Editorial for EJEL Volume 11 Issue 2

The articles in this issue demonstrate the widening range of possibilities for e-learning. The technologies continue to develop and change, and issues of adoption and innovation persist. Like any other technologies, e-learning hardware and software is best used when it is introduced to solve a real problem which has been carefully thought through. The articles show that there is tremendous promise and opportunity, but there are no quick fixes, and no one-size-fits all solutions.

Kyalo and Hopkins investigated attitudes towards online learning for continuous professional development in medical colleges in Kenya, which are facing financial and multi-site challenges. Online learning was found to be acceptable in principle, but the survey confirmed doubts about using online learning for practical and, particularly, for clinical subjects. Fears about the credibility of online qualifications did not seem to be warranted, but this could depend on the clinical or theoretical focus of a course. Motivation was seen a potential problem too, and although many of the staff who had previous experience of online learning were positive, the majority were decidedly neutral. The recommendation of the authors is to adopt a hybrid approach, which is likely to deal with many of these problems.

Hramiak asks whether experience of using blogs in teacher training can simply be cascaded into schools, or whether it is much more complex than that. Teachers’ confidence in using blogs came up against ‘inhibitors’ in the actual classroom. Time, access and support were issues. Not surprisingly, the use of blogs needed to be integrated with pedagogy, specifically with ways to support, share and reflect on experience and interaction, and with the curriculum. Strategically, there is a need for students opportunities to interact, and learn in different spaces, outside of the narrow circle of teacher-student interaction in the classroom. Perhaps this has some bearing on the reluctance of head-teachers to adopt whole school approaches too.

They do flag up the issue of academics being “reluctant to adopt technology in their sessions with trainees”, which seems to point to a reluctance to ‘let go’, and embrace students opportunities to interact, and learn in different spaces, outside of the narrow circle of teacher-student interaction in the classroom. Perhaps this has some bearing on the reluctance of head-teachers to adopt whole school approaches too. This can be mission-critical, where issues such as firewalls are not solved, enclosing the school in its own walled garden, in which one of the major affordances of blogs – to reach out of the classroom, is prohibited.

Xanthou has developed a dynamic e-assessment tool which responds not just to whether the answer to a particular question is right or wrong, but also to the level of accuracy of the answer. It then raises or lowers the level of the following questions. This provides the student with the motivation to repeat the tests until they become familiar with the course content.

This includes both adaptive presentation and adaptive navigation – the latter in particular provides more than just a ‘programmed learning’ response, as the learner has freedom of choice which enables them to determine their own learning paths. She concludes that while physical contact with a tutor is clearly ideal, these adaptive
tools can “significantly contribute towards a more interactive, ... more efficient, meritocratic educational framework that cannot be reproduces using conventional ... means”.

Worrall and Harris conducted action research with a group of professionals hard pressed for time, and dissatisfied with the lack of responsiveness of their currently available networking platforms. They conclude that feedback needs to be improved, and they need to have more ownership of the site, as well as more facilities for private interaction in private chat rooms.

Florence Martin and Michele A Parker explore the adoption of synchronous online classrooms at university, using Roger’s model of diffusion of innovation. They found that availability and ease of use, and efficiency and reliability of the system were key extrinsic the motivators, although the faculty were wary of using particular tools if they lacked confidence.

Personal factors that rated highest for adoption were an interest in improving teaching and learning, supporting studies elsewhere. Archiving and play-back, and the audio and text chat feedback facilities were used extensively. Conferencing was used for online courses as well as to extend interaction in blended courses, and to offer virtual office hours.

Moten et al tackle the ever growing problem of online cheating, as availability and sophistication of such ‘services’ continues to grow. Procrastination and time-management, peer pressure and behavior, and a less personalized and distant relationship to students all played a role. The authors discuss a range of problems and possible solutions, but it remains an ongoing issue.

Kotsilieris and Dimopoulou explore the possibilities offered by 3D virtual worlds for students to interact via avatars, in ways which are not possible in the real world. They discuss the way Sloodle can be used to bring together Moodle and OpenSim, and their experience in setting up an experimental virtual class.

