action research project, future research will consider the success of the approach on retention, learning quality and impact on staff development.

The MOOC ran in September 2014 for ten weeks with academic support and guidance provided for participants. How long a MOOC should run for is still a matter of discussion but this was seen as most aligned
to the original version of the Critical Issues in Business module. The participants were given academic support to promote participation and subsequent retention and support required by the academic member of staff varied. At the point of entry to the MOOC thirty one contributors registered their interest and tracking software allowed the team to see that the majority of the participants were browsing the material in a relatively random fashion. The participants were from various geographical locations and varied backgrounds which were revealed via an “introduce yourself” online activity.

The academic member of staff responded individually to each of the participants with a welcome message and a prompt to take part in the first series of activities, this was not too time consuming due to the small numbers involved. Thirteen of the 31 participants actively took part in the first series of e-tivities and posted responses to questions and activities set by the team. Participants also actively responded to each other’s ideas and opinions and the discussion was quite lively, again the academic member of staff posted a response to each thread prompting further discussion and then encouraging the participants to move on to the next topic and series of activities. At the final point of activity for the first topic four participants were actively engaging, two of these participants were local to the area, one was from India and one from Africa, all of the active participants at this stage were female.

The active group of four continued to engage throughout the next series of activities and took part in all of the prompted e-tivities and discussions. There was evidence of, cross cultural exchange and discussion of the wider literature and business implications of the topics presented. Throughout these stages the academic continued to respond to each thread and to encourage participation from the group in moving on to the next stage. Toward the end of the guided online activities participants were invited to consider if they would like to engage in the MBA programme and redirected to information and guidance on the MBA course. At this point three of the participants asked direct questions to the academic member of staff regarding costings, timings and admissions criteria for the full MBA programme. This level of interaction is considered to crucial to successful learning, however is not scalable for large numbers, Laurillard (2014) highlights this in a recent article stating that we cannot think of education as a mass consumer business, rather it is a personal client industry. Laurillard (2014) further reflects that learning requires tailored guidance, which is simply not scalable or manageable in terms of personal interaction from academic and or support staff. The issue of scalability and participant support continues to be of concern to the wider team and the realisation that if participant numbers grow significantly then this will need to be considered in terms of course design, support and the probable financial impact of supported learning.

Q 1. What do you think you gained from completing this short course?
“A good understanding of the subjects covered, delivered in a good and varied media environment”.

Q2. What do you think could have been improved?
“The issues with regard to technical issues ideally would not have existed; however the ones that I dealt with were relevantly addressed and resolved.”

Q3. What made you want to undertake this course?
“Experience, delivery method”.

This feedback, although limited to one response, did raise the issue of technical issues such as broken links to external websites and resources. This has prompted the MOOC design and delivery team to undertake regular checks to external links and resources.

One member requested to take the assignment for the MOOC and to transfer on to the MBA programme; this participant was local to the area and already knew the university well. This Project was supported by internal Learning Innovation funding, but the key technical staff involved were critical to the development of this MOOC, without the funding support to enable them to work on the project for large periods of time, it remains to be seen whether this project could have got off the ground as academic staff are not yet knowledgeable enough to design and deliver collaborative activities online. The financial outlay has to be a key consideration if a MOOC is delivered for marketing programmes and or and the purpose of fee paying student attraction and retention. In a Times Higher commentary, one academic from the University of Edinburgh indicated that each MOOC cost approximately £30,000 from development to delivery (Times Higher Education, 2013). That said, the process of development throughout this project has enhanced academic understanding of online learning design and overall technical ability has improved.
9. Opportunities

It is also apparent that in order to harvest the developmental opportunities presented by new educational segments, providers will have to deploy new marketing initiatives particularly in the areas of social media marketing and pre and post MOOC consumer evaluations (Hollands and Tirthali, 2014).

The planning, design and collaborative process did allow for idea sharing and understanding learning from different viewpoints and it was agreed that the CAIERO/Carpe Diem model proposed by Salmon et al (2013) was effective in developing comprehensive learning activities but while some activities will be piloted, the feedback from initial participants will be crucial to ongoing learning design.

The MOOC is due to run again in February 2015 and has been advertised using alumni networks and the central university website. So far 125 individuals have registered their interest and the team will continue to engage with the process and monitor the strengths and weaknesses of the MOOC as the course progresses by tracking interaction and gaining valuable participant feedback.

The sustainability of this module will also be an area for reflection, if successful then some participants will enrol onto the MBA and from a financial perspective the project is worthwhile but even if participants do not translate into actual university students the impact of the course design on staff development and future learning design is both beneficial yet currently intangible but one thing is for sure staying still is not an option for the future.

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Developing confidence in the use of digital tools in teaching

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Abstract: In this study Higher Education teachers were offered new mobile devices with very few conditions attached. The aim was to introduce staff to mobile technology and how it could be used to support teaching and learning within a small, interdisciplinary campus. The study hypothesized that by offering staff the simple incentive of new mobile devices for professional and private use, they will be keener to adopt new practices. The only conditions required were the adoption of two items of software – SharePoint as a file repository, and the VLE provider’s mobile learning application which provides access to the VLE for both learners and staff. There were three stages to the project; Stage 1 involved presenting staff the results of student feedback from their own courses, where the students set out their preferences for using learning technologies. Stage 2 involved surveying staff opinions on the impact of the mobile devices once they were issued. Stage 3 followed up with a selection of interviews, focussing on concepts of interest gained from the questionnaires. Overall results from this study suggested there was an undeniable enthusiasm amongst teaching staff for using mobile technology, however there were still issues surrounding digital confidence and the pedagogical reasoning for integrating such technologies. There is still a divide on the role of mobile technologies within the classroom, most likely stemmed from the lack of knowledge surrounding their potential purpose. In conclusion, staff enthusiasm alone is not enough to result in adoption and integration of mobile technology within teaching and learning, there must be a focus on pedagogy and relevance for teaching staff to engage fully.

Keywords: learning agility, Higher Education, institutional change, digital scholarship

1. Introduction

The pervasive presence of technology in everyday life has driven higher expectations among learners for digital approaches to learning and teaching; teachers fail to recognise and respond to this drive at their peril. Conole et al (2008) highlight i) students’ specific expectations for the internet as a first access point for information, and for all involved in the learning process to ii) access up-to-date information and iii) be able to communicate on demand. Their study shows that students are becoming what Weller (2011) calls ‘digital scholars’ using technology for all forms of research and retrieval of information, communication, data processing and manipulation, storage and analysis. This argues that the pace of learning for teachers and developers must increase. Institutional strategies for fostering “learning agility” must be found (De Meuse et al 2010, Greener, 2012a), enabling academics to explore and develop the willingness and ability to learn new competencies in digital education and scholarship (Lombardo and Eichinger, 2000, p. 323, Vincent 2008). Previous research has shown that academic teaching staff are motivated to engage with Technology Enhanced Learning (TEL) by a desire to deliver high quality learning for students (Bennett, 2014). By building on this enthusiasm with a practical project, the aim will be to reduce any confidence issues with technology, often identified as a major barrier for teaching staff (Kregor et al, 2012). Engaging with mobile learning may result in a ‘trojan horse’ effect, where, based on engagement with mobile learning, staff reflect on wider uses of technology, such as esubmission and assessment (JISC, 2011).

This study project took place at a small interdisciplinary university campus in which the prime mission is widening participation and working to develop the educational aspirations of the local community. As a result, all faculties have outposts at this campus, and staff have a teaching focus, though some will be engaged in research activity within their home faculties. To interpret a strategic university objective of digital transformation involves potential constraints, not least of which is the limited time and energy of academic staff to retain a focus on discipline scholarship alongside their teaching and pastoral commitments locally, yet also embrace a wider vision of digital learning, when this is not necessarily part of their professional background or personal appetite.

Why did we undertake this project?
A paper presented to the European Conference on E-Learning in 2012 outlined the view from the literature concerning the preparation and development of university teachers in the application of Web 2.0 (Greener, 2012b). It was suggested that a pedagogy, which explored and applied those affordances of Web 2.0 most suited to learning, could promote an active role for the learner in their Higher Education: enabled effectively by digital technology, which in turn could foster sharing and collaboration in social learning networks and contexts (p2). It was also evident from this literature review that the advantages of learning technologies were mediated in their impact on teachers by “the local environment, the macro environment of learning and teaching and the teacher’s own personal response to learning technologies based on teaching beliefs and self-efficacy” (p5). This paper focusses on an attempt to trigger change in the local environment. It is only one piece of the jigsaw for fostering learning agility (De Meuse et al 2010, Greener 2012a) but is presented as one example of breaking through established teaching behaviours to raise capabilities in digital education and scholarship (Vincent, 2008).

McGill’s Synthesis report for UK JISC on Transforming Curriculum Delivery through Technology (2011) provided the main rationale for our local practical project:

“Evidence indicates that funding practical interventions that enhance the general student and staff experience ...can have an impact on enrolment, retention and student satisfaction. These also lead to increased integration of institutional IT and administration systems.” (p6).

The report makes it clear that students should be involved as agents of change and that learners should be offered multiple access routes into their curriculum to reflect their diverse circumstances – digital technology can support this flexibility, given the necessary investment and staff training. In particular, we took to heart the following from the report “Curriculum staff need to adopt an open-minded approach to the ways technologies are incorporated and used within the curriculum. There is no single right approach.” (p8). Few staff had experience of using mobile devices, in particular tablet computers, so this hardware was identified as a disruptive technology which could be offered as an incentive to staff to take part in the project, specifically using a platform (Google Android) which most staff had not experienced before.

2. Methodology

The project was completed in three distinct stages. In Stage 1 we conducted a focus group with students, including local campus-based student representatives along with previous and current Student Union Vice Presidents with a keen focus on learning. The aim was to gain a sense of what local campus students believed was available to them in terms of learning technologies, and moreover, what they wanted us to use. In the session students were presented with the different learning technologies available at the University, and asked their thoughts/attitudes towards these. The session proved a constructive way to air frustrations students had about staff who demonstrated little use of learning technologies. We explained the basics of the proposed project and invited student views to help staff see what kind of take-up there was already among students of various technologies and mobile devices and to gauge student response to the possible increased use of digital technologies for learning and teaching.

These results were presented to academic staff in two lunch-time sessions stimulating debate and interest particularly among staff that had little prior experience of using learning technologies in teaching. Twenty staff agreed to take part in the project, wishing to experiment with mobile devices – in this case a Nexus tablet – and were offered the following deal:

A loaned tablet computer for experimentation and use in learning and teaching at no cost provided:
- They committed to using the university’s SharePoint system for file storage
- They committed to using the mobile application for the VLE
- They allowed monitoring of the above
- They agreed to take part in two evaluation surveys during the next three month period.

The purpose of including the SharePoint system was to encourage uptake, as staff had infrequently used the system since launch. For staff operating at more than one campus site, as well as working from home, the system allows web access to all files at all places with Wi-Fi.

The purpose of encouraging the use of the mobile app for the VLE was to see how students were increasingly
accessing the VLE. Many staff were unaware that this view could be different from a computer view, so understanding the differences was seen as an important experience for staff. Overall the aim was to encourage staff through the project to use mobile computing for sharing ideas, updating skills and modelling good practice with students.

In Stage 2, once the mobile devices were distributed to staff, questionnaires were issued to gather feedback (at two months and four months into the project respectively). The aim was to assess the impact of the tablets on digital engagement, attitudes to mobile devices for teaching and learning and engagement with the two mobile apps (Mobile VLE App and Sharepoint).

Stage 3 consisted of semi-structured interviews with a sample of the original subject group. The aim was to explore the impact of the tablet intervention, and the results of the questionnaires. Interviews were conducted on campus in a private room, with two researchers interviewing. The interviews were filmed (Sony, HandyCam) for data analysis purposes and lasted between 45 – 60 minutes. Subjects’ identities were replaced with a numerical system to preserve confidentiality.

Results – Stage 1 (Focus Group)

General views ranged widely, with students both strongly positive and strongly negative about what technology was in use. There was a feeling that, since modules and courses differed widely in what they made available to students (for example through the Virtual Learning Environment) that it would be helpful to have guidance on this for students. Considerable time was spent explaining to some of the students what was already available to them as awareness and application was patchy. Students also understood that not all staff were yet comfortable themselves with many of the technologies on offer, and this inconsistency was a problem for students studying multiple modules with differing virtual profiles. This was very much in line with our experience and Weller’s (2011) notion of digital scholarship – there is very little consistent understanding in the student body of how to employ digital technologies for learning.

To put these findings into a national context in the UK, a much bigger study of University of Sheffield students found that 55% of this population had smartphones, compared with 33% in the general UK population. E-marketer reported in June 2013 that Android compatible phone sales had increased massively in the last 12 months and the ownership of smartphones among the general UK population was estimated at 48-55%, suggesting that a higher ownership among students would also have increased. This was consistent with our small study. The much larger sample in the UCAS media survey of December 2012 suggested that 82% of new undergraduates owned a smartphone and 20% a tablet. This survey result proposed that today’s students were more than 40% more likely to own a smartphone than the general UK population.

Student comments in session offered a clear set of messages to staff on campus:

- Students disliked the inconsistent offer of technologies to support learning and wanted staff to offer a broader range of digital learning support.
- Most students anticipated greater use of technologies in learning at university level over the next five years, although not all were positive about this.
- Students offered three main ways in which they thought technologies could help their learning: enabling better communication with and learning from teachers, getting prompt and detailed feedback from staff and helping students to put their learning into context.

Results – Stage 2 (Questionnaires)

The response rate for the initial questionnaire was 85 % (17/20). Results suggested the large majority of staff spent time online regularly, and over half would choose to spend any ‘spare time’ at work online. Most also described their use of ICT as frequent and with enthusiasm.

When questioned about VLE use (other than uploading lecture content), staff frequently posted YouTube videos, utilised online marking tools and created online reading lists for students. It would be worth noting that there is an expectation that both e-submission and online reading lists are utilised by academic staff at this institution. Other learning technologies (such as e-portfolios, quizzes and mobile voting tools) were not
taken advantage of by staff. This produces a real disparity with the focus group data from earlier in this study, highlighting learners’ wishes to greater utilise learning technology in their study.

Staff were mixed in their responses on the Google Nexus tablet. Half felt they were successful in utilising it for teaching and learning, whereas the other half reported they didn’t experiment with it enough, some due to lack of confidence. Confidence issues with ICT are a common barrier cited by teaching staff (Totter, Stutz & Grote, 2006; Pelgrum, 2001). However most staff utilised the tablet regularly and 70% were satisfied with the device. There may be a difference here in the use of the device as a consumable item compared to a creative item for use in teaching – this will be explored further later. Interestingly 60% of staff involved owned a smartphone and 70% owned a tablet, showing they had previous experience of mobile technologies. Some cited specific issues with the Nexus (compared to iOS devices) which may also explain some of the negative responses.

Results for the second questionnaire (issued November, 2013) reported positive attitudes towards the use of information technologies, however the response rate was much lower with this survey (45%, 9/20) compared to the previous. This might have been for a number of reasons, including the questionnaires’ timing (mid-semester) as well as feelings surrounding the Google Nexus Tablet itself. Due to the smaller sample size, care must be taken when analysing this data set. Staff use of the VLE remained unchanged, with the ‘compulsory’ elements frequently used. Assessing the impact of the loaned tablets on engagement with other learning technologies was difficult given the lower response rate.

One major aim of the project was to increase staff use of SharePoint for storage, backups and accessibility across campuses. When asked what further support was required, the majority of staff stated more training was needed on this system. Training sessions were offered prior to this project, and so one must ask whether the type of training being offered was suitable and matched the needs of academic staff.

There were also mixed attitudes in allowing learners to use mobile devices in the classroom. This is surprising given that this project was to encourage staff to see the benefits of promoting a BYOD culture.

Overall all staff that responded in stage two felt the project was a success in getting them to engage with mobile devices and become more comfortable with them in teaching and learning. As mentioned previously the aim of the project was to engage staff in updating their digital skills and improving their confidence, and this has partly been achieved.

However there were some areas identified for further exploration:

- How can the institution improve the confidence of teaching staff in using mobile devices?
- What challenges/barriers prevent staff utilising ‘non-compulsory’ digital tools in their teaching?

Results: Stage 3 (Interviews)

In order to triangulate the data and to further explore staff attitudes to learning technology, a number of short, semi-structured interviews were undertaken with staff who took part in the project. Seven staff from the original pilot agreed to participate to further explore the impact of the tablet intervention. Staff involved represented a range of academic disciplines, and were based at multiple campuses within the institution. The aim of the interview was to ascertain the individual’s thoughts on a number of key issues that arose from the questionnaires. These included; thoughts on using mobile technology in the classroom, attitudes to compulsory and non-compulsory technologies within the institution, barriers to learning new technology and preferred method of learning new technologies.

Mobile Attitudes

As mentioned previously there had been a mixed response amongst staff questioned about their attitude to mobile technology in the classroom. The interviews revealed there was a ‘balancing act’ between disruption and augmentation of learning.

“Many like to take notes with mobile devices... I have to believe they are actually making notes!” (4)
"I think there’s an element of getting distracted…. it’s a tricky one…. Although my view is providing they are not disrupting others, it’s ok". (1)

“Anything that encourages learning, I’m in favour of” (2)

Staff also commented on the process of change within the institution, and how teaching staff are progressing at different rates with integrating the use of technology within their lectures.

“I think it’s changing, we underestimate the student’s ability to use these devices in their learning. In some cases staff are ahead (with mobile technology use) and some are behind – and the same applies with students” (3)

“I’m uncomfortable – I have not yet developed a way of integrating their online presence with my teaching” (4)

Interestingly one member of staff spoke about how using mobile devices in large lecture scenarios was not appropriate, but then admitted there was a need to increase the interactivity of lectures, probably using polling on mobile devices. This further develops the notion that staff are at a point of change, torn between ‘traditional lecturing’ and ‘technology assisted teaching’. Some are more open to this change than others.

"Engagement is a much broader issue – it doesn’t matter if they have a mobile or not - if the engagement isn’t there it isn’t there” (2)

There is also the question of whether students are comfortable with viewing such devices as ‘work tools’. McCoy (2013) has suggested that, with students, such devices are habitual for non-class activities, such as social media. There is evidence that supports the digital distraction of mobile technology (McCoy, 2013) and fear of this is exhibited by academic teaching staff. This notion of a gap between owning a device and using it for academic study is concurrent with previous research (Chen & Denoyelles, 2013). It has also been reported that there is a larger divide for small mobile devices than tablets (Chen & Denoyelles, 2013). One suggestion raised was to move forward institutions’ need to commit to a ‘unified technology solution’, where learners are provided with identical mobile devices which can be centrally configured and viewed as a tool for learning.

**Barriers to New Technologies & Learning Methodologies**

There seemed a wide scope for barriers to staff learning new technologies. First order barriers such as time to prepare materials and digital confidence were identified and concurrent with previous research (Prestridge, 2012). An interesting theme that emerged was the need for relevance – staff sometimes felt there was not a clear underlying pedagogical focus for using a new technology, which reduced its relevance.

“If I don’t immediately see the usefulness of it, I’m kind of half-hearted” (4)

There is a real need for Learning Technologists to focus on the pedagogical need for such technologies, rather than just demonstrating ‘how’ they are used. These ‘second order’ barriers are also reported by Prestridge (2012). This may be crucial in tipping the balance and encouraging teaching staff to utilise learning technologies within the classroom.

There was a common theme that most staff were confident in learning new technology themselves, utilising internet walkthroughs and videos. If they were unsuccessful they would converse with a colleague or a learning technologist. The confidence in learning new technology independently but not with implementation highlights a complex paradoxical relationship in digital confidence. The difference may be explained by the staff simply not wanting to make mistakes in front of their audience, as one lecturer explained.

“It’s all very well sitting at your desk and getting it to work, but when you’re in front of a group of people and it doesn’t work as you thought it might... you get that hot under the collar moment” (1)

It is also worth noting that on reflection staff highlighted the issue with this ‘DIY’ approach to learning, in that knowledge ‘gaps’ appeared, particularly with complex technologies. It would also be worth noting that there was no specific member of staff delegated to provide support or training during this project, which may have hindered staff adopting the use of the tablets.
Thoughts on the Tablet

Staff generally used the device provided, and agreed it had been a success in improving their confidence in using mobile technology. It must be stated however that this only reflected the view of a small proportion of the original sample (35%) and so notions of ‘success’ cannot be accurately attributed to the project as a whole. Also staff were using tablets mainly for productivity, not teaching – e.g. personal research, checking email etc. Some criticised its features for ‘creating’ material, preferring to focus more on its role as a ‘consumer’ device.

“It’s good for doing light pieces of work, for bringing to meetings, keeping notes on…. But in producing large documents it’s no good” (2)

“(with the tablet) I was able to travel lighter – but the work I was doing required typing and creating, so I got back into the habit of using the laptop” (5)

“I’ve used it a lot for meetings... and our periodic review” (3)

However none of the staff interviewed was using their tablets for teaching or learning activities. Some staff were using BYOD mobiles/tablet strategies in the classroom, but the general consensus was that this was limited and those that did use them ‘could do more’. Again there seemed a lack of relevance for using these devices within teaching and learning and, contrary to expectations, this did not align with specific subject disciplines. This links back to staff attitudes on mobiles in the classroom – the lack of pedagogical clarity on the use of mobile devices can be used can lead to staff being wary of encouraging its use and implementation. Fabian and Maclean (2014) discuss an action research study of similar type to this one which did prove to result in staff using Android based tablets for learning and teaching activities. However, in that study, staff were selected on the basis of their innovative track record with technologies and given directed training, both technical and pedagogic, to support the tablets’ use, also the project was focussed explicitly on using the tablets for teaching in the classroom. In the HE study, there was no direction and the staff involved, although mostly regular IT users, had not previously considered active use of mobile devices for classroom learning.

3. Conclusions

In this case study, with learning technology support being boosted at the campus, paralleled with an institution wide digital literacies project being implemented for staff, there was a real need to fully understand the concerns and attitudes of academic staff. This is to be vital in shifting the use of such technologies from the technically “literate” and innovative staff, to a culture of accessibility for all staff to utilise (Singh & Hardaker, 2014). The study provided a valuable insight into the challenges of institutional digital transformation – and particularly with this study, the challenge of engaging staff with technologies. One aim was to improve digital confidence, which some staff felt was achieved. Engaging staff with applications such as Sharepoint proved more elusive, mainly due to a lack of training provision and support.

It is worth considering the suggestions of Liz Bennett (2014) in her work in attempting to apply Sharpe and Beetham’s Digital Literacies Framework (2011) to HE lecturers. In shifting the model to apply to teachers rather than students, Bennett finds that, rather than access to technology driving development of digital skills, practices and attitudes, as in the student model, this access was not a concern for staff. Rather it was the attitudes, teaching beliefs and confidence towards TEL which drove the design of learning activities with technology and the necessary investment in skill development and search for access. This suggests a strong role for teachers’ dispositions towards TEL in the process of engagement. Moreover, Bennett identifies the over-riding impact of teachers’ needs to improve learning opportunities for students (p9), a view supported by other researchers in this field (Masterman and Manton (2011), Ertmer and Ottenbreit-Leftwich (2010) and Cuban (1998) cited in Bennett (2014)). It is this commitment to supporting students’ learning, which was evident in the interview responses from our campus study. The issue of personal self-efficacy and confidence with technology tools for learning was an, albeit strong, mediating influence rather than an obstacle in its own right. This suggests that rather than trying to tackle confidence improvement directly, for example through workshops and technical support, the objective should be to engage with teaching staff on the pedagogical issues they face and the potential opportunities for solving learning problems and improving learning opportunities for students through experimenting with proven learning technology applications.
The study has shown that whilst students hold an expectation of digital transformation, in practice there is still much to do in supporting this change from a teaching perspective. Just as shown in the Digital Practitioner Framework (Bennett 2014), there is a disconnect between student expectations and staff capabilities and motives. The pedagogical reasoning and methodology for the use of mobile technology is still unclear for some teaching staff, and it is this barrier that will prevent the utilisation of mobile learning within Higher Institutions. Where staff can be encouraged to improve learning opportunities for students through supported experimentation with learning technology tools, their confidence and their personal identity as digital practitioners is likely to increase. Higher Education institutions have to grasp the digital nettle fast, sheer enthusiasm will not do – reflecting Marshall’s view (2012). Justifying the pedagogic purposes of mobile technology for teaching and learning, combined with support for teaching staff will help harness the current enthusiasm for mobile technology and tip the balance from uncertainty to an integration of mobile learning.

References


JISC, JISC Info Kit Mobile Learning, [online] Available from http://www.jiscinfonet.ac.uk/infokits/mobile-learning/why-mobile-learning/


Electronic testing has become a regular part of online courses. Most learning management systems offer a wide range of tools that can be used in electronic tests. With respect to time demands, the most efficient tools are those that allow automatic assessment. The presented paper focuses on one of these tools: matching questions in which one question can be paired with multiple response terms. The aim of the paper is to identify how the types of questions used in a test can affect student results on such tests expressed as test scores. The authors focus mainly on the issue of the possible increase in scores that can occur with the use of closed questions, when students, after selecting the answers to the correct answers to, then guess the answers to the remaining questions (see Diamond and Evans, 1973, Ebel and Frisbie, 1986, Albanese, 1986). The authors show how the number of distractors (unused answers) included in a question influences the overall test score. The data on multiple-choice and alternative-response tests are important for determining the threshold at which students demonstrate they possess the required level of knowledge. Here the authors will compare the scores obtained for three types of closed questions: multiple choice, alternative response and matching questions. The analysis of matching assignments in this paper demonstrates that they are a useful type of assignment is higher than that of multiple-choice assignments with three distractors. The results currently between very good students – and this applies even if two distractors are used. In the case of such an objective, it is better to use multiple-choice assignments.

A general objective of this paper is to determine how the use of closed test assignments and questions may influence student test scores, and from an analysis determine which types of test assignments are best and have the greatest discriminating power. We will estimate the scores students would attain and the probability of their attaining them if they know the answers to a certain number of questions and guess the answers to the rest (see Diamond and Evans, 1973, Ebel and Frisbie, 1986, Abu-Sayf, 1979 and Albanese, 1986). We will compare the obtainable scores for three types of closed questions - multiple choice, alternative response and matching questions - and for combinations of them within individual tests. The results of the calculations will be demonstrated on examples that show how the choice or use of a particular test influences a student’s test score.

This study was motivated by the preparation and assessment of tests of Czech-language knowledge to be applied to the children of immigrants to the Czech Republic (see Kostelecka and Jancarik, 2014). The tests examined in the course of our research contained the various types of questions mentioned above. In subject areas studied in the research we combined various types of tests. In order to compare the results in individual subject areas it was necessary to distinguish the random score(s) in relation to the type of test used. We found that the issue of formula scoring in the case of multiple-choice and alternative-response (true/false) types of questions has been extensively discussed in the literature; however we were unable to find in the literature an analysis of formula scoring calculations for the matching type of question. Our calculations, which are presented below, show that matching questions have different attributes from the other two question types. Most notably, the score formula for this type of question is not a linear function, which means that it is possible to change the properties of a test using matching questions, particularly the area in which the test possesses a best discriminating power. We will demonstrate this aspect of matching questions using the example of the situation that motivated this research, namely, the need to create language tests that distinguish between students on the basis of a 60% level of knowledge of the material tested.

2. Multiple-choice questions

There is currently a wide range of programmes that can be used to create matching-type questions and enable their use both on websites and in almost every type of e-learning system. One frequently used programme for creating this type of test is Hot Potatoes™ (see Figure 1), for which there also exists a plugin for integration with the Moodle Language Management System (LMS).

![Figure 1: Hot Potatoes™](image)

Individual programs differ, of course, in terms of the number of options they offer and their visual presentation (see Figure 2). Usually, however, they offer the user the option to choose the number of questions and possible answers.

![Figure 2: Matching-type question in LMS Fronter](image)

3. Calculating probabilities

To calculate the possible scores that students can obtain and the probability of students obtaining those scores we used classic probability and combinatorial methods (see Charter, 2000). We shall assume in reference to all the calculations made in this paper that the student always knows the answers to a pre-determined number of questions and that he or she guesses the answers to the remaining questions by using each of the other responses just once. Programs automatically ensure that one answer cannot be applied to more than one question. The number of questions and the number of response options that are included in a test have an effect on the total random score that a student can attain. In this analysis we are focusing on tests in which each question comprises five sub-questions. This is the same number that was used in the test studied in our previous research. Moreover, it is easy to fix the total number of points awardable using this number of sub-questions and to create combinations of questions for tests of different length.
For each question and sub-question we examined the use of between five and seven response options. These represent three different approaches to formulating a test assignment that asks a student to match five items and to do by choosing among:

- five response options (the 5-5 type),
- six response options (the 5-6 type) and
- seven response options (the 5-7 type).

The results we compare here are of the scores students would probably obtain using the above-mentioned types of test tasks and of the scores they would obtain if we used multiple-choice or alternative-response questions.

To calculate the probability of students obtaining a certain score (see Arratia and Tavare, 1992, Pitman, 1997) we used rencontres numbers $F(k,n)$ as described, for instance, by Riedel (2006), where $F(k,n)$ is the number of permutations of an $n$-element set that keeps $k$ elements fixed.

$$F(k, n) = n! \sum_{j=k}^{n} \frac{(-1)^{j-k}}{(j-k)! k!}$$

### 3.1 The 5-5 type of matching question

In the case of the 5-5 type of matching question, the student is presented with five response options (without using distractors) and has to correctly match them to five lexical items. Table 1 presents the calculated probabilities of obtaining individual scores. The rows give the number of questions the student would answer correctly, while the columns give the probability of the given score being attained. We are interested in learning, for instance, what the probability is that a student who knows the answer to fewer than three questions will ultimately obtain three or more points in total in this kind of assignment (and will thus obtain a passing score of 60% or more). Table 1 shows that the probability of students who know the answer to just two questions getting a score of three or more points is greater than 50% in this type of assignment (there is a 50% likelihood that the student will obtain three points, and a 17% likelihood that the student will obtain as many as five points for this assignment).

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### 3.2 The 5-6 type of matching question

Table 2 presents the score and probability calculations for a matching question that uses one distractor (the 5-6 type). This type of assignment is of more informational value than a multiple-choice question with three distractors. However, students who know the answer to just two questions here still have more than a 50% probability of obtaining at least the required score of 3 points and thereby passing this assignment.
The 5-6 type of matching assignment: 5 questions and 6 matching options (1 distractor)

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</table>

The 5-7 type of matching question

Table 3 shows the probabilities of different scores being obtained in a matching question with two distractors (the 5-7 type) in relation to the number of answers a student truly knows. In this type of assignment, the probability that a student who knows two correct answers will obtain three points is less than 50%. Among the assignments studies here this type will be the one best suited to testing the language skills of immigrant students in the proposed diagnostic test.

Table 3: The 5-7 type of matching assignment: 5 questions and 7 matching options (2 distractors)

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<td></td>
<td>100%</td>
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</table>

3.3 The 5-7 type of matching question

3.4 A comparison of tests

Tables 4 and 5 present comparisons of all the above-mentioned test assignments. The results for the tests that use multiple-choice (M-C) and alternative-response (T-F) questions are also included in these tables for comparison. Table 4 calculates average test scores for each type of test in relation to the number of correct answers a student knows. The results presented in the figures indicate that the most informative type of assignment for diagnostic testing is the matching question test with two distractors. Table 5 shows the probability that a student who knows the correct answer to two or fewer questions will attain the required minimum of three points to pass the assignment. This threshold corresponds to the requirements of the language test that the initial calculations were prepared for. The results indicate that the alternative-response type of assignment (true/false) is not appropriate because it is of little informational value. The best and most informative type of assignment is the matching question with two distractors. Pre-testing moreover showed that this type of test assignment appeals to students and is easy to understand.

Table 4: Average scores for the different types of test assignment

<table>
<thead>
<tr>
<th></th>
<th>T-F</th>
<th>M-C</th>
<th>5-5</th>
<th>5-6</th>
<th>5-7</th>
</tr>
</thead>
<tbody>
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</tr>
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<td>4.5</td>
<td>4.3</td>
</tr>
<tr>
<td>5</td>
<td>5.0</td>
<td>5.00</td>
<td>5.0</td>
<td>5.0</td>
<td>5.0</td>
</tr>
</tbody>
</table>
Table 5: The probability a student can successfully pass the assignment even if she/he has less than the required amount of knowledge to pass

<table>
<thead>
<tr>
<th></th>
<th>T-F</th>
<th>M-C</th>
<th>5-5</th>
<th>5-6</th>
<th>5-7</th>
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<tbody>
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<td>29%</td>
<td>19%</td>
<td>14%</td>
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<tr>
<td>2</td>
<td>88%</td>
<td>58%</td>
<td>67%</td>
<td>54%</td>
<td>49%</td>
</tr>
</tbody>
</table>

4. Calculating probabilities for a combination of questions

The calculations show that the score formula for the matching-type/assignment is not (unlike the formula scoring for other types of questions studied) a linear function (cf. Ridel, 2006). As a result, the matching question is better at accurately measuring a student’s skills on some levels than other types of questions are. On the other hand, when multiple questions are used the overall result is influenced by how the student’s knowledge is distributed between different questions. Table 6 shows the situation where a student is presented with two matching-type questions and knows the answers to six sub-questions. The average attained score is divided according to how the student’s knowledge of the answers to sub-questions is divided.

The results show that students whose knowledge is distributed evenly among the questions have a slight advantage. This fact needs to be taken into account in the development and assessment of tests.

Table 6: Average score for two questions of the same type based on a distribution of six correct answers

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<th>5-5</th>
<th>5-6</th>
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<td>3-3</td>
<td>8</td>
<td>7.4</td>
<td>7</td>
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</table>

5. Score formula and formula scoring for Multiple-Choice test

The basic objection to the use of tests with closed questions is that students often get part of their score by just guessing the answers to questions they cannot answer. If a test contains multiple-choice items, the typical student’s strategy will be to answer those questions they know the answer to and then guess the answers to the rest of the questions. The results that we get are distorted and cannot be compared to the results of other tests. If, for example, we make two tests with the goal of comparing pupils’ knowledge, where one test consists of open questions and the other is multiple choice with just two items per question, the score on the second test will naturally be much higher because most of the answers will have been guessed with a fifty percent probability of guessing the right answer.