Roy Williams
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Exploring the Acceptability of Online Learning for Continuous Professional Development at Kenya Medical Training Colleges

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Abstract: This study explores the acceptance of online learning (OL) for continuous professional development among lecturers at Kenya Medical Training College in 2009. The large and multi-campus College faces logistical and cost challenges in ensuring that its 700 lecturing staff have access to continuous professional development. Online learning potentially provides an effective and efficient solution to this problem. A questionnaire was administered to a sample of the lecturers to assess the perceived usefulness and perceived ease of use of online learning, taking into account lecturers’ experiences. Two focus group discussions were also held to assess the lecturers’ views on issues relating to OL. We find that there is a high level of acceptability of the idea of undertaking further training using OL as user attitudes towards web-based training were positive. The benefits of OL over face-to-face learning for clinical training and the accreditation of OL courses are issues of ongoing concern to lecturers. Successful and large scale adoption of OL course requires promotion of their benefits in addition to clarification of the accreditation of the available courses.

Keywords: online learning; professional development; perceived usefulness of technology; perceived ease of use of technology; online qualifications

1. Introduction

Kenya Medical Training College (KMTC) is the largest medical and health training institution in East and Central Africa with 700 lecturing staff and a responsibility for 14,000 students enrolled in more than 50 different medical and health courses across 28 campuses. Lecturers at KTMC are required to keep up-to-date in their field and in addition, are encouraged to enrol in degree and masters programs. A number of factors such as limited conventional classroom learning opportunities, insufficient training funds and restrictions on release of lecturers from their KMTC duties have resulted in management advocating online learning for continuous professional development.

This study explores the attitudes to and the use of online learning (OL) for professional development among lecturers at KMTC through the administration of a questionnaire. The study undertook to find out the appropriateness, barriers and potentials of online learning through the participating and non participating lecturers’ experiences.

Previous studies in other parts of the world have commended online learning as an appropriate method of fostering continuous professional development while others have pointed out its limitations especially in remote areas where technology is lagging behind (Beller and Ehud, 1998, Bartolic and Bates, 1999). Most analyses on technology acceptance, however concentrate on high income countries. Kenya as a low income country thus makes an interesting case for analysis as quality and availability of technology is likely to be different to that of the richer countries. This study is able to cast some light on whether technology acceptance is influenced by the availability and quality of the technology. Formative findings in Kenya have suggested negative beliefs and myths have surrounded the use of OL materials, and their delivery and quality (Amutabi and Oketch, 2003).

2. Background

2.1 Training needs at Kenya Medical Training College

Kenya Medical Training College (KMTC) was established in 1927 and is the largest medical training institution in East and Central Africa. With over 14,000 students attending more than 50 different medical and health courses, KMTC makes the biggest single contribution to the health sector in Kenya with more than 2500

Reference this paper as: Kyalo, I, W and Hopkins, S. “Exploring the Acceptability of Online Learning for Continuous Professional Development at Kenya Medical Training Colleges” The Electronic Journal of e-Learning Volume 11 Issue 2 2013, (pp82-90), available online at www.eiel.org
graduates every year for both the Kenyan public and private health sectors, and the foreign job market. KMTC contributes to more than 80 percent of the health workforce in Kenya and in response to regional needs, also train students from other African countries such as Uganda, Tanzania, Burundi, Rwanda, Sudan, and Nigeria. In total, there are 28 constituent colleges spread throughout the country with 1,500 members of staff of which almost 50% of these are lecturers (Kenya Medical Training College, 2008).

KMTC has a core function of training competent, multidisciplinary health professionals. In order to deliver this, qualified and experienced lecturers are fundamental. To facilitate learning and training of competent health professionals, the lecturers must continually validate their knowledge and skills to reflect the changing nature of health care needs (Mazmanian and Davis, 2002). This calls for a vigorous engagement in Continuous Professional Development (CPD) programs.

In addition to routine CPD, the management of the institution has continued to encourage lecturers to enrol in degree and masters programs. Currently, the majority of KMTC lecturers are holders of higher national diplomas and a minority with bachelors and masters degrees in different fields.

Amutabi and Oketch (2003) note that conventional classroom learning opportunities are limited in local universities. In addition the budget situation means that KTMC has limited funds for training and restrictions on the number of lecturers who can be released for full time and part-time courses. The combination of pressure of work, lack of finances and personal limitations is driving many lecturers to consider the use of online learning for their CPD as a more cost effective means of staff development.