There are several ways to rectification of the gained data. Each method has its advantages and drawbacks and which one is used will depend on the particular test assignment and the goal we want to achieve. There are three basic goals in all testing:

- to minimise wherever possible the number of questions in which students can make random guesses
- to minimise the differences (in scores/results) of students who know the same number of correct answers
- to ensure the comparability of results attained using different kinds of tests

The literature describes in detail some tools that can be used to minimise the number of answers a student can just guess with respect to one of the above stated goals (cf. Budescu and Bo, 2014, Farrell and Farrell, 2014). These tools include advice on how to select distractors, how to pose questions, and may recommend deducting points for incorrect answers, or they may give advice on how to estimate the number of guessed responses on the basis of the number of wrong answers. However, none of these options solves the problem entirely. For example, a pupil could rule out some of the response options to a multiple-choice question, thereby reducing the actual number of options from which to attempt to guess the right answer; the chances
of the student’s success are thereby increased. The usual approach to estimating the number of questions to which a student did not know the answer in a multiple-choice test is based on the number of incorrect answers the student chose. This calculation is based on the idea that a student scores by chance in about one nth of the number of guessed answers (where \( n \) is the number of items to choose from). Thus, if a student answered 3 questions incorrectly on a test in which question was accompanied by four response items to choose from, we presume the student had been guessing four times and one of the guessed answers was correct. Thus the following formula could be used:

\[
FS(C) = C - \frac{W}{(n - 1)}
\]

where \( FS(C) \) is the formula scoring, \( C \) the number of correct answers and \( W \) the number of wrong answers. The table 7 presents the converted values for a test with five questions offering different numbers of response items to choose from (two, three, four and five items).

**Table 7: Standard formula scoring for a multiple-choice test made up of five questions with different numbers of response items (from 2 to 5) to choose from**

<table>
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<th>5</th>
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<td>-1.67</td>
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</tr>
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<td>1</td>
<td>-3.00</td>
<td>-1.00</td>
<td>-0.33</td>
<td>0.00</td>
</tr>
<tr>
<td>2</td>
<td>-1.00</td>
<td>0.50</td>
<td>1.00</td>
<td>1.25</td>
</tr>
<tr>
<td>3</td>
<td>1.00</td>
<td>2.00</td>
<td>2.33</td>
<td>2.50</td>
</tr>
<tr>
<td>4</td>
<td>3.00</td>
<td>3.50</td>
<td>3.67</td>
<td>3.75</td>
</tr>
<tr>
<td>5</td>
<td>5.00</td>
<td>5.00</td>
<td>5.00</td>
<td>5.00</td>
</tr>
</tbody>
</table>

However, this method of conversion is not suitable for comparing results from different types of tests as it introduces negative values to the test results and in some cases significantly changes the range of possible test values. Moreover, the formula scoring presented above cannot easily be extended for use with matching-type tests.

For this reason the authors of this paper introduce a new approach based on the formula

\[
SF (C) = \frac{\sum_{i=1}^{C} i \cdot P(C, i)}{\sum_{i=1}^{C} P(C, i)}
\]

where \( C \) stands for the number of correct answers and \( P(C, i) \) stands for the probability that a student will attain \( C \) correct answers when s/he knows \( i \) correct answers and guesses the remaining answers. This formula is based on the idea of the mean value of a random variable and calculates the value from which the required number of points is attained if the student is guessing randomly.

**Table 8: Score formula for a multiple-choice test made up of five questions with different numbers of response items (from 2 to 5) to choose from**

<table>
<thead>
<tr>
<th>C/n</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>1</td>
<td>0.29</td>
<td>0.38</td>
<td>0.44</td>
<td>0.50</td>
</tr>
<tr>
<td>2</td>
<td>0.73</td>
<td>0.97</td>
<td>1.14</td>
<td>1.27</td>
</tr>
<tr>
<td>3</td>
<td>1.43</td>
<td>1.87</td>
<td>2.14</td>
<td>2.31</td>
</tr>
<tr>
<td>4</td>
<td>2.53</td>
<td>3.08</td>
<td>3.36</td>
<td>3.51</td>
</tr>
<tr>
<td>5</td>
<td>4.10</td>
<td>4.51</td>
<td>4.67</td>
<td>4.75</td>
</tr>
</tbody>
</table>
Table 9: Score formula for a multiple-choice test made up of ten questions with different numbers of response items (from 2 to 5) to choose from

<table>
<thead>
<tr>
<th>C/n</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>1</td>
<td>0.17</td>
<td>0.23</td>
<td>0.29</td>
<td>0.33</td>
</tr>
<tr>
<td>2</td>
<td>0.39</td>
<td>0.56</td>
<td>0.70</td>
<td>0.83</td>
</tr>
<tr>
<td>3</td>
<td>0.69</td>
<td>1.02</td>
<td>1.30</td>
<td>1.53</td>
</tr>
<tr>
<td>4</td>
<td>1.11</td>
<td>1.67</td>
<td>2.12</td>
<td>2.45</td>
</tr>
<tr>
<td>5</td>
<td>1.71</td>
<td>2.57</td>
<td>3.17</td>
<td>3.56</td>
</tr>
<tr>
<td>6</td>
<td>2.55</td>
<td>3.72</td>
<td>4.38</td>
<td>4.76</td>
</tr>
<tr>
<td>7</td>
<td>3.73</td>
<td>5.06</td>
<td>5.68</td>
<td>6.00</td>
</tr>
<tr>
<td>8</td>
<td>5.25</td>
<td>6.51</td>
<td>7.00</td>
<td>7.25</td>
</tr>
<tr>
<td>9</td>
<td>7.05</td>
<td>8.00</td>
<td>8.33</td>
<td>8.50</td>
</tr>
<tr>
<td>10</td>
<td>9.01</td>
<td>9.50</td>
<td>9.67</td>
<td>9.75</td>
</tr>
</tbody>
</table>

Tables 8 and 9 show how the converted test results change depending on the number of response items. We can see that the range of results is close to the range of results on the original tests results. Unlike the above-described method usually used, this method keeps the minimum value but also decreases the maximum value because the maximum number of points can be attained not only thanks to knowledge, but also to random guessing. The presented function is not, unlike the previous one, a linear function.

5.1 Example of use

The differences between both functions after the correction of test results can be demonstrated by comparing results in a test of language skills of migrant children at the B2 level in writing and listening (see Kostelecka and Jancarík, 2014). In the written test, pupils produced written answers to open questions, in the listening test true-false question were used. Therefore we compared a test with open questions to a test highly prone to random error. The results of this comparison are presented in Table 10. The comparison was carried out both for a complete set of data and for data from which we excluded tests on which pupils scored either the minimum or the maximum number of points (the biggest difference between the conversion functions is at these two extremes). The comparison shows that despite the significant initial difference in the point values, the pupils’ skills in both studied areas were very similar.

Table 10: A comparison of calculations before and after subtracting randomly attained calculations using both methods described above

<table>
<thead>
<tr>
<th></th>
<th>Ø Writing</th>
<th>Ø Listening</th>
<th>Ø Listening SF</th>
<th>Ø Listening FS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full sets of data</td>
<td>3.46</td>
<td>6.98</td>
<td>4.12</td>
<td>3.72</td>
</tr>
<tr>
<td>Data without extremes</td>
<td>4.80</td>
<td>7.26</td>
<td>4.41</td>
<td>4.30</td>
</tr>
</tbody>
</table>

Table 11: A comparison of calculations before and after subtracting randomly attained calculations using both methods described above

<table>
<thead>
<tr>
<th></th>
<th>Ø</th>
<th>Writing - Listening</th>
<th>Ø</th>
<th>Writing - Listening SF</th>
<th>Ø</th>
<th>Writing - Listening FS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full sets of data</td>
<td>3.73</td>
<td>2.48</td>
<td>3.08</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data without extremes</td>
<td>2.70</td>
<td>2.29</td>
<td>2.95</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This means that the conversion functions approximated the data of both groups. What is very interesting is to compare the values before and after conversion for individual students. In Table 11 you will find the ‘average distance’ between the results of individual students in both skill areas studied. The table clearly shows that the
method we propose reflects the overall shift and approximation of results even at the level of the individual student, which is not true in the case of the standard FS method, where this approximation (in lesser degree) can only be observed for the full data set.

6. Determining the score formula for matching-type tests

Table 12: Score formula for each type of test and the attained score

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-7</td>
<td>0.00</td>
<td>0.58</td>
<td>1.38</td>
<td>2.36</td>
<td>3.47</td>
<td>4.62</td>
</tr>
<tr>
<td>5-6</td>
<td>0.00</td>
<td>0.54</td>
<td>1.32</td>
<td>2.25</td>
<td>3.28</td>
<td>4.42</td>
</tr>
<tr>
<td>5-5</td>
<td>0.00</td>
<td>0.50</td>
<td>1.19</td>
<td>2.07</td>
<td></td>
<td>4.00</td>
</tr>
<tr>
<td>T-F</td>
<td>0.00</td>
<td>0.29</td>
<td>0.73</td>
<td>1.43</td>
<td>2.53</td>
<td>4.10</td>
</tr>
<tr>
<td>MC 3</td>
<td>0.00</td>
<td>0.38</td>
<td>0.97</td>
<td>1.87</td>
<td>3.08</td>
<td>4.51</td>
</tr>
<tr>
<td>MC 4</td>
<td>0.00</td>
<td>0.44</td>
<td>1.14</td>
<td>2.14</td>
<td>3.36</td>
<td>4.67</td>
</tr>
<tr>
<td>MC 5</td>
<td>0.00</td>
<td>0.50</td>
<td>1.27</td>
<td>2.31</td>
<td>3.51</td>
<td>4.75</td>
</tr>
</tbody>
</table>

The method of determining score formula presented above, based on probability of the different resultscan be modified for matching-type tests. The following table (Table 12) presents the corresponding values of the function for all the three types of tests studied here. For easy comparison it also contains data on multiple-choice tests.

7. Conclusion

The goal of this paper was to describe the basic properties of a matching-type test. The matching-type test has significant potential and is a tool particularly well suited to tests that seek to assess the level of knowledge a student has attained. For example, the matching-type test with two distractors is very good at distinguishing knowledge levels measured against a 60% passing score.

The results currently indicate that these types of assignment are not useful if the objective is to rank students or to distinguish between very good students – and this applies even if two distractors are used.

The paper introduces two methods of rectification of data that are obtained from tests made up of closed questions. The rectification calculations make it possible to compare scores attained in different types of test because they allow the score values to be ‘purged’ of random score increases that can occur in relation to the type of test used. The paper compares two methods used for multiple-choice tests and introduces how one of the methods can be modified to be used with matching-type tests. This paper presents the score values of this scoring formula for the 5-5, 5-6 and 5-7 types of test and introduce a method that can be used to calculate these values also for other types of test.

Acknowledgements

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References

The Effectiveness of E-Learning: An Explorative and Integrative Review of the Definitions, Methodologies and Factors that Promote e-Learning Effectiveness

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Abstract A structured search of library databases revealed that research examining the effectiveness of e-Learning has heavily increased within the last five years. After taking a closer look at the search results, the authors discovered that previous researchers defined and investigated effectiveness in multiple ways. At the same time, learning and development professionals within public and private organisations are increasingly being asked to prove the effectiveness of their learning and development initiatives. This paper investigates the effectiveness of e-Learning through an integrative review. The paper answers the following research questions: How is the effectiveness of e-Learning defined? How is the effectiveness of e-Learning measured? What makes e-Learning solutions effective? The authors discovered 19 distinct ways to define effectiveness, the most common of which is ‘learning outcome’, appearing in 41% of the articles examined in the literature review. Moreover, the most common way to measure effectiveness is quantitatively with pre- and post-tests. This paper includes an empirical study of an e-Learning solution for science teachers (K–12) which serves as a valuable addition to the findings of the literature study. The study suggests that it is difficult to use e-Learning to improve teaching performance, as participating teachers can apply several strategies to avoid substantially changing their work-related practices. Furthermore, the study shows that only using the fulfilment of pre-defined learning objectives as an effectiveness parameter does not allow developers and researchers to see unexpected and unintended changes in practice that occur as a result of the e-Learning program. Finally, the research provides insight into the validity of self-assessments, suggesting that participants are able to successfully report their own practices, provided certain qualitative survey approaches are used. In this paper, a model for understanding the relationships of the key factors that influence effectiveness is developed. The model categorises these factors from three perspectives: the context in which the e-Learning solution is used, the artefact (the e-Learning solution itself) and the individuals that use the artefact. It was found that support and resources, the individuals’ motivation and prior experience and interaction between the artefact and the individuals that use it all influence effectiveness. Finally, this paper discusses whether e-Learning and traditional face-to-face learning should be measured according to the same definitions of and approaches to effectiveness, ending with a call for learning designers and researchers to target their measurement efforts to counting what counts for them and their stakeholders.

Keywords: effectiveness, e-Learning, adult learning, literature study, definition, measurement

1. Introduction

Research examining the effectiveness of e-Learning has increased in recent years. This is primarily due to the increased possibilities for IT and learning as well as increased political and organisational attention to ‘what works’ in learning. Figure 1a shows the 761 papers relevant to this research, and Figure 1b shows 111 intensively coded abstracts of the 761 papers (which are described in further detail in the methodology section below). There are fewer papers published in 2013 than in any other year because the structured search took place in October 2013.

In the following analysis, the authors investigate the research into the effectiveness of e-Learning. The paper is structured around three research questions: How is the effectiveness of e-Learning defined? How is the effectiveness of e-Learning measured? What makes e-Learning solutions effective? The aim of the literature study is to organise similar research in order to better understand the characteristics and tendencies as well as connections between the applied concepts.

1.1 Literature study - methodology

Several systematic reviews and meta-studies on the effectiveness of e-Learning are considered within the context of health care or language learning. These reviews primarily include quantitative studies based on certain criteria, such as sample size (Veneri, 2011), transparency of statistical information (Grgurovic, Chapelle and Shelley, 2013; Means et al, 2013) or homogeneity of the respondents and predefined outcome measures (Rosenberg, Grad and Matear, 2003). Only one relevant meta-review, which included both qualitative and quantitative studies in an integrative review evaluating the outcome of distance learning for nursing education, was found (Patterson, Krouse and Roy, 2012).

The quantitative meta-reviews aimed to document the effectiveness of e-Learning by consolidating the data of a number of quantitative studies. The mixed-method meta-review mentioned above describes the state of the research, explains how the studies evaluate different outcomes and discusses different aspects of learning effectiveness. This is somewhat similar to the present paper, which also applies a mixed-method methodology in an integrative manner. However, many more research articles are considered in this paper due to broader selection criteria. Hence, this paper is not concerned with re-investigating how effective e-Learning is, but rather with understanding the definitions, measurements and factors promoting e-Learning effectiveness.

The authors aimed to obtain a broad foundation of high-quality papers, from which a large but not pre-defined number was chosen for further investigation. Papers were chosen using a strategic randomised approach based on a purposive sample size, then analysed based on the concept of theoretical saturation (that is, the point at which new data no longer provide further insight into the subject at hand). In this integrative review, data analysis, data reduction and data displays are equally important (Whittermore and Knafl, 2005).

The authors conducted conventional subject searches in 30 academic databases (J-stor, Scopus and Proquest, which includes 28 databases) to discover articles examining the effectiveness of e-Learning within the context of adult learning (see Table 1). All fields of research were included in the searches, as e-Learning can be used to support any subject. The searches only included articles in English, and where possible, only peer-reviewed journals. The chosen synonyms for ‘effectiveness’ include ‘transfer’ and ‘application’, which may have resulted in an overrepresentation of articles that define effectiveness as the application of learning content into work practices.

The searches resulted in almost 1000 articles. Articles clearly irrelevant to the subject were excluded, diminishing the number to 761. If an article contained an empirical study on the effectiveness of e-Learning and the solution under investigation was targeted at working professionals or students, then the abstracts were carefully coded and analysed in great detail using Nvivo 10. When doubts about the relevance or coding of the abstracts surfaced, the two authors discussed the abstract, decided on the best coding and documented what was learned from the discussion in a shared document.
Before the coding began, a rough coding scheme was created based on the research questions, which entailed parent codes (named ‘nodes’ in NVivo) such as ‘definition of effectiveness’, ‘research question’, ‘research methodology’, ‘subject area’, ‘audience’, ‘theories applied’, ‘technology applied’, ‘key findings’ and so on. The detailed coding tree was created through in vivo coding, a grounded approach in which codes are added as the analysis reveals relevant factors by using the original statement of the source as a code name (Harry, Sturges and Klingner, 2005). New sub-nodes were continuously created as new definitions, new factors of effectiveness and new technologies were discovered in the abstracts.

As mentioned, the purposive sampling led to a strategic randomised approach for selecting papers from the large collection. The papers were not investigated in alphabetical order. Rather than analysing from A to Z, a variety of letters in the alphabet was chosen, as there tend to be surnames, and henceforth letters, which are used more in some regions than others. Though the aim was not to obtain an even global distribution of papers, the authors, nevertheless, tried to accumulate the broadest scope of information possible.

Of the 224 abstracts that were carefully read, 111 fulfilled all the criteria and were coded in detail using the above-mentioned method.

1.2 Empirical study – bringing context into the literature study

The empirical study aimed to discover if, how and why an e-Learning program would be successful in improving science teachers’ work practice in Danish elementary schools. Thus, the empirical study lives up to the criteria of the literature study, as it focuses on the effectiveness of e-Learning for working professionals. It also explores some of the challenges highlighted by the literature study.

The solution and learning design focused on developing competent teaching methods for natural science. In this project, effectiveness is understood as the transfer of learning, which positively impacts teaching practices. The e-Learning was investigated thoroughly from February to June 2014 as a possible solution for 7 teachers at three Danish elementary schools.

The data gathering method included extensive in-class video recordings and observations. The researcher recorded teaching methods using a mobile ethnographic approach; the teachers had small camcorders attached to their necks, which enabled the researcher to view the classroom from the teachers’ perspective. The data consisted of approximately 120 hours of in-class video recordings and 100 pages of observation notes. The researcher also had reflection sessions with the teachers before and after the introduction of e-Learning. These sessions were inspired by the mind tape and retrospective interview methodologies (as in Kumar, Yammiyavar and Nielsen, 2007). The teachers’ interactions with e-Learning, including their preparation for classes, were recorded by Camtasia, a software program that can record the screen, mouse movements and a picture-in-picture setting of the user. Here, the think-aloud approach was applied (Nielsen, Clemmensen and Yssing, 2002). The data consisted of approximately 25 hours of video recordings and 40 pages of observation notes of teachers’ interactions with e-Learning. The teachers responded to a satisfaction survey immediately following the conclusion of the e-Learning, as well as a pre-survey shortly before initiating the e-Learning and a post-survey approximately one month after completion of the e-Learning. The latter was repeated 6 months after completion. This final data consists of 28 responses to the surveys, which each had approximately 20 questions.
The approach to gathering empirical data was specifically designed to capture some of the complexity, possibilities and challenges of teaching practices, both expected and unexpected. In the following section, the preliminary results of the empirical study are included when they contribute to answering the research questions of this paper.

2. How is the effectiveness of e-Learning defined?

Approximately one-third of the abstracts in the literature study were coded. From these, as many as 19 different ways to define effectiveness have been identified. These definitions are listed in chronological order below, in Table 2, with the most commonly used definition at the top. The table includes 92 papers of the 111 coded. The remaining abstracts did not state the target audience and are therefore not included in this table. The actual number of papers from which the 19 definitions were obtained is 170, not 92. This is because a set of definitions is often used to investigate the effectiveness of an e-Learning solution; for example, several papers use both ‘learning outcome’ and ‘satisfaction’ as definitions for effectiveness (Harrington and Walker, 2009; Jung et al, 2002; Maloney et al, 2011). The number of papers in this list would of course change if the remaining abstracts were coded, but the author’s find that the most common definitions are expected to stay relatively stable, as they have not significantly changed in recently reviewed abstracts.

Table 2: Definitions of effectiveness organised by the context of adult learning

<table>
<thead>
<tr>
<th></th>
<th>Higher education</th>
<th>Work-related learning</th>
<th>Total</th>
</tr>
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<tbody>
<tr>
<td>Number of papers:</td>
<td>52</td>
<td>40</td>
<td>92</td>
</tr>
<tr>
<td>Distribution of papers:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learning outcome</td>
<td>29</td>
<td>9</td>
<td>38</td>
</tr>
<tr>
<td>Transfer (application to practice)</td>
<td>3</td>
<td>15</td>
<td>18</td>
</tr>
<tr>
<td>Perceived learning, skills or competency</td>
<td>11</td>
<td>6</td>
<td>17</td>
</tr>
<tr>
<td>Attitude</td>
<td>8</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>8</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>Skills acquired</td>
<td>5</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Usage of product</td>
<td>4</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>Learning retention</td>
<td>4</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>Completion</td>
<td>0</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Motivation and engagement</td>
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<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Organisational results</td>
<td>0</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Application to simulated work practice</td>
<td>0</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
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<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Confidence</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Cost-effectiveness</td>
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<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Connectedness</td>
<td>1</td>
<td>1</td>
<td>2</td>
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<tr>
<td>Few errors</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Raised Awareness</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Success of (former) participants</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Undefined effectiveness</td>
<td>10</td>
<td>2</td>
<td>12</td>
</tr>
</tbody>
</table>

Of the papers reviewed, 57 % (52/92) examined effectiveness within higher education, in which context the most prominent definition of e-Learning effectiveness was ‘learning outcome’, with 56 % (29/52) of these papers applying this definition. Within work-related learning, the most common definition was ‘transfer (application to practice)’, with 38 % (15/40) of the papers applying this definition.

‘Learning outcome’ occurs when participants acquire new understandings as a result of the e-Learning initiative. This is a broad definition, but in the abstracts of papers examining higher education, the definition is often clarified in terms of measurements; for example: ‘Student learning measurements included: pre-test, final examination (post-test) and final letter grade’ (Boghikian-Whitby and Mortagy, 2008).

Within the field of work-related learning, the ability to apply the content or processes of the e-Learning
solution is essential. For example, in a study on teachers’ technology competencies, it was not ‘knowing about’, but rather the actual ‘integration of computer activities with appropriate inquiry-based pedagogy in the science classroom’ that determined effectiveness (Angeli, 2005).

It is, however, interesting that ‘transfer (application to practice)’ is sometimes evaluated through the participants’ self-assessments: ‘Outcomes were measured across levels 1 to 3 of Kirkpatrick’s hierarchy of educational outcomes, including attendance, adherence, satisfaction, knowledge and self-reported change in practice’ (Maloney et al, 2011) and ‘A follow-up questionnaire showed that two-thirds of those who viewed the program had subsequently reviewed the performance data for the initial wire they were using and 20 % had changed it’ (Marsh et al, 2001). This brings to light the discussion of whether or not it is possible for learners to assess their own transfer (i.e. if people accurately report their actions, or if researchers, managers, peers or learning professionals must observe and report).

Since learning literature often focuses on engagement and motivation as necessary factors for knowledge gain and learning transfer, it is surprising that only five papers include these aspects in their research (Table 2).

Some papers investigated the interrelatedness of more aspects of effectiveness, such as the relation between learning outcome/retention and behaviour. For example, Hagen et al (2011) found that ‘...the effects of the intervention on security awareness and behaviour partly remains more than half a year after the intervention, but that the detailed knowledge on information security issues diminished during the period.’ Such a study challenges the idea that behaviour changes can be measured through learning retention.

Table 2 also shows that the abstracts dealing with higher education operated with few definitions other than ‘learning outcome’, while the abstracts dealing with work-related learning generally applied a greater variety of definitions. This could be because universities work with performance requirements that primarily focus on examination grades and completion rates, causing effectiveness to be measured by cognitive knowledge indicators. In a work-related setting, however, effective learning is much broader, including aspects that are not bound to individual or group projects, such as the application of learning to work contexts, organisational results and cost-effectiveness.

It became clear in the analyses that many abstracts and a number of papers did not state their definitions of effectiveness; 13 % (12/92) of the abstracts left effectiveness completely undefined.

2.1 Why is this important?

Having multiple ways of understanding the effectiveness of e-Learning allows professionals and researchers substantial flexibility in defining, measuring and determining the effectiveness of an e-Learning solution. However, the broadness of the concept does present challenges. Leaving the concept of e-Learning undefined may lead to misunderstandings, and the aspects of effectiveness that are of most value to participants and stakeholders may not be considered. Illuminating the many definitions of effectiveness can lead to reflection and inspiration for appropriately utilising the concept of effectiveness, thus enabling learning professionals to better align their expectations and target their measuring efforts towards what is important to them and their stakeholders.

3. How is the effectiveness of e-Learning measured?

The previous section broadens the understanding of the definitions applied within research examining the effectiveness of e-Learning. But how are these definitions investigated in the various studies? How do the researchers measure effectiveness, and what consequences result? Of the 111 abstracts coded in detail, 63 abstracts identified their research design.

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<th>Table 3: Research study methods</th>
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<tr>
<td>All abstracts coded with...</td>
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<tr>
<td>9</td>
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<tr>
<td>Comparative studies applying...</td>
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The first row of Table 3 shows the distribution of research studies coded as mixed, qualitative and quantitative studies. In addition, 30 comparative studies were found, 11 of which do not describe in the abstract whether
they are conducting qualitative, quantitative or mixed methods research. The distribution of the rest is shown in the second row. Nearly 73% (37/51) of the studies are quantitative. Almost half of these are comparative studies, which compare e-Learning with traditional face-to-face and/or blended learning. The vast amount of comparative quantitative studies may be due to policy makers’ interest in this research (Grgurovic et al., 2013).

The literature study reveals that the most common way to measure effectiveness is through quantitative pre- and post-testing. To come to an understanding of which definitions of effectiveness are most used in particular kinds of studies, the effectiveness code was correlated with the research methods applied. This correlation showed that ‘learning outcome’ was used more frequently in quantitative studies (18 papers) than qualitative (2 papers) and mixed methods studies (1 paper). More quantitative studies were identified than qualitative studies, but the quantitative studies’ use of ‘learning outcome’ is still significantly higher.

It might be assumed that qualitative studies would use several definitions of effectiveness, but this was not the case. Instead, these studies tended to use only one or two of the 19 definitions, whereas quantitative studies used significantly more. This could be because qualitative and mixed methods studies aim to explore a single concept in dept, and the intentions are often to understand the ‘why’s’ of such a concept, which requires a significant amount of time and resources. On the other hand, quantitative research uses definitions as a set of variables constituting effectiveness, thus necessitating the use of several definitions.

The reason for the distribution of research methods in this literature study could be due to both a publication and policy bias. Writing thorough descriptions of the ‘why’s of qualitative research requires more space than reporting means and standard deviations. Very few journals allow for such prolonged papers, and quantitative papers also tend to be in higher demand, in line with what Grgurovic (2013) calls a ‘publication bias’ (i.e. the tendency to only publish studies with statistically significant findings).

3.1 Why is this important?

As stated, most research into the effectiveness of e-Learning focuses on measuring if and/or which e-Learning solutions are effective using quantitative measures. The aim of the empirical study examining an e-Learning program for science teachers was to understand the complex approaches used, when attempting to change teaching practices using e-Learning. The solution uses an on-the-job learning approach, including in-class practice, and a facilitated team-based competence development setup. It was shown that great effort is needed to use e-Learning to improve teaching performance.

The qualitative analysis of the teachers’ interactions with e-Learning (Camtasia recordings) shows three prevailing strategies that the teachers use to avoid substantial changes to their work practice:

1. Finding statements to reject content, which means that the teachers seemed to be searching for single statements in the e-Learning content that they could use to prove that application to practice was not possible. Some stated that they preferred to teach as the e-Learning suggested, but their work context would not allow for it.
2. Modifying content to make change less demanding, which means that the teachers consciously or unconsciously modified the content to work similarly to their current practices, allowing them to state that they were already teaching this way, or changing the content to become easily applicable. This finding is in line with Bransford and Schwartz (1999), who discovered that people often modify a transfer situation until it becomes similar to something they know (Lobato, 2006).
3. Pinpointing content that can be easily implemented, which means that the teachers used elements of the content that they could easily apply to their teaching without changing it fundamentally.

For the quantitative and qualitative surveys, the teachers were asked to evaluate their application of the program’s learning content to the lessons that were observed by the project researcher. This enabled the researcher to compare the teachers’ self-assessments of transfer and transfer-related concepts (motivation, knowledge and self-efficacy) with the observation material. This led to the conclusion that all teachers following the program made noticeable changes to their teaching practice, largely using the third strategy mentioned above.
This research design (see 1.3) also enabled the researcher to discover unintended and unexpected transfer. For example, one teacher became so fond of her new way of posing questions to the pupils that she now uses the method when teaching history as well. On the other hand, her co-worker was insecure with the new teaching methods, which negatively affected her teaching. Research examining learning transfer shows that the traditional notion of one-to-one transfer from learning to practice must be challenged (see Lobato, 2006). A challenge often faced when evaluating effectiveness is that unexpected transfer, which can have both positive and negative impacts on performance, may not be analysed if only known and a priori concepts are investigated. Thus, if only quantitative survey data was gathered, the empirical study would have presented a misleading view of the transfer of learning. In addition, the teachers generally overestimated themselves in both pre- and post-testing. However, by including the qualitative elements of the survey (e.g. teachers describing their actions during the lessons in their own words), most discrepancies between self-assessment and observation were clarified, and the responses could be accepted or corrected. The amount of pure quantitative research in the literature study was also of concern. Results relying solely upon rating scales and multiple-choice tests can easily become misleading. Openness to participants’ own unframed understandings, even if only part of a survey, can potentially result in more valid and usable answers regarding the effectiveness of e-Learning, regardless of its definition.

4. What makes e-Learning solutions effective?

All the abstracts used in this study were coded for whether the e-Learning was effective, not effective or partly effective, provided this was stated or indicated in the abstracts. This was the case for 61 of the 111 abstracts examined. The distribution is shown in Table 4.

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<tr>
<td>Effective</td>
<td>41</td>
</tr>
<tr>
<td>Not effective</td>
<td>6</td>
</tr>
<tr>
<td>Partly effective</td>
<td>14</td>
</tr>
</tbody>
</table>

Considering the challenges of e-Learning, the fact that only 10 % (6/61) of the studies are classified as ‘not effective’ questions the validity of the classifications. Taking a closer look at the abstracts, it became clear that many of the empirical studies on effectiveness were conducted by researchers who appeared to have a stake in the success of e-Learning. This issue of ‘effectiveness bias’ means that the literature study at this point does not support the investigation into which e-Learning solutions are particularly effective. Perhaps a future analysis of the papers in question is warranted. What this study can explore are the factors that influence e-learning effectiveness.

A qualitative view of the factors, which the researchers classify as either promoting or prohibiting e-Learning effectiveness across a spectrum of definitions, methodologies and e-Learning media, provides valuable additions to e-Learning design and research. Through in vivo coding, 34 factors were found and divided into the three categories: individual (subject), contextual scaffolding (context + object) and e-Learning solution and process (artefact). These categories are inspired by the concept of activity theory, as they relate to learning and the transfer of learning (in line with Engeström, Leont’ev, Vygotsky and Orlikowsky).

Table 5: Factors that influence effectiveness
The categorization of the factors shows an interesting distribution (Table 5). The papers examined in the literature study clearly prioritise factors related to the e-Learning solution and process, even though contextual factors may be more critical to e-Learning effectiveness (Noesgaard, 2014). The reason for this phenomenon may be that the contextual factors are perceived as too complex and changeable to investigate and control for research, and that they lay outside the responsibility of learning professionals.

As previously mentioned, the grounded approach uses the wording from the papers in the first round of analysis. This was also done for the factors listed in Table 5. In the second round of analysis, the authors found that the interconnectedness of the factors called for further categorisation. This categorisation into key factors is discussed further below and is illustrated in Figure 2.

Overall, in terms of the contextual factors, the key factors are quite clearly ‘resources’ (time, technology) and ‘support’ (from managers, IT personnel or peers) in the learning environment. These factors are essential for using e-Learning initiatives to improve performance and change behaviours.

With regards to individual factors, the papers generally agree that effectiveness varies according to individual differences (e.g. Armatas et al, 2003; Aydoğan Karaaslan, 2013). Some papers refer to learner characteristics broadly and others discuss particular issues relevant to their study. Two mentioned characteristics are ‘age’ and ‘previous online experience’ (Table 5). One study suggests ‘...that adult students benefit more from taking online classes compared to traditional age students [...] and that computer competency helped improve performance in online classes over time’ (Boghikian-Whitby and Mortagy, 2008: 107). Sometimes, factors that are not mentioned can have an impact on effectiveness: ‘However, although gender is a significant predictor in traditional classroom courses, its effect disappears in Web-based courses. There is evidence that Web-based courses can be conducive to the learning process of technical knowledge for female students’ (Lam, 2009).

The individual factors largely fit into two categories related to learner characteristics: ‘experience’ and ‘motivation’.

It is not surprising that the experience of participants, in terms of previous relevant work experience and online experiences, affects the effectiveness of e-Learning. These factors seemed to determine the kind of attitude that participants ‘go into the learning process with’; previous experience can be beneficial, if the previous work and online experiences correspond with the e-Learning (Boghikian-Whitby and Mortagy, 2008; Bennison and Goos, 2010; Haverila, 2010). What is intriguing is that, experience may either increase or decrease effectiveness. The authors have in previous empirical studies within higher education with students who study IT and educational design found that, when the definition of effectiveness was ‘satisfaction’, the
students’ previous experience with a variety of e-Learning solutions left the students unimpressed; hence, decreasing effectiveness (satisfaction). In the empirical study discussed in this paper, the teachers had little e-Learning experience and were generally satisfied. Similarly, a learner with significant relevant work experience may perform well on tests and at work but have a low satisfaction score because the learning was not challenging. This underlines the importance of clarifying the definition of effectiveness and to discuss the ways in which individual factors can affect effectiveness.

Motivation to learn and engage with the e-Learning solution is key to effectiveness, especially when effectiveness is defined as the time spent using the product: ‘Results suggest the importance of motivation to learn and workload in determining aggregate time spent in e-learning courses’ (Brown, 2005: 465). However, when projects are defined as ‘blended e-Learning’, time spent may not always be a good indicator of whether learning took place: ‘beyond the impact of extrinsic-related perceptions, social and personal motivations are important drivers of discussion forum usage in an e-learning context...[ ]... It is concluded that even for adult learners, social interaction with instructors and collaborative interaction with peer students are important in enhancing learning and active participation in online discussion’ (Jung et al, 2002: 153). Therefore as in traditional learning, motivation is not only based on individual factors.