To cope with the demands and challenges of CPD and higher degree acquisition, online learning opportunities are increasingly being introduced in Kenya by both local and foreign universities (Amutabi and Oketch 2003). This study examines the acceptance of the lecturers and the management of KMTC of the use of OL and its perceived impact in improving the quality of training. There exists a view that positive perceptions about the learning method can affect the achievement of the learning objectives, outcomes and their transfer to others (Ames and Archer, 1988, Lockwood and Gooley, 2001).

2.2 Research objectives

This study aims to explore general experiences and beliefs of lecturers regarding online learning, and analyze its use and acceptance as a method of enhancing professional development and quality of training in KMTC. In order to explore these general issues, the research has a number of specific objectives. A questionnaire was used to explore the lecturers’ knowledge of OL, to determine their experiences of OL, to find out the perceptions of lecturers towards online learning as a method of professional development and to assess the attitudes of online learning over face to face learning. A further stage of the study, elicited managers’ and experts’ views about online learning (Kyalo, 2009).

In addition, the information obtained from the questionnaire was used to test a number of research hypotheses of the relationship between demographic and socioeconomic characteristics of the lecturers and their acceptance of OL. These hypotheses are:

1: Lecturers based in urban areas are more likely to accept and use OL than those based in rural areas;
2: Lecturers who are computer literate are more likely to participate in OL;
3: Experienced lecturers are more likely to use OL;
4: Lecturers with higher qualifications are more likely to use OL;
5: Lecturers with past or current experience in OL are more likely to have positive attitudes towards OL.

2.3 Theoretical framework

Africa and the rest of the developing world are experiencing a surge in the use of electronic technology for communication and educational purposes. The potential use of this technology however remains largely unexploited due to limited access to ICT facilities (Wilson, 2008). The region depends heavily on high income
countries for both ICT materials and technical support leading to high costs of internet services and a technological gap in both education and business sector. While internet coverage appears to be improving in big cities and business centers, connectivity still remains poor and expensive in remote areas (Harasim, 2001). Kenya is in the process of installing fiber optic technology which is expected to boost and reduce the cost of internet communication and other ICT services in the country (Limo, 2009).

Online learning (OL) which is also called e-learning and web-based learning refers to the use of the web-based technologies to deliver material to enhance knowledge and skills. There are 2 possible modes for OL: distance learning or computer-assisted instruction (Ruiz JG et al., 2006). Considerable literature across a number of disciplines attests to the efficiency and effectiveness of OL as means of delivery for teaching and learning (Tallent-Runnels MK et al., 2006). OL is welcomed by students as it provides them with convenience and autonomy as learning is generally self-paced. These characteristics enhance motivation and performance. From the instructors’ viewpoint, OL content can be more easily updated.

Whilst not disputing the importance of issues of technological capacity and cost, this paper concentrates on the factors that may impact on the acceptance of OL as a means for obtaining further qualifications or updating skills in KMTC. Lack of acceptance of new technology as evident in rejection, partial engagement or active resistance may be very costly to both the individual and the employer (Hashim, 2008). Thus employers tend to be concerned about financial, pedagogical and attitudinal barriers to use of new technology. All are instrumental in judging the success of the introduction of technology but attitudinal problems are considered to be the most difficult to manage.

Information system researchers have used the technology acceptance model (TAM) to study individuals’ acceptance of new technology (Davis F.D., 1989). The model uses two technology acceptance measures of perceived usefulness and perceived ease of use, as the keys to success. Perceived usefulness is defined in the literature as “the degree to which a person believes that using a particular system would enhance his or her job performance”. Perceived ease of use is defined as “the degree to which a person believes that using a particular system would be free of effort”. (Davis F.D., 1989).

Earlier research by Schultz and Slevin found that the perceived usefulness of technology, especially in terms of the likely effect on job performance and advancement is highly correlated with self-predicted use (Schulz R.L and Slevin D.P., 1975). A system which does not help people in the performance of their job is unlikely to be viewed favourably, and thus adopted.

Both perceived usefulness and perceived ease of use have strong behavioural elements. Thus more recent research is strongly linked to the literature of psychology. Bagozzi, Davis and Warshaw (Bagozzi R.P. et al., 1992) note that the general model underlying the acceptance or rejection of technology follows a sequence of factors that run from systems design characteristics, beliefs and evaluations of consequences of use, attitudes, decision-making and intentions to use and finally to usage. In the TAM, it is anticipated that positive attitudes towards technology are more likely to lead to an intention to adopt. Bagozzi et al (1992) suggest that the weakest link in the causal chain, and the least researched, is attitudes. Measurement and definition of attitudes may be problematic as attitudes may be linked to both goals and actions.