For the e-Learning solution and process, the key factors are ‘interaction’ and ‘practice’. The importance of these factors was determined as a result of the coding of the factors that influence effectiveness as well as the codes including the reasons that e-Learning was or was not effective. Interrelated factors, such as ‘instructional scaffolding’, ‘modelling’ and ‘support’, were combined into a single factor, ‘interaction’. Though e-Learning is often considered to be equally or more effective than face-to-face learning, interaction is generally considered to be critical to the effectiveness of e-Learning, as illustrated in the following papers: ‘Students valued interaction with instructor as an important factor in online learning. New students had a better success rate in instructor-led online courses than in independent-study online courses. Adult students need modelling and scaffolding to be successful in an online environment’ (Jiang, Parent and Eastmond, 2006); ‘...the supported training group had a significantly higher program completion rate than the independent group’ (Bennett-Levy et al, 2012); and ‘Results indicate teachers attributed improved student learning to technology use; online communication with peers and experts reduced teacher isolation, enhanced professional practice and gave access to perspectives and experiences otherwise unavailable; but the additional workload discouraged several teachers’ (Hawkes and Good 2000). The last article also touches on the contextual factors as it emphasises the need to consider both the time available to the learners and the expected workload of the e-Learning (see also Noesgaard, 2014).

A recurring factor contributing to e-Learning effectiveness is ‘practice’. The learner is given the opportunity or is required to practice the educational material presented via the e-Learning solution in case studies, simulations or actual work situations. The aim is to support learning retention and transfer to practice, as simulated practice provides a safe learning environment before the skills are applied in critical work situations: ‘Intermediate-fidelity simulation is a useful training technique. It enables small groups of students to practice in a safe and controlled environment how to react adequately in a critical patient care situation. This type of training is very valuable to equip students with a minimum of technical and non-technical skills before they use them in practice settings’ (Alinier et al, 2006).
The model in Figure 2 shows the key factors (in grey) that were identified by the review to influence the effectiveness of e-Learning (artefact) across the multiple definitions (Table 2). A supportive and resourceful learning environment (context) must be in place. The level of motivation of the individual(s) interacting with e-Learning (artefact) influences the time they spend using the product, and previous online or professional experience appears to have a largely positive impact on effectiveness. An e-Learning design that accommodates interaction between instructor(s) and peers and provides opportunities to practice the e-Learning material in simulated—or, when appropriate, real-life—work situations also promotes e-Learning effectiveness. As such, this model shows the interrelation of the key factors influencing effectiveness, but it cannot stand alone, as this abstraction like many papers in the literature review does not take the great variety of definitions into account. However, it is a good tool for starting discussions about effectiveness.

4.1 Why is this important?

Understanding the factors that are deemed critical for effective e-Learning in the context of adult learning can enable learning professionals to reflect on their priorities regarding learning design. The model and list of factors can be used as a checklist and a starting point for discussing how to ensure that the factors relevant to specific e-Learning participants, contexts and solutions are taken into account.

5. Critical reflections

Many of the studies analysed in this integrative review value e-Learning based on how well a given e-Learning solution accommodates for individual characteristics (experience and motivation) or the extent to which the solution provides opportunities for interaction and practice and to a smaller extent whether or not the necessary contextual resources and support are in place (Figure 2).

As discussed, approximately half the papers included in the literature review use a comparative methodology. This means that the effectiveness of e-Learning is largely defined based on how well the e-Learning performed, compared to traditional face-to-face teaching with the same content. Thus, the same definitions of effectiveness are used for both e-Learning and face-to-face teaching, and e-Learning must outperform face-to-face teaching in order to be considered effective. With this in mind, it becomes important to take another critical look at the key factors, since the comparative research methodology affects their perceived importance. This means that some of the factors like interaction and practice may have surfaced as critical during the review, because these factors illustrate the strong sides of face-to-face teaching. A given e-Learning solution must, therefore, entail these factors to be effective when compared to face-to-face teaching. But do we want e-Learning to be more like face-to-face teaching? Is the most effective e-Learning an online replication of the classroom setting? What would happen if policy makers and researcher stopped asking if e-Learning is as good as what we currently have with face-to-face teaching and instead started asking if we could get something better or different from e-Learning? Should different modalities have the same measures of performance, or should we consider e-Learning to be a unique learning process and thus use different definitions of effectiveness?
Within recent years, massive open online courses (MOOCs) have received profound attention within the field of e-Learning. MOOCs offer free courses, competence development and even certification. They are often considered to be the promised land of education, democratising education through scalable technology. As a stand-alone solution, MOOCs provide opportunities for reflecting on and constructing new knowledge, but often they entail a minimum amount of live interaction. Many MOOCs continue to be online replications of classrooms primarily consisting of video lectures, multiple-choice quizzes, Q&As and more informal after-class discussions in online discussion forums.

So are MOOCs ineffective because little interaction is provided compared to face-to-face teaching? And if not, is interaction not a key factor in e-Learning effectiveness? We argue that interaction is indeed essential to learning retention and learning transfer. An educational design applying collaboration and interaction with peers and a facilitator (the teacher or instructor) can provide a purposeful space for reflecting on the practice as well as an empathetic customisation of the subject matter, which no automatic process is capable of yet. Hence, when the overarching objective is to design e-Learning which increases learning retention and work performance, the effectiveness of e-Learning may very well be evaluated by the quality of the interaction provided. But what if the overarching objective is different than the definitions provided here (Table 2)? What if we, despite the vast number of definitions in this paper, are missing more e-Learning specific definitions that are independent of face-to-face teaching, such as democratization and scalability? And as a last mental exercise, what if we started evaluating face-to-face instructions on these objectives?

6. Conclusions

This paper has discussed the following research questions: How is the effectiveness of e-Learning defined? How is the effectiveness of e-Learning measured? What makes e-Learning solutions effective?

Through an integrative review, relying on both a literature review and an empirical study, this paper identified multiple ways to define effectiveness, with ‘learning outcome’ as the most prominent definition. The authors highlighted the benefits of reflection on and clarification of the way in which these definitions are used in research and practice. The paper discovered that the research is largely applying quantitative and comparative methodologies. In this regard, this paper suggests that applying purely quantitative measures to fulfil predefined learning objectives does not allow researchers and practitioners to discover unexpected and unintended transfers to practice and presents potential sources of error. Including open-ended qualitative questions in surveys can substantially improve the validity of such approaches; the empirical study and some of the analysed papers show that self-assessment can give researchers and designers quality feedback on the effectiveness of the e-Learning solution. To understand what makes e-Learning solutions effective, this paper analysed factors promoting the effectiveness of e-Learning. These factors were categorised according to the context in which the e-Learning solution was used, the artefact (the e-Learning solution itself) and the individuals that used the artefact. Subsequently, further categorization into key factors resulted in a model to guide e-Learning design.

One of the many questions raised in the discussion was the question of whether e-Learning and traditional face-to-face learning should be measured based on the same definitions of and approaches to effectiveness. To find appropriate answers to this question, the authors suggest that future researchers and designers critically consider the identified definitions, measures and factors when designing for effective e-Learning.

7. Limitations and further work

The literature study has certain limitations: First, the fact that the analysis is based primarily on abstracts, only including a few full papers, might have resulted in slightly different categorisations than had the full papers been analysed. Second, e-Learning is dealt with as a single concept, when in fact it consists of a great variety of delivery methods, technologies and learning designs. However, these variations are coded in the literature study, and the authors look forward to further exploring the concept of e-Learning. Third, the literature study considers a larger number of papers than most other literature studies. Still, the quantitative analysis will benefit from an increased number of coded abstracts since some of the findings are based on relatively small numbers (Table 2). However, as mentioned in the methodological section, the authors chose theoretical saturation over volume. Finally, both researchers were involved in discussions about the design of the e-
Learning solution tested in the empirical study and thus may be affected by effectiveness bias. The researchers will continue to explore these concerns as the study continues.

8. Recommendations

Based on the analyses in the previous chapters, the following recommendations are proposed:

- There are many understandings of e-Learning effectiveness. Be sure to clarify what would make your solutions effective. Consider using the list of definitions for inspiration (Table 2).
- Do not measure effectiveness simply for the sake of measuring. Know what measurements will give you the documentation your stakeholders require and the answers you need to continuously improve your solutions.
- When designing e-Learning, consider the key factors that impact e-learning effectiveness (Figure 2).
- Be critical and consider whether or not your face-to-face and e-Learning solutions should use different definitions of effectiveness (performance measures). Aim to compare your solution to other solutions using the same definitions of effectiveness.

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References


Powerful Practices in Digital Learning Processes

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Abstract: The present paper is based on two empirical research studies. The Netbook 1:1 project (2009–2012), funded by the municipality of Gentofte and Microsoft Denmark, is complete, while Students’ digital production and students as learning designers (2013–2015), funded by the Danish Ministry of Education, is ongoing. Both projects concern primary and lower secondary school and focus on learning design frameworks that involve students’ agency and participation regarding digital production in different subjects and cross-disciplinary projects. Within these teacher-designed frameworks, the students perform as learning designers of learning objects aimed at other students. Netbook 1:1 has shown that digital and multimodal production especially facilitates student-learning processes and qualifies student-learning results when executed within a teacher-designed framework, which provides space for and empowers students’ agency as learning designers. Moreover, the positive impact increases when students as learning designers participate in formative evaluation practices. Traditionally, the Danish school has worked hard to teach students to verbalise their own academic competencies. However, as our everyday environment becomes increasingly complex with digital and multimodal technologies, formative evaluation as a learning practice becomes central, requiring the students to develop a digital and multimodal literacy beyond the traditional, language-centred type. In order to clarify these practices, we address the various understandings of evaluation and assessment that may blur our arguments. Students’ digital production and students as learning designers is a large-scale project that follows up on the findings of Netbook 1:1. It experiments further with various evaluation practices in a digitalised learning environment that focuses on different phases of the learning processes and includes feed-forward and feedback processes. Evaluation as a learning practice in a digitalised learning context focuses on students as actors, addressing their self-reflections, responses to feedback from peers and feed-forward processes, and responses to feedback from teachers and feed-forward processes. We find that apart from teacher initiated and planned evaluations, the teachers find it useful to initiate ad-hoc evaluations in order to grab interesting aspects on the fly. At the same time we see students initiate ad-hoc peer-evaluations and make appointments for swapping their work for peer-evaluation.

Keywords: Assessment, evaluation, formative, summative, self-evaluation, peer evaluation, teacher evaluation, digital learning processes, multimodality, evaluation design, agency, empowerment, reflection, construction of meaning

1. Introduction

Traditionally, Danish schools have worked hard to teach students to verbalise their own academic competencies. However, the advent of new media impacts on the representative forms of subject matters and calls for new subject knowledge. The representative forms are specifically changed through multimodality; the subsequent, new subject knowledge is needed not only because the technology is available, and multimodal competencies are core competencies of the 21st century (Organisation for Economic Co-operation and Development [OECD] 2008). New subject knowledge is also necessary because multimodal means of expression function as an externalising vehicle for reflection and construction of meaning (Sørensen & Levinsen 2014), in the same way as speech and writing externalise thoughts and enhance learning (Dysthe, Hertzberg & Hoel 2001). With multimodal expressions, the students achieve a broader repertoire through which to experience the world and express themselves while learning. Gradually, as education becomes more digitalised and multimodal, schools are challenged to provide new subject knowledge, together with professional capacities, to describe multimodal competencies and specify learning objectives and what must be taught and evaluated.

Since the 1990s, especially in the UK, there has been a growing interest in developing formative evaluation, since evaluation has proven to be a powerful learning practice in contemporary constructivist learning designs, such as cooperative, action or problem-based learning that aim at students’ active participation and agency (Black & Wiliam 1998, Harlen & Deakin Crick 2002, Tanner & Jones 2003, Hattie & Timperley 2007). At the same time, formative evaluation functions as a means of navigation for the actors during the process of transformation undertaken in schools as digitalisation expands (Luckin et al. 2012). This development has led to an increasing interest in digitally supported, formative evaluation practices, a field marked by new ideas and
innovation, such as experiments with mobile technologies and social networks (Ibid.). Summative evaluation has recently been actualised by the Programme for International Student Assessment (PISA) that ranks students’ performance among the OECD member-countries. The PISA results and the ranking of countries have set the agenda for educational politicians, educators and researchers across Europe, shifted the focus from formative to summative evaluation (Dysthe 2009, Shewbridge et al. 2011, p. 7) and released huge investments in digital, multiple-choice tests and measuring designs (called The Digital National Tests in Denmark). In both formative and summative digital evaluation designs, multimodality and students’ agency stand weak (Wyatt-Smith & Kimber 2009). Accordingly, the development and production of evaluation designs that encompass both constructivist and social constructivist, digitalised learning designs or learning designs that involve use of digital resources, and the various modalities and their interrelations as representations, emerge as a major challenge. Moreover, since their definition 50 years ago, the concepts of formative and summative evaluations together with the distinction between evaluation and assessment have become weakly defined (Taras 2008).

Our research in Netbook 1:1 (for further reading about research design, data collection and analysis, see Levinsen & Sørensen 2013 and Sørensen & Levinsen 2014) shows that various designs of evaluation formats, ranging from students’ self-evaluation over peer evaluation to teacher-initiated evaluations, are crucial for students’ subject-related and trans-disciplinary learning, the way they work and how they design and conduct presentations. In the ongoing research and development project, Students’ digital production and students as learning designers (2013-2015), we experiment with various evaluation practices, learning objectives and criteria for evaluation. The present paper describes the basic framework for formative and summative evaluations and various evaluation formats that have been developed and tested in the project, illustrated by empirical examples. Additionally, we briefly touch up on theoretical approaches and new challenges, such as student governance and multimodality in evaluations.

2. Literature study

The teacher’s awareness of the students’ knowledge (or lack of it) and abilities is pivotal to the design of a learning framework that involves students’ agency. In practice, to facilitate learning, both the teacher and the student must achieve awareness of the student’s (pre)condition and progress (Luckin et al, 2012, p. 40). To achieve this awareness and transform it into a teacher’s assessment and the students’ reflected understanding of their learning levels and challenges, the generally agreed practice is evaluation/assessment – a huge topic ranging from national tests to the kind of everyday classroom practices that are the focus of the present project. These practices are divided into two main categories: formative and summative (Shriven 1967, Bloom, Hastings & Madaus 1971).

The research literature regarding the respective roles of assessment and summative and formative evaluations in students’ learning and empowerment as agents in relation to their learning is primarily produced in the UK. According to Tanner and Jones (2003), Taras (2008) and Black (2013), the research focus has mostly been directed towards formative rather than summative approaches. Taras pointed out that the relationship between the two forms is weakly described: “More seriously, the absence of this discussion has resulted in the distortion of this relationship, which has led to a misunderstanding of both assessment processes” (Ibid. p. 173).

Taras (2008) and Tanner and Jones (2003) argued that the formative and summative concepts are often used to denote and distinguish between two types of evaluation: teacher and classroom assessment (formative assessment) versus external/national assessment (summative assessment). In contrast to the general definition, Brookhart (2001) emphasised function and purpose rather than type and claimed that both classroom and external assessments are applicable to formative and summative purposes. Tanner and Jones (2003, p. 276) defined an “assessment event” to include: “…the preparation for the assessment by both the teacher and the student, the feedback from the assessment offered by the teacher and the impact of the assessment on the subsequent learning behaviours of the student”. Accordingly, the formative purpose of any evaluation or assessment should be to provide feedback that helps students identify gaps and assist in their learning progress and performance.

The works of Black and William (1998, 2009) and Hattie and Timperley (2007) showed that positive impact on students’ learning performance is strongly connected to interaction and continuous evaluation by the teacher as an integrated part of everyday teaching. Luckin and colleagues (2012) found that assessment as a learning
practice, combined with digital production, strongly supports students’ academic and cross-disciplinary learning, the way they work and how they shape their projects and presentations, while their awareness of their own capabilities changes substantially as they progress. In the UK, the so-called assessment-for-learning movement had promoted formative over summative approaches until recently (Taras 2008); the consequence has been a research focus locked on the negative effects of testing (Black 2013) leaving the term evaluation to be currently more preferred than assessment (Taras 2008). As a counter movement, the present PISA programme promotes summative evaluation as a driver for learning over formative evaluation (Dysthe 2009). In this situation, most research aims at producing evidence that either of the types performs better than the other, rather than focus on how they might enhance each other or how they should be understood or defined (Taras 2008).

Consequently, the meaning of the terms evaluation and assessment and their relation to summative and formative purposes have become quite ambiguous and weak defined. When perceived as belonging solely to the teachers’ domain, they are often understood as interchangeable. However, due to the scientific dispute mentioned above the term evaluation is currently preferred over assessment (Taras 2008). In contrast Luckin and colleagues in their NESTA report Decoding Learning: The Proof, Promise and Potential of Digital Education (2012) relate the concept of evaluation to the researchers studies of learning practices. Assessment is related to teacher domain and teacher initiated informal or formalized measures, while reflection refers to student involving, formative activities that belong to both the students’ and the teachers’ domains. In North America the concepts are often understood opposite to the European tradition (Matyi 2010) which may also be a source of confusion.

3. Formative and summative evaluations as learning practices

In the following we adopt Lucking and colleagues distinction between the concepts assessment and reflection. However we also use the term evaluation as a dialogue, inquiry and agency driven learning practice that produces reflection, feedback and feed-forward for both teacher and students.

The general research focus has been on the teacher-driven evaluation and assessment that aim to provide both teacher and students with knowledge that improves the students’ performance, as presented in OECD Reviews of Evaluation and Assessment in Education – DENMARK (Shewbridge et al. 2011). The focus on the teacher as the main provider of feedback and feed-forward corresponds with the general view within the learning design theory that learning design – including evaluation and assessment – is the teacher’s domain (Dale 1989, 2000). In contrast to the generally accepted position, we discovered in our research (Levinsen & Sørensen 2013, Sørensen & Levinsen 2014) that even young students are able to act as learning designers of digital learning resources aimed at other students. They were able to reflect on both their learning and working process, and the learning design and esthetical qualities of their own and others digital products. We found that practices ranging from students’ self-evaluation over peer-evaluation to teacher-driven formative evaluations in various designs are crucial for students’ subject-related and trans-disciplinary learning, the way they work and how they design and conduct presentations. The students actively reflect on and use both the feedback and feed-forward produced in both ongoing evaluations during the work process and final evaluations. We also found that the students’ ability to act as learning designers depended on the teachers’ ability to design and facilitate a frame that supported the students.

In the ongoing project, Students’ digital production and students as learning designers, we take these ideas a step further. We coin the concept of students as learning designers, meaning that students act as learning designers of their own learning processes, including forms of evaluations within a teacher-designed framework that empower students’ agency through digital production of learning objects aimed at other students. In the project, we experiment with various evaluation practices with formative purposes, learning objectives and criteria regarding evaluations that:

- focus on different phases of the learning processes
- contain feed-forward and feedback processes
- focus on students as actors and address their self-reflection, responses to feedback from peers and feed-forward processes, and responses to feedback from teachers and feed-forward processes
As mentioned above, Luckin and colleagues (2012, p. 40) pointed out two important processes – reflection and assessment - in order to identify what and how the learner knows and understands. The first is the student’s reflection on his or her own learning activities. In doing so, the student develops an understanding and becomes empowered about how to improve his or her learning activities and strategies. These reflections are qualified through dialogue, inquiry and practice. The second process is the teacher’s professionally based assessment of and reflection on the student’s learning activities. The learning processes are qualified by the teacher’s feedback and feed-forward to the student, as the student should learn to respond to critical comments and include them in the ongoing learning activities and reflections. In our understanding of students as learning designers, students’ reflection and teachers’ ongoing assessment interact through a shared evaluation practice within the teachers’ learning design framework. This framework (for further reading see Sørensen & Levinsen 2014) provides a basis for ongoing formative and summative evaluations where the evaluation activities may function as a driver for reflection and learning for both teacher and student.

In agreement with Brookhart (2001), we understand summative and formative evaluations as functions that may take place both inside or outside the (hybrid) classroom and with the purpose of providing both teacher and students with appropriate knowledge to strengthen and stimulate students’ academic development. Along with Scriven (1967) and Bloom and colleagues (1971), we understand these functions as having different points of departure. Thus, summative evaluation lends itself to a backward-looking perspective that aims at evaluating completed tasks and whether (minimum) competencies have been achieved in relation to defined learning objectives. On the other hand, formative evaluation refers to a forward-looking perspective that aims at producing feed-forward that supports the students’ future learning, ways of working and collaborating, and presentations and presenting performance. Thus, we understand evaluations as learning practices that are performed by both teacher and students as functions with a purpose. Summative evaluation is mostly conducted at the end of a learning process and may include assessment and measuring, while formative evaluation may take place both during and at the end of a learning process. The two evaluation practices are complementary; summative information is about the distance to the goal (learning objective), while formative information helps define and navigate the journey (learning) towards that goal.

As mentioned above, we find that design for learning is both the teacher’s and the students’ domain. **Netbook 1:1** (Sørensen & Levinsen 2014) showed that the students operate at all three levels of Dale’s model (1989, 2000): practice, organising and planning and theory, due to a teacher-designed frame, which centres on the students’ learning process and subject-related reflections. The frame defines an arena that invites and motivates the students to take on responsibilities and act as learning designers under the teacher’s supervision. We find that students evaluate and reflect on their practice during these processes by using everyday language, while the teacher’s reflection in action is based on his or her professional theoretical knowledge and competencies.

From a design-for-learning perspective where the students’ learning is driven by their reflections and evaluations as learning designers, we have further developed Dale’s model into a four-level Design for Learning Model. In the new model (Figure 1), the fourth level including formalized assessment belongs solely to the teacher’s domain.

![Figure 1: Four-level design for learning model](image)

Taking the departure point from the students as learning designers, we argue that evaluation becomes a pivotal practice for both the learning process and learning results and that evaluation should be a core learning practice in any teacher-based design frame, explicitly formulated in terms of function and purpose, and actively integrated into the students’ agency as learning designers. Apart from Luckin and colleagues’ (2012) two processes, we work with three variations of evaluation practices:

- students’ self-reflection and self-evaluation
- peer response with feedback and feed-forward
Birgitte Holm Sørensen and Karin Tweddell Levinsen

Before we unfold the evaluation practices, we should explain the feedback and feed-forward concepts that are present in all three practices and form the basis for evaluation as a learning practice. Feedback aims to:

- take stock
- share knowledge
- evaluate a process and/or a result

Feedback is a practice where summative and formative purposes may function complementarily. When feedback aims at taking stock, it is often given during the learning process. However, feedback may also function as summative at the end of a learning process and provide an overview to the student about what is or is not learned and which competencies are acquired or not. When the aim is sharing constructed knowledge among students, feedback may equally be generated during and/or after the process. When the aim is to offer a critical or an appreciative response, evaluation is typically performed at the end of the process, when the work is completed and presented. Feed-forward aims to:

- proceed with a process
- generate new ideas
- produce changes

Sometimes, feedback and feed-forward are intertwined, since feedback often leads to conversations that raise questions and reflections about how to proceed, and knowledge sharing leads to new ideas. However, in our context, it is convenient to focus on feed-forward if the purpose is solely formative, such as if the students are at a standstill, the teacher finds a lack of subject-matter quality in their work, the organisation of their work does not function, and changes are needed. Based on assessment, the teacher may choose to intervene and challenge the students to reset their usual ways of thinking and doing and inspire new strategies to proceed. Feed-forward may also occur spontaneously, for instance, if a student finds useful ways of using a program or an app or discovers information that may be shared with the class. As feedback, feed-forward may be given both during and after a learning process. For both teacher and students, feedback and feed-forward may function as drivers for redesigning both the frame and the learning design.

4. Research design and methodology

The project is based on a combination of Action Research and Design Based Research using quantitative and qualitative approaches. The overall framework for the project includes interventions within different subjects. The interventions are in accordance with Design Based Research designed with increasing complexity from simple mathematical exercises to more complex trans-disciplinary activities that involve advanced technologies such as social media, robotics or location-based technologies. In accordance with Action Research, the researchers and the teachers collaborate closely when preparing the interventions locally at each school as the interventions must be integrated in the ordinary planning of the school year.

The project is complex in many ways and produce data using two main approaches within an overall mixed methods framework (for details see Levinsen et al. 2014): 1) Baseline measures are conducted as a long term diachronic quantitative survey combined with qualitative structured observations at the start, middle and end of the project; 2) each of the six interventions are followed through a combined synchronic and diachronic approach where the researchers as action researchers follow the interventions in order to document and identify changes and developments of the performed practice. Qualitative data are collected before, during and after the interventions in the form of individual semi-structured interviews, semi-structured focus groups and informal conversations with teachers and students, as well as video, photo and artefacts. The aim is to produce a complementary set of data that records and documents the interventions and allows for analysis of their impact on the students’ learning and the teachers practice.
5. Students as learning designers, and evaluation practices

In this section, we present examples of both teacher initiated and student driven evaluation practices from the projects Students’ digital production and students as learning designers and Netbook 1:1, based on subject-related, trans-disciplinary and individual contemplative projects.

5.1 Students’ self-reflection and self-evaluation

The teacher develops a digital objective and an evaluation sheet for the students to fill in at the end of a project. The evaluation sheet is included in the student portfolio and used during student-teacher and student-parent-teacher conversations. In the early grades, the students possess limited writing skills, so the sheet has a mix of check marking and a few written answers. The teachers plan the activity with a generous time frame and perform formative guidance while the students evaluate themselves in relation to the following categories: Subject/trans-disciplinary learning; Working practice – organisation; Collaboration; Product and presentation; Technology; Modalities; and Working efforts.

In this manner, the students’ evaluation refers to the teacher-defined objectives for the project, which stem from the legislated learning objectives for Danish schools. These objectives are discussed with the students for their understanding and rephrased to student-language. Figure 2 shows examples regarding Sepp’s working practice and Alberta’s understanding of the subject matter.

Figure 2: Example of a digital questionnaire in which second-grade students answer questions after studying an author and his books (authors’ translation)

In the early grades or if the students are not yet used to evaluation as a learning practice, it is important to introduce the format thoroughly, since its purpose is to provide an arena for the students’ reflections on their learning process and the learning itself.

It may be an issue of whether check marking supports reflection. However, in the early grades, it is important that all categories are present and allow the students to become accustomed to and build a repertoire of relevant criteria to master the evaluation of various learning objectives and the dimensions of the learning process.

5.2 Multiple representations and functions of learning objectives

In Danish as native language teaching, 1st grade remediates a known fairy-tale into a multimodal representation with 5th grade as the intended target group. One general learning objective is that the students learn to negotiate content and means of expression in groups while the specific context addresses learning objectives such as: play and experiment with language; genre; multimodality; and digital production (Undervisningsministeriet (Danish Ministry of Education) 2009).

First the teacher facilitates a class session using the Interactive Whiteboard, where the students suggests requirements that secure that 5th grade will appreciate the remediated stories (Figure 3). These requirements end up fulfilling the learning objectives regarding genre.

Figure 3: Learning goals turned into student-language requirements
The groups work out a paper based storyboard with hand drawn sketches (Figure 4) where they turn the requirements into a criteria for evaluation: *Can others (5th grade) understand what’s going on?*

![Hand drawn storyboard](image1)

**Figure 4:** Hand drawn storyboard

This leads to changes in the order of the sketches as well as details in the sketches, in some cases initiated by the students and in others by the teacher. The groups decide the roles (actors, instructors, camera, set manager etc.) and start to produce their storyboard using an iPad (Figure 5).

![Storyboard](image2)

**Figure 5:** Mise-en-scene: Hansel and Gretel’s poor starving family in the cold and miserable cottage; instructor and photographer evaluate the takes.

Now the students use the requirements as criteria to frame the production using questions as *Can others (5th grade) tell who is who and where they are?* and *Can others (5th grade) see how they feel?* The students were able to work on the production for more than half an hour without teacher intervention. In the following teacher initiated class session, the groups display their work using wireless access to the Interactive Whiteboard. The requirements now frame the peer suggestions for improvements such as: If you take a close-up of Hans holding the stick ... *Then we understand what’s going on.* The peer-session is followed by a new iteration where the productions are finished. For the final presentation the class has – facilitated by the teacher - transformed the requirements into a set of summative questions to 5th grade that test the quality of their work, e.g.: Can you see who that is? How is Hans feeling? Why does he feel that way? ... Can you repeat the story? The response from 5th grade leads to discussions regarding *Red Riding Hood*: Can a boy act as the grandmother and a girl as the hunter? and the suggestion from a 1st grade girl: if they have something that shows grandmother or hunter, then you can *tell who is who*.

5.3 **Responses with feedback and feed-forward**

Ongoing evaluations with feedback and/or feed-forward can be used as short time-outs, where students and/or the teacher show and tell something that others can learn from, for example, when students have found out how to animate a graphic element. A complementary summative and formative purpose may also be included at the end of a learning process.
In our project, the students continuously uploaded their work or collaborated directly in the cloud. Therefore, all products, notes and stages in the processes were accessible for both the teacher and the peers at all times. They were both easily shared online and mediated using the interactive whiteboard during time-outs.

**Peer response:** During the process, peer response is provided as planned or as spontaneous time-outs where the students take stock of the progress in relation to the overall time frame. Short presentations using the interactive whiteboard allow for peer comments on the quality of the work and suggestions for improvements. The whiteboard can be used as a tool to add layers and comments directly on the digital work. As an evaluation practice with a formative purpose, peer response is both useful for subjects and trans-disciplines, working practice, and use of technologies and modalities, since it supports ongoing improvements. Peer response as a final evaluation of subjects and trans-disciplinary projects focuses on the students’ digital products, the acquired subject or trans-disciplinary learning, and the working practice, including subject-related and social collaborative aspects. Peer response as a final evaluation of individual contemplative projects focuses on each student’s final product and the way the student uses modalities to present and mediate the product and the content. During the peer response, the teacher stays in the background and guides the evaluation in terms of how to express relevant critiques without hurting the receiver and ensuring that all relevant aspects are brought into play. The students’ self-evaluation is also an element in the final peer response as it is a driver for the formative function of peer response.

10th. grade students work with digital production. Digital production entails working with creative writing based on text and picture stories they have read a week before. The students use the program inklewriter to which the teacher gives a brief introduction. The students choose individual characters from the story and convert a branch structure based on the selected characters. The branch structure means that the students as authors of the various stories will develop two possible endings for the story; e.g. a good and a bad ending. The program inklewriter has an integrated structure that provides this kind of narrative. The teacher introduces the construction of branch structure and present an example of a student produced branch story as inspiration. Students work in groups of two.

The production process is designed so that it entails ongoing teacher initiated peer evaluations. At the start of the second module the teacher provides a short presentation to peer response where the students must read, review and comment on each other’s texts in opponent groups. First, the students have to read each other’s stories and then give response regarding language, narrative comprehensibility and genre in relation to the original short story. A peer response could for example entail encouragement from fellow students regarding writing more nuanced and not use repetitive terminology or sentence types. "You have to use a thesaurus" is the appeal from one group to another - and an online thesaurus is shown. The students examined immediately expressed great satisfaction with the process of peer response. Later in the same module the opponent groups will change so different groups will evaluate each other, which may be initiated by the students themselves. The observation showed that peer responses were both initiated by the teacher as well as by the students themselves.

The final evaluation showed that both teachers and students were very excited about working with branch stories in Inklewriter. Both sides found that it was an inspiring and creative way of working. The teacher found that the students have written a lot and with a good quality. In addition, the students found that their stories were largely qualified by the ongoing peer response, as the following quotes from students’ shows: "We learned a lot of peer evaluation", "peer evaluation is the best form of evaluation" "good to be a response group of other students," "you get inspiration from other groups" and "we provide other good ideas".
Teacher response: The teacher may both produce process and final evaluations and hold summarising conversations with individual students. As the learning manager, the teacher needs to maintain awareness of the various aspects of the learning processes and the students’ challenges, then uses this knowledge to select important issues for either process or final evaluations. The teacher’s professional background and knowledge about the students help him or her select what to allocate to the plenum and individual conversations, respectively. The evaluation may be organised in various ways; accordingly, the teacher must possess a repertoire of practices that suits the evaluation purposes, such as: Are there only right or wrong answers or alternative possibilities? Is the purpose to reflect on a subject or to inspire more in-depth work with the subject matter? What kind of evaluation enhances the students’ future learning processes, and what may be vulnerable?

For a full week, 10th-grade students work on trans-disciplinary projects, using art and architecture in their neighbourhood. They employ various digital production tools to produce short videos, texts, photos, etc., about the neighbourhood. These are published through the social location-based, mobile gaming platform SCVNGR that allows users to build a game-layer on top of the world. During the week that also includes peer-response sessions; the teacher accesses the digital productions and takes stock of the students’ process, progress and challenges. This knowledge is used to provide formative input to the students in the form of feed-forward regarding the thoroughness of their mediating content and the functional and aesthetic use of their modalities. The teacher will for instance select a few productions based on which he gives feed-forward by a dialogical form with the students. Based on this feed-forward, the teacher and the students together set specific criteria for the quality of the productions, which subsequently function as guidelines for the following work with the students’ productions. At the end of the process, the final file constitutes the students’ delivery of the assignment for the teacher’s assessment.

6. Concluding discussion

Although the project Students’ digital production and students as learning designers (2013–2015) is not finished and we are only able to present initial analyses, we find evidence that the interaction between student-formulated requirements/learning objectives and the various forms of formative evaluations strongly impact on the students subject learning and their ability to perform qualified learning design and evaluations of their own and others work - both regarding subject matter and esthetical qualities. We find that the teachers change their everyday practice as they experience the learning impact and begin to implement class dialogues about learning objectives and formative evaluation practices in their learning design. We also find that the students voluntarily initiate formative evaluations and use the requirements actively while the student-formulated concepts are gradually replaced with the subject matter concepts. However, the study also opens for a new range of research interests, of which a few are mentioned in this concluding section of the paper.