In conclusion, while studies have shown that OL can achieve the same or even better results than the traditional methods in fostering knowledge and skills, there is need to evaluate the users’ attitudes towards this ease and usefulness of OL (Tallent-Runnels MK et al., 2006). Attitudes and beliefs are strong determinants of behavior and will affect the acceptance of any methodology hence affecting its effective use and overall impact in quality improvement.

3. Methods

3.1 Sample and data collection

Since it was not possible to survey all 700 lecturers in all the 28 locations of the KMTC colleges, 120 study subjects were drawn from 6 of the 28 colleges. The participating colleges, both urban and rural were selected through cluster sampling. After that selection, all full-time lecturers in the 6 participating colleges were used as
study subjects. The research design is a cross-sectional analytical study with data collected from 6 of the 28 colleges of KMTC using a researcher designed questionnaire.

In a second stage of the study, qualitative data were collected via Focus Group Discussions (FGD) with an aim to complement, strengthen and explain quantitative results. The data were derived from two FGDs each consisting of 7 lecturers who had participated in OL and personal interviews with three key informants. The key informants included a human resource officer in KMTC, a principal in one of the KMTC colleges and a lecturer dealing with e-learning in one of the local universities.

The survey instrument is a modified version of a validated questionnaire used in a previous and related study by Chin (2004). In order to allow for clarification of issues for both the researcher and study subjects, one of the authors (William Kyalo) undertook all the data collection procedures including the surveys reported in this paper and the interviews and FGD.

The study instruments were designed in such a way that useful information was collected at the same time as responses to the research questions. The information collected included socio-demographic characteristics, user rate of OL, perceived usefulness of OL, and beliefs, experiences and attitude towards online learning as a tool for continuous professional development.

This section summarises the survey results based on the 120 questionnaires filled by the lecturers in the 6 KMTC constituent colleges. The responses to the interviews are also summarised. The first set of results summarizes the demographic and qualifications of the survey respondents (Table 1).

**Table 1: Demographic details of surveyed lecturers at KMTC (n=120)**

<table>
<thead>
<tr>
<th>Socio-demographic variables</th>
<th>Male</th>
<th>Female</th>
</tr>
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<tbody>
<tr>
<td>Gender</td>
<td>58.3% (n=70)</td>
<td>41.7% (n=50)</td>
</tr>
<tr>
<td>Age (years)</td>
<td></td>
<td></td>
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<tr>
<td>Mean</td>
<td>44.9</td>
<td></td>
</tr>
<tr>
<td>Median</td>
<td>47.0</td>
<td></td>
</tr>
<tr>
<td>Work Experience (years)</td>
<td></td>
<td></td>
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<tr>
<td>Mean</td>
<td>18.5</td>
<td></td>
</tr>
<tr>
<td>Median</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Work Location:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>54.2% (n=70)</td>
<td></td>
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<tr>
<td>Rural</td>
<td>45.8% (n=50)</td>
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</tr>
<tr>
<td>Profession</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nurse</td>
<td>48.3% (n=58)</td>
<td></td>
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<tr>
<td>Environmental health officer</td>
<td>11.7% (n=14)</td>
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<tr>
<td>Medical doctor</td>
<td>1.7% (n=2)</td>
<td></td>
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<tr>
<td>Medical lab technologist</td>
<td>10.0% (n=12)</td>
<td></td>
</tr>
<tr>
<td>Clinical officer</td>
<td>10.8% (n=13)</td>
<td></td>
</tr>
<tr>
<td>Medical engineer</td>
<td>5.0% (n=6)</td>
<td></td>
</tr>
<tr>
<td>Pharmaceutical technologist</td>
<td>1.7% (n=2)</td>
<td></td>
</tr>
<tr>
<td>Medical imaging</td>
<td>1.7% (n=2)</td>
<td></td>
</tr>
<tr>
<td>Dental technologist</td>
<td>1.7% (n=2)</td>
<td></td>
</tr>
<tr>
<td>Occupational therapist</td>
<td>3.3% (n=4)</td>
<td></td>
</tr>
<tr>
<td>Orthopedic technologist</td>
<td>3.3% (n=4)</td>
<td></td>
</tr>
<tr>
<td>Medical records</td>
<td>0.8% (n=1)</td>
<td></td>
</tr>
<tr>
<td>Highest Qualification attained</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diploma</td>
<td>6.7% (n=8)</td>
<td></td>
</tr>
<tr>
<td>Higher National Diploma (HND)</td>
<td>65.8% (n=79)</td>
<td></td>
</tr>
<tr>
<td>Undergraduate Degree</td>
<td>15% (n=18)</td>
<td></td>
</tr>
<tr>
<td>Postgraduate Degree</td>
<td>12.5% (n=15)</td>
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</table>

The majority of the lecturers (58.3%) were males while 41.7% were females. The age of the lecturers ranged from 28 to 60 years. The mean age is estimated at 45 years. The lecturers’ work experience ranged from 1 to 34 years with an average of 18.5 years.

Work locations were categorized as urban or rural. Colleges located in big cities and provincial headquarters were categorized as urban while those located in district headquarters and counties were categorized as rural. 54.2% of the lecturers worked in urban environment while 45.8% were based in rural areas. It is expected that urban and rural environments enjoy some differences in terms of telecommunications infrastructure.
Nearly half (48.3%) of the lecturers involved in this study were nurses. This is consistent with the KMTC statistics which show that the majority of lecturers are in the nursing discipline. The next most common occupancy groups are: environmental health officers (11.7%) and the medical laboratory technologists and clinical officers (10% each). The majority of the lecturers (65.8%) who responded to this study had a higher national diploma as their highest qualification while 15% and 12.5% had undergraduate and postgraduate degrees respectively. The remaining 7% had a basic diploma as their highest qualification. In Kenya, a Higher National Diploma refers to one year of specialized training following the award of a basic diploma. Usually, it is argued that Higher National Diploma is equivalent to a bachelor’s degree, though many authorities still believe it is a slightly lower qualification than a bachelor’s degree.

The majority of the lecturers (68.3%) have not engaged in online learning (OL). Only 31.7% had engaged in OL in the past and at least 20% of the lecturers were still participating in online learning at the time of this study. Overall, only 33.3% of the lecturers had experience of OL through past or present participation. However, the overwhelming majority (73.3 %) expressed their intention to engage in OL in the near future.

Nearly 90% of the lecturers reported to have basic computer skills though at different levels of proficiency. All these lecturers who had basic computer knowledge were accessing the internet daily, weekly or at least on a monthly basis. Most of the internet access was happening at work place and in internet cyber cafés. Over 80% of the lecturers could easily access a computer and technical assistance if needed and about 70% felt that they had the necessary and adequate computer skills to participate in OL. 65% stated that the internet connection is usually reliable and fast enough.

4. Results and discussion

4.1 Survey results

The survey results assessing the degree of technology acceptance by the KMTC lecturers are provided in Table 2. The results are divided into two sections of perceived usefulness and perceived ease of use. As was explained earlier, perceived usefulness indicates the capacity of the new technology to enhance job performance. Perceived ease of use indicates the effort required to use the technology. The higher the perceived usefulness of a new technology, the more likely people are to adopt it. A system which does not help people in the performance of their job is unlikely to be adopted.

The responses to the survey questions which focus on perceived usefulness of OL reveal a high level of agreement that the use of technology is beneficial (refer to Table 2). Questions on feeling positive (question a), quality of knowledge acquired (question b) and recommending the use of the technology to colleagues (question f) received high approval ratings. Questions on the capacity of the knowledge acquisition to enhance job performance are not regarded so positively. Questions on the acceptability of the online qualifications to the institution (question d) and to the professional body (question e), and whether online learning was successful (question j) receive agreement rankings of 50% or less. While there is not strong disagreement to these 3 questions, there appears to be some hesitancy or uncertainty regarding the acceptability of the online qualifications. This is apparent in the high percentage of respondents who feel neutral towards the questions.

The qualitative responses from the FDG support the survey responses. One of respondents in the FDG commented that: “The only unfortunate thing is that I don’t think OL qualifications are recognized by most of the employers and professional bodies.” While this uncertainty exists, it is unlikely the perceived usefulness will translate into unqualified acceptance of online learning by the lecturers.

Convincing lecturers of the value, acceptability and recognition of online learning requires strong leadership within the institution. The managers