The use of language bears an impact on whether the students take the evaluation as a formative input for future work. Littleton and colleagues (2005) developed the concept of “thinking together”, addressing various forms of dialogue and questioning that may either enhance or hamper collaboration and learning. “Thinking together”, combined with an explorative manipulation of digital representations, is also useful in evaluation processes, especially when language functions as a vehicle for exploration and construction of knowledge and as a driver for reflection. The underlying reason is that the teacher may use the students’ articulation of and work with the digital product to identify challenges and exploit the acquired knowledge to reorganise the frame or details in the learning design. In the Danish school, similar to higher education, no tradition exists for evaluating the teacher’s work. Nonetheless, we note an advantage in involving students in this aspect of the teacher’s practice, for instance, the learning design and the teacher’s communication and interaction with the students that may point at future research interests

Digital technology offers a wide range of options for developing evaluation as a learning practice. We found that teachers and students used shared networks and cloud technology to create new dynamic frameworks for both the teachers’ work with evaluations and for the students’ peer evaluation. Accordingly, there is a need for research and development regarding how technology may support summative and formative evaluation practices during and after learning processes. It is also necessary to explore and develop digital solutions that enhance the analysis of evaluation results and support the teachers and students decision making on how to transform produced knowledge into efficient practices. Teachers are already exploring digital options; Luckin
and colleagues (2012) specifically cited social media. E.g. the use of audio-visual technologies and text based questionnaires involve a range of modalities that expands the need for literacy beyond written texts and spoken words. The very notion of both formative evaluation and classroom assessment is also challenged by the hybrid space that emerges through mobile and wireless technology and dissolves the brick-and-mortar-defined limits of the physical classroom (Luckin et al 2012, de Souza e Silva 2006, Sørensen, Audon & Levinsen 2010).

We have already mentioned the beginning impact of digitalisation on the forms of assessment such as digital, national summative types and the competitive approach used in the PISA programme. However, other dimensions such as multimodality, creativity and innovation that are actualised by digitalisation also influence assessment. When students’ approach to subjects become multimodal, and subjects are mediated digitally through multimodal representations, multimodality becomes part of both the subject matter itself and the related academic competencies. As mentioned in the introduction, the Danish school has aimed at teaching students to verbalise their own academic competencies. However, the advent of new media and their impact on representative forms and competencies call for new subject knowledge, not only because the technology is available and multimodal competencies represent a core competence in the 21st century (OECD 2008). New subject knowledge is also needed because multimodal modes of expression function as an externalising vehicle for reflection and construction of meaning, together with speech and writing (Sørensen & Levinsen 2014). Thus, multimodal means of expression provide students with both a broader repertoire for expressing themselves and a more nuanced tool for experiencing the world. This means that multimodal means of expression not only have to be part of the articulation of evaluations and assessments in a digital learning environment, but the students’ use of the former should be assessed as a competence with defined learning objectives. This issue is an important dimension in future discourses on any subject and its related knowledge regime. For the teachers, it is a major challenge to develop learning designs for evaluation/assessment-as-a-learning practice in a digitalised learning environment and to include both the modalities and their interrelations.

References


Reflections of Students’ language Usage in Social Networking Sites: Making or Marring Academic English

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Abstract: Social networking sites (SNSs) have become a major form of communication in today's day and age whereby language use has been impacted in various areas especially in that of learning and teaching. Young users use literally half their week engaging in SNSs communication, thereby giving rise to a brand of internet slang which is entirely their own. This youth-speak has gone on to influence other areas of language usage. The questions asked in the survey increased the identification of the linguistic features such as the frequency of code switching and erratic spelling and leet, thus expanding the research base. The survey participants, the majority of who are from the Chinese ethnic group had experienced mother tongue interference in their English Language proficiency. The descriptive statistical method was used to analyse the questionnaires, wherein the data collected indicated a rather excessive usage of short messaging texts by almost all respondents owning a mobile device. To authenticate the research findings, an analysis of the text discourses was found to be necessary. The findings proved that the frequent use of short messaging had not majorly affected the English language proficiency of the participants. In academic writing there was a conscious effort to stay clear of SNSs language. The mushrooming SNSs has helped create a whole young generation who have their own meta-language, which provides an opportunity to probe to what extent the English language is altered. This research should kick-start research on how the English language in these areas is used and whether the frequent use of it can develop or weaken proficiency in the language. The results of the present study will definitely enrich the corpus of work conducted on the influence of language of social media and encourage further detailed research in this area.

Keywords: students’ language usage, linguistic features, mobile phone, technology uses in education, e-learning, academic writing, classroom environment and social networking sites

1. Introduction

English Language proficiency is now a requirement in all areas of work, study, entertainment and communication. Used almost extensively in inter-state and international communication, it is important to have a working language of the English Language. In the case of Malaysians, it is almost true to a fault that Malaysians have a poor grasp of the language, with improper use of the language being rampant in daily conversation. Taking into consideration demographic factors of SNSs users, it is found that the age range is mostly 18 – 25 years. These users utilize more than half their week engaging in SNSs communication, leading to the creation of new phrases and words. The shortcut language used and created on instant messaging, on the offset, seems to be drastically deteriorating students’ vocabulary. Many learn the language through observation and imitation in both speaking and writing. To take an example, one linguistic feature sprouting from this shortcut language base is “leet”. Derived from the word elite, leet or leet speak serves as an alternative alphabet for the English language. It is generally seen used on the internet and in chat-rooms. For instance, the leet spelling of the word “leet” is 1337 and l33t. Hence, the leet alphabet is a specialized form of graphic symbolic writing. Even Manglish, or ‘mangled English’ generally used by Malaysians across ages and ethnicities, is a concoction of Malaysian English words, interchangeably used from the Malay, Chinese and Tamil languages.

A problem arises when users are not able to differentiate formal language from informal language as more often than not, the students at tertiary level, are inclined to use improper formats and sentences that stultify Standard English. This particular peculiar occurrence has given rise to Internet slang, further raising the question of the impact on Malaysian students. Those lacking English proficiency may be affected as they will have the tendency to imitate and this case, imitate improperly. Or will it not? What about those with a high level of English language proficiency? Would it deteriorate their language ability? Often, the inability to gauge
improper, ungrammatical language usage in these mediums, may, in the long run, affect their career in their respective fields. Those students who have graduated find it intimidating to communicate in proper English either in speaking or in writing, especially with workplace management. Language instruction is now becoming more and more expensive, preventing many graduate students to sign up for language courses. This and the underlying feeling of inferiority of a non-native speaker communicating with a conversant speaker prove to be stumbling blocks for the person.

Mobile phone users can communicate with others by using symbols or abbreviated forms of words and sentences in order to save space, time and money (Mphahlele & Mashamaite, 2005). The communication-style of social networking users is observed to be rather similar. The present study investigates how Internet slang used on SNSs and mobile phones differs from Standard English and the reasons for Internet slang usage on these social platforms. This research objective is to investigate the variables that influence English proficiency among the students in Universiti Tunku Abdul Rahman (UTAR). The objectives of the study are as follows:

- To determine the association between language preference and English proficiency
- To examine how abbreviations and short forms relate to English proficiency; and
- To investigate the relationship between the usage of SNSs and English proficiency.

Figure 1 shows the relations among the independent and dependent variables, the independent variables being language preference, abbreviations and short forms as well as usage of SNS and the dependent variable being the English proficiency of the respondents. Based on this, our hypotheses are:

Hypothesis 1: There is a relationship between language preference and English proficiency.

Hypothesis 2: There is a relationship between abbreviations and short forms and English proficiency.

Hypothesis 3: There is a relationship between usage of social networking sites (SNS) and English proficiency.

As this area can be further researched, particularly in the Malaysian context, this study hopes to enrich the knowledge on the study of language usage on SNSs as well as motivate other further research in this area.

2. Literature review

Language and communication play a crucial role in information sharing, specifically on the use of information technology in education. Tools and platforms such as Facebook enhance communication and human interaction and can potentially be harnessed for language learning. Sources indicate that factors like motivation, imitation and environment for learning are crucial in language learning.

The amount of SNS users has increased tremendously over the past five years, especially among teenagers and students (Aydin, 2012). Many users have created Internet slang to communicate and express their thoughts on SNSs and mobile networks.

Various researches have shown that Facebook impacts all levels of academia and academic settings. In opening up new worlds of learning for both teachers and students, Facebook has been found to have the potential for use in educational applications. Roblyer et al. (2010) found that Facebook can also become a valuable resource for
to support students’ educational communication and collaboration with faculty, providing a different model of how online tools can be utilized in educational contexts. Meanwhile, Cummings (2011) describes how social media impacts higher education through five (5) interconnected “literacies”–attention, participation, collaboration, network awareness and critical consumption.

Grosseck (2008) and Muñoz (2009) have found that SNSs like Facebook and Twitter enable students to share information (e.g., when a Facebook ‘Group Page’ is created for a class or course subject), to learn about their classmates, to communicate with their classmates and professors, and to post and discuss relevant class information. In Twitter, a message is linked to a course or class blog that offers students opportunities to discuss various kinds of asynchronous online discourse.

Besides, according to Thurairaj et al., (2012) Facebook and Twitter do lead to positive language learning. Thus, these SNSs like Facebook and Twitter should be incorporated as learning tools for language learning. Based on the interviews conducted, students stated that activities through social media are very interesting and it makes learning easier besides helping them improve their communication. The researcher found that, making Facebook and Twitter as learning tools is claimed to be fun and it is welcomed by the students. Besides, the researchers have also indicated that Facebook and Twitter are used widely to communicate in English. There are various activities preferred by the students and most importantly everything leads to positive language learning. Thus the students do improve tremendously in their language as well as their writing skills. Besides, the students also claimed that they do learn and improve their language from the preferred activities on Facebook and Twitter. It is indeed a learning process when they check messages, tweets or notifications while surfing the sites. Besides, the students also confirmed that they learn new sets of vocabulary when they check their friends’ activities or updates. In addition, it is revealed in this research that the students are very open to the usage of Facebook and other social networks to support classroom activities. With the features on Facebook and Twitter, they can enhance classroom discussion and make it more interesting. In Malaysia, the younger, college-going generation is paralysed without mobile phone apps such as Whatsapp, Viber, Hangout, Line, WeChat and Tango.

Thurairaj and Roy (2012) state that, besides keeping in mind that the teaching materials should help their students to master the language, teachers also have to make sure that the teaching materials are interesting. Thus activities through Facebook and Twitter will definitely be more interesting in nature to enhance positive language learning. Since most of the respondents are very exposed to the usage of Facebook and Twitter, to support classroom learning efficiency, Facebook and Twitter should be used comprehensively in the classroom. That way it can provide an atmosphere for language learning. It is mentioned that human learning is a complex phenomenon and learning processes among individual students are never identical. Hence lecturers should vary their teaching methods. It is indisputable that Facebook and Twitter could make language learning enjoyable. However, time is needed to find people with good command of the language who are willing to share their knowledge on Facebook and Twitter. Besides, we also need to ensure that everyone who is in sync with this notion will give full support so that social networking sites can remain as vibrant language learning platforms for students.

Kabilan et al. (2010) found that the students believed Facebook could be utilized as an online environment to facilitate the learning of English since it led to improvement of language skills, confidence, motivation to communicate in English and a positive attitude towards learning English as a second language. The research found that only 8.1% of students disagreed that Facebook can be an effective online environment to facilitate their practice of writing in English. In terms of reading practice in English, 7.5% of the students claimed that Facebook is not a suitable environment. Hence, Kabilan (2010) concluded that language instructors need to integrate Facebook as an educational project with pre-determined learning objectives and outcomes in order for the learning experience to be meaningful.

Social networking can be utilized as a social learning resource and space for new literacy practices. Creating a well-crafted social learning platform would most likely require a deeply collaborative effort among technology experts, educators, social learning theorists, psychologists, sociologists and students. As professed by Aydin (2012), studies on the educational benefits of social networking focus on specific areas such as social learning, e-learning, environmental learning, business, art, and chemistry education. The author recommended Facebook as an effective medium for language learning and teaching, with the possibility of improving learners’ language skills.
Md Yunus et al. (2012) investigated the advantages and disadvantages of integrating social networking tools into the ESL (English as a Second Language) writing classroom and discussed ways to plan related activities. Data collected through an online discussion board from TESL students in a state university in Malaysia revealed that integrating social networking services in ESL writing classrooms can broaden students’ knowledge, increase their motivation and build confidence in learning ESL writing. The main hurdles in integrating social networking tools into ESL writing classes were students’ difficulty in concentrating on the materials when using computers, lacking equipment, lacking access to the Internet, and having insufficient time for facilitators to interact with the students.

Internet slang and short message services have been shown to have an impact on the English language. It was estimated that 90% of school children owned a mobile phone, and 96% used text messaging. This shows that young people are active ‘texters’ (Plester et al., 2008). Internet slang was invented for the purpose of saving keystrokes. As typing is much slower than speaking, in order to counter this problem, people started shortening words and creating new words.

As for the impact of texting on English proficiency, Craig (2003) and David (2008) similarly concluded that texting through SNSs in some ways improves students’ literacy as it provides more opportunities to engage with the language. However, Craig (2003) also found that texting also threatens students’ literacy because it creates undesirable reading and writing habits due to common use of abbreviations and unusual jargon, thereby damaging students’ ability to employ formal literacy skills. Text messaging is deemed to be detrimental to students’ language proficiency since students mix this “text language” with the standard language they learn at school. Consequently, students displayed numerous errors ranging from incorrect spellings to “ungrammatical” sentence constructions (Mphahlele & Mashamaite, 2005). The danger extends to classwork, examinations and research reports, especially in an academic environment (Dansieh, 2008).

Nevertheless, it might be interesting to note a study by Abdul Kadir & Zubir (2012) on e-distance learning students in a public university in Malaysia. The study found that code-switching occurs intentionally and not through lack of competence in the base language. The students used code-switching functions for various purposes such as to capture attention, to show respect, to show empathy and to indicate a shift in topic. An earlier study (Muthusamy, 2009) showed that undergraduates of a Malaysian public university had emphasised habitual expression that was related to psychological aspect of behaviour as their main reason for code switching. Lack of register competence was also another contributing factor for code switching. The study concluded that the ability of the interlocutors who were able to speak more than one language fluently played an important role during their interaction.

Drouin (2011) examined the frequency of text messaging, use of “textese” and literacy skills (e.g., reading accuracy, spelling and reading fluency) in a sample of college students in America. Co-relational analyses revealed significant positive relationships between text messaging frequency and literacy skills (spelling and reading fluency) but significant, negative relationships between textese usage in certain contexts (e.g. emails to professors) and literacy (reading accuracy). Those reportedly using more textese on SNSs and those using more textese in emails to professors had significantly lower reading accuracy scores.

Regarding writing skills, Drouin (2011) also discussed the new shift of writing instruction and pedagogy that uses social networking tools in order for to attract students’ interest in learning language. Research-based best practices and a sample writing assignment were presented to illustrate a new model of composing in an online environment that is encouraging to teenagers. Given that teenagers did not appear to recognize their out-of-school writing as ‘real’ writing, Drouin (2011) emphasizes that one should be equipped with a variety of mentoring strategies and knowledge of different communication modes, which includes social networking and media platforms like Facebook.

Computer-assisted language learning has been shown to have its disadvantages. Cummings (2011) states that computer-assisted language learning will never be able to substitute for teachers because there could be issues of control in administrating relevant exercises in language teaching and learning. Nevertheless, the researcher conceded that they offer new opportunities for better language practice and may significantly reform a country's educational system.
Mphahlele and Mashamaite (2005) suggest that applications of expression tools such as blogs, MySpace, Facebook and Bebo into language learning contexts require further investigation by the computer-assisted language learning community.

The use of SNSs in educational contexts has not been sufficiently explored despite the prevalence of social networks around the world (Roblyer et al., 2010; Aydin, 2012). Research should investigate the various uses of Facebook within educational contexts. Kabilan (2010) suggests that future research focus on the meaningfulness of Facebook to students’ language learning experiences.

3. Methods

This quantitative study involving 236 participants from private universities in two states in Malaysia looks at assessing the language used in SNSs in students’ day-to-day language usage, in accordance with their multiple levels of English proficiency. The respondents were selected based on convenience sampling method. This medium-scale survey was conducted at two major locations as a prelude to greater mining of data and an even bigger research opportunity. The responses were obtained from June 2013 to February 2014. The questionnaire was designed based on various question types such as multiple choice questions (MCQ), open-ended questions, yes/no questions, Likert scale questions (ranging from strongly agree to strongly disagree), ranking questions (1 being the best/most preferred to 5 being the worst/least preferred), and frequency questions (frequently, occasionally and never). The respondents answered questions on what influences their English proficiency via SNSs and mobile phones. Respondents had to answer all the questions. However, only the following questions were analyzed in this study, and were grouped into three independent variables based on the objectives of this study. The full questionnaire will be provided upon request.

a. The association between language preference and English proficiency.

Q8. What language do you prefer to use when you are communicating with your friends at university via the SNSs as listed (in the questionnaire)?

Q18. Do you use only one language communicating with your friends via SNSs and mobile phone in each conversation?

b. The association between abbreviations and short form and English proficiency

Q12. Do you use proper abbreviations or short forms when communicating with your friends in UTAR through SNSs?

Q13. Why do you think UTAR students use linguistic features or abbreviations and short forms in these three mediums?

Q25. If you use any of the Internet slang below, how frequently do you use it on SNSs?

Q30. Using linguistic features such as improper grammar, abbreviations and code-switching to communicate with your friends will have a negative impact. What do you think about this statement?

c. The association between the usage of SNSs and English proficiency.

Q11. As a student, which do you think is the best media to learn English from?

Q14. Do you agree that Facebook, Twitter and mobile phones can enhance your language skills?

Q17. Rank the following elements in terms of your preference as the language you use in Facebook, Twitter and mobile phone.

The respondents were required to indicate perceptions of their own and friends’ English proficiency:

Q16. How do you rate the language your friends use when communicate with you via social network and mobile phone?

Q26. How would you rate your English proficiency?
4. Findings and discussion

4.1 Descriptive statistics

Table 1 provides a summary of demographic information for all respondents, including gender, age, region, education level, owning a mobile phone, and availability of short-message service (SMS). Table 1 shows that from the total 236 respondents, 103 were male (43.6%) and the remaining 133 were female (56.4%). Female respondents were 12.8% more than male respondents. Additionally, the table showed that 99.2% of respondents fall under the category of 15-24 years old; however, people within the age of 25-34 years were relatively low (i.e., only 0.8%). Among the respondents, 68.6% were from the central region (Selangor) followed by 17.4%, 9.3%, 2.5% and 2.1% from the northern (Perlis, Kedah, Penang, Perak), southern (Negeri Sembilan, Malacca, Johor), east coast (Kelantan, Terengganu, Pahang) and west coast regions (Sabah, Sarawak) respectively. Among the 236 respondents who owned a mobile phone, 99.2% used the SMS function. Only 0.8% of all respondents did not use it.

Table 1: Respondents’ profile

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Frequency</th>
<th>Percent (%)</th>
<th>Cumulative percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>103</td>
<td>43.6</td>
<td>43.6</td>
</tr>
<tr>
<td>Female</td>
<td>133</td>
<td>56.4</td>
<td>100.0</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15-24 years</td>
<td>234</td>
<td>99.2</td>
<td>99.2</td>
</tr>
<tr>
<td>25-34 years</td>
<td>2</td>
<td>0.8</td>
<td>100.0</td>
</tr>
<tr>
<td>Region</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northern Region</td>
<td>41</td>
<td>17.4</td>
<td>17.4</td>
</tr>
<tr>
<td>Central Region</td>
<td>162</td>
<td>68.6</td>
<td>86.0</td>
</tr>
<tr>
<td>Southern Region</td>
<td>22</td>
<td>9.3</td>
<td>95.3</td>
</tr>
<tr>
<td>East Coast Region</td>
<td>6</td>
<td>2.5</td>
<td>97.9</td>
</tr>
<tr>
<td>West Coast Region</td>
<td>5</td>
<td>2.1</td>
<td>100.0</td>
</tr>
<tr>
<td>Mobile Phone</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>236</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>No</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Short-message service (SMS)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>234</td>
<td>99.2</td>
<td>99.2</td>
</tr>
<tr>
<td>No</td>
<td>2</td>
<td>0.8</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Figure 1: Usage frequency of social networking sites.

Time spent on SNS: 89.8% of respondents logged into the SNSs daily. Only 1.7% of them logged in less than twice a week.

The most preferred social networking sites: The most preferred sites were Facebook, Google+ and Twitter which were 99.2%, 36.4% and 24.2% respectively from 236 respondents. MySpace and LinkedIn were the least-used SNSs among the respondents.

Figure 2: Usage of social networking sites

4.2 Inferential statistics

Table 2: The association between language preference and English proficiency

<table>
<thead>
<tr>
<th>Panel A: How do you rate the language of your friends when they communicate with you via social network and mobile phone?</th>
<th>Very Good</th>
<th>Good</th>
<th>Average</th>
<th>Poor</th>
<th>Very Poor</th>
<th>Chi-square</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q8 English</td>
<td>1.4%</td>
<td>27.2%</td>
<td>64.6%</td>
<td>5.4%</td>
<td>1.4%</td>
<td>5.417</td>
<td>0.712</td>
</tr>
<tr>
<td>Chinese</td>
<td>19.3%</td>
<td>76.1%</td>
<td>4.5%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td></td>
<td></td>
<td>100.0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q18 Yes</td>
<td>1.7%</td>
<td>12.1%</td>
<td>81.0%</td>
<td>5.2%</td>
<td></td>
<td>7.594</td>
<td>0.108</td>
</tr>
<tr>
<td>No</td>
<td>.6%</td>
<td>28.1%</td>
<td>65.2%</td>
<td>5.1%</td>
<td>1.1%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 2 illustrates the chi-square test results for the first objective. The chi-square tests in the Panel A suggest that perceived English proficiency of friends does not significantly associate with language preference \( \chi^2 : 2.12, p = 0.146 \) and number of language \( \chi^2 : 0.24, p = 0.626 \). However, the self-perception of English proficiency is significantly associated with language preference \( \chi^2 : 14.21, p = 0.076 \). Among those who prefer to use English when communicating with friends using social networking sites indicated higher level of confidence on their English proficiency, where 3.4% respondents perceived they are very good and 21.1% are good.

Table 3a: The association between abbreviations and short form and English proficiency

<table>
<thead>
<tr>
<th>Panel A: Q16. How do you rate the language of your friends when they communicate with you via social network and mobile phone?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Q12  Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Q13a Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Q13b Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Q13c Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Q13d Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Q30a Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Q30b Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Q30c Yes</td>
</tr>
</tbody>
</table>
### Panel A: Q16. How do you rate the language of your friends when they communicate with you via social network and mobile phone?

<table>
<thead>
<tr>
<th>Q30d</th>
<th>Yes</th>
<th>1.8%</th>
<th>30.6%</th>
<th>61.3%</th>
<th>5.4%</th>
<th>.9%</th>
<th>7.792*</th>
<th>0.099</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>18.4%</td>
<td>76.0%</td>
<td>4.8%</td>
<td>.8%</td>
<td></td>
<td></td>
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<td></td>
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</tbody>
</table>

### Panel B: Q26 How would you rate your English proficiency?

<table>
<thead>
<tr>
<th>Q12</th>
<th>Yes</th>
<th>1.4%</th>
<th>15.5%</th>
<th>66.7%</th>
<th>14.0%</th>
<th>2.4%</th>
<th>6.483</th>
<th>0.166</th>
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<tbody>
<tr>
<td>No</td>
<td>6.9%</td>
<td>24.1%</td>
<td>51.7%</td>
<td>17.2%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Q13a</th>
<th>Yes</th>
<th>2.4%</th>
<th>15.6%</th>
<th>65.9%</th>
<th>14.6%</th>
<th>1.5%</th>
<th>5.018</th>
<th>0.285</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>22.6%</td>
<td>58.1%</td>
<td>12.9%</td>
<td>6.5%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Q13b</th>
<th>Yes</th>
<th>2.1%</th>
<th>16.8%</th>
<th>61.1%</th>
<th>16.8%</th>
<th>3.2%</th>
<th>1.825</th>
<th>0.768</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>2.1%</td>
<td>16.3%</td>
<td>67.4%</td>
<td>12.8%</td>
<td>1.4%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Q13c</th>
<th>Yes</th>
<th>6.9%</th>
<th>23.6%</th>
<th>58.3%</th>
<th>6.9%</th>
<th>4.2%</th>
<th>21.267***</th>
<th>0.000</th>
</tr>
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<tbody>
<tr>
<td>No</td>
<td>13.4%</td>
<td>67.7%</td>
<td>17.7%</td>
<td>1.2%</td>
<td></td>
<td></td>
<td></td>
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<table>
<thead>
<tr>
<th>Q13d</th>
<th>Yes</th>
<th>18.4%</th>
<th>65.8%</th>
<th>13.2%</th>
<th>2.6%</th>
<th>1.17</th>
<th>0.883</th>
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<tbody>
<tr>
<td>No</td>
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<td>16.2%</td>
<td>64.6%</td>
<td>14.6%</td>
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<table>
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<tr>
<th>Q30a</th>
<th>Yes</th>
<th>2.1%</th>
<th>22.4%</th>
<th>59.4%</th>
<th>14.7%</th>
<th>1.4%</th>
<th>10.055**</th>
<th>0.040</th>
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<tbody>
<tr>
<td>No</td>
<td>2.2%</td>
<td>7.5%</td>
<td>73.1%</td>
<td>14.0%</td>
<td>3.2%</td>
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<td></td>
<td></td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Q30b</th>
<th>Yes</th>
<th>1.5%</th>
<th>12.4%</th>
<th>68.6%</th>
<th>16.1%</th>
<th>1.5%</th>
<th>6.026</th>
<th>0.197</th>
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<tbody>
<tr>
<td>No</td>
<td>3.0%</td>
<td>22.2%</td>
<td>59.6%</td>
<td>12.1%</td>
<td>3.0%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Q30c</th>
<th>Yes</th>
<th>2.6%</th>
<th>23.7%</th>
<th>60.5%</th>
<th>13.2%</th>
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<th>6.432</th>
<th>0.169</th>
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<tbody>
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<td>No</td>
<td>1.9%</td>
<td>13.1%</td>
<td>66.9%</td>
<td>15.0%</td>
<td>3.1%</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Q30d</th>
<th>Yes</th>
<th>.9%</th>
<th>18.0%</th>
<th>64.0%</th>
<th>15.3%</th>
<th>1.8%</th>
<th>1.993</th>
<th>0.737</th>
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<tbody>
<tr>
<td>No</td>
<td>3.2%</td>
<td>15.2%</td>
<td>65.6%</td>
<td>13.6%</td>
<td>2.4%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at k: 0.01; **Significant at k: 0.05; ***Significant at k: 0.001*

Table 3a summarizes the chi-square tests and Table 3b summarizes the spearman correlation coefficients to examine the second objective. The results in the Panel A of Table 3a shows that the perceived friends’ English proficiency (Q12) is not associated with proper use of abbreviations or short forms (Q30d). As for the reasons for the students using linguistic features in these three medium, the English proficiency is significantly associated with saving typing time (Q13a). Only 0.5% among those who use linguistic features for time saving purpose rated their English proficiency as very good, as opposed to 6.5% those who do not think that linguistic features are time saving rated their English proficiency as very
16.8% among the respondents who agree that using linguistic features such as improper grammar, abbreviations and code switching will have negative impact due to the fact that they did not realize that in fact the grammar is not presented in a proper way (Q30b) rated their friends having good English proficiency. In contrary, 34.8% among those do not think there is negative impact of using those linguistics features rated that their friends have good English proficiency ($\chi^2 = 11.310, p = 0.000$). 30.6% respondents among those agree that the abbreviations are based on own personal patterns thus sometimes it leads to misunderstanding of a word or term by one another (Q30d), rated their friends as having good English proficiency; while 18.4% among those who disagreed rated their friends as having good English proficiency.

The Panel B of Table 3a relates the use of short forms and abbreviations to self-rated English proficiency. The self-perceived English proficiency is significant when associated with the reason of using linguistics features to amplify and emphasize a point ($\chi^2 = 11.310, p = 0.000$). Among those who agree that practice becomes a habit and affects the use of the English language in many areas as well as in the corporate world, 22.4% respondents rated themselves as having good English proficiency as opposed to 7.5% among those did not agree ($\chi^2 = 10.440, p = 0.001$).

![Figure 3](https://www.ejel.org)

**Figure 3:** Usage frequency of the linguistic features in social networking sites.

Figure 3 depicts the frequency of internet slangs usage based on its popularity, from top to bottom. The most popular linguistic features is Onomatopoeia (i.e. Exclamatory spellings of emotions, for example Hahahah, wah, and woohoo), More than half of the respondents indicate that they use Letter homophone (e.g. u to represent you), Acronyms (e.g. lol to present laughing out loud), Misspelling (e.g. dun to represent don’t), Code Switching (i.e. concurrent use of more than one language in a sentence), Malaysian English (i.e. incorporates Malaysian slang into the English language), shortening of words (e.g. msg to represent message), and Repetition (e.g. okayokay). More than half indicated themselves use new jargons occasionally (e.g.
gooling and tweeting). The least popular internet slang is leet, in which 68 percent of the respondents never use it before.

**Table 3b: The association between abbreviations and short form and English proficiency**

<table>
<thead>
<tr>
<th></th>
<th>Q16</th>
<th></th>
<th>Q26</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Correlation</td>
<td>P-value</td>
<td>Correlation</td>
<td>P-value</td>
</tr>
<tr>
<td>Leet</td>
<td>-.154**</td>
<td>.018</td>
<td>-.006</td>
<td>.932</td>
</tr>
<tr>
<td>New jargons</td>
<td>-.030</td>
<td>.649</td>
<td>.096</td>
<td>.143</td>
</tr>
<tr>
<td>Unusual jargons</td>
<td>-.100</td>
<td>.125</td>
<td>.014</td>
<td>.836</td>
</tr>
<tr>
<td>Acronyms</td>
<td>-.096</td>
<td>.143</td>
<td>-.141**</td>
<td>.031</td>
</tr>
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<td>Shortening of words</td>
<td>-.130**</td>
<td>.046</td>
<td>.023</td>
<td>.723</td>
</tr>
<tr>
<td>Code switching</td>
<td>-.028</td>
<td>.668</td>
<td>-.081</td>
<td>.217</td>
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<td>Misspelling</td>
<td>-.152**</td>
<td>.020</td>
<td>-.125</td>
<td>.055</td>
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<tr>
<td>Letter homophone</td>
<td>-.074</td>
<td>.257</td>
<td>-.158**</td>
<td>.015</td>
</tr>
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<td>Letter-number combinations</td>
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<td>.788</td>
<td>-.007</td>
<td>.909</td>
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<td>Onomatopoeia</td>
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<td>.335</td>
<td>-.064</td>
<td>.325</td>
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<td>Malaysian English</td>
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<td>.429</td>
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<td>.727</td>
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<td>Repetition</td>
<td>.060</td>
<td>.356</td>
<td>-.137**</td>
<td>.035</td>
</tr>
<tr>
<td>Capital letter</td>
<td>.090</td>
<td>.169</td>
<td>.042</td>
<td>.518</td>
</tr>
<tr>
<td>Eccentric spelling</td>
<td>.052</td>
<td>.428</td>
<td>.080</td>
<td>.223</td>
</tr>
</tbody>
</table>

*Significant at \( p < 0.05 \); **Significant at \( p < 0.01 \); ***Significant at \( p < 0.001 \)

Table 3b depicts the correlation coefficients between the frequency of linguistic features usage and English proficiency of their friends (Q16) and themselves (Q26). The use of leet (\( r = -0.154, p = 0.018 \)), shortening of words (\( r = -0.130, p = 0.046 \)), and misspelling (\( r = -0.152, p = 0.020 \)) are significantly negatively related to their friends’ English proficiency. Meanwhile, the use of acronyms (\( r = -0.141, p = 0.030 \)), misspelling (\( r = -0.130, p = 0.046 \)), and repetition (\( r = -0.137, p = 0.035 \)) are negatively related to their own self-rated English proficiency. The negative relationship implies that the more frequent the respondents use the linguistic features, the higher the tendency they rate themselves poorly in English proficiency. These can be observed in Figure 3, in which more than 50 percent of the respondents indicate that they use shortening of words, misspelling, acronyms, letter homophone and repetition. It is worth to note that misspelling is significantly associated with self-rated English proficiency and their friend’s English proficiency. Based on the lecturers’ perceptive, by using their personal observation checklist in the classrooms, it is found that the respondents do not use any misspelling in their assignments and presentation slides during oral presentation in classrooms. They are very aware that misspelling is not accepted and marks will be deducted if it is reflected in their assignments and oral presentation slides. However it is frequently used in social networking sites. Thus, it can be concluded that most of the students use misspelling in social networking sites for convenience purpose especially to save time. Furthermore they follow their friends’ trends in the social networking sites.

**Table 4: The association between usage of SNSs and English proficiency**
Table 4 summarizes the Spearman correlation coefficient to examine the third objective. The first two columns illustrate the findings of the respondents’ rating of their friends’ English proficiency. The respondents’ perception on the best media, specifically television programme (Q11. Television programme) is negatively related to their friends’ English proficiency. However, their perception on social networking sites (Q11. Social networking sites) are positively related to how they perceived their friends’ English proficiency. This conclusion is further confirmed by the finding on Q14. The extent to which the respondents agree that Facebook, Twitter and mobile phones can enhance their language is positively correlated with their perception of their friends’ English proficiency. The more the respondents prioritize grammar (Q17. Grammar) and spelling (Q17. Spelling), the better the respondents rate their friends’ English proficiency.

The last two columns of Table 4 report the finding on their self-rated English proficiency. The priority on grammar is positively related to self-rated English proficiency (Q17. Grammar: 0.150, p = 0.010), while the priority on code switching is negatively related to self-rated English proficiency (Q17. Code Switching: -0.125, p = 0.055).

5. Conclusion

The results show that most respondents set their own preferred language as a default language in SNS. The Chinese language is the most common and preferred among the respondents. This is causing less contact with English, making it worse for those who read and speak English on a daily basis. This negatively impacts the respondents’ proficiency in the English language. However, the usage of abbreviation and short forms does not affect English proficiency. This is because the respondents tend to be aware of the examination requirements, the non-compliance of which would affect their scores. Besides, the respondents are also aware that the misspelling which has shown a significant value in both how the friends’ are rated in SNSs in terms of English proficiency and also how they (the users; themselves) are treated until this case is over. They are very aware that misspelling is not accepted and marks will be deducted if it is reflected in their assignments and presentation slides for oral presentation. However it is frequently used in social networking sites. According to Thurairaj et al. (2012) the users are able to switch their minds and apply different sets of words to cater to their purpose and to the occasion. Therefore in formal writing, students consciously avoid using short forms,
which does not affect their English proficiency. The usage of SNSs such as Facebook, Twitter and mobile phones enhances English proficiency as these SNSs can be accessed worldwide and thus allow people all over the world to post and share their thoughts, feelings, news and articles. Since these are mostly penned in English, users tend to learn English by default, through SNS.

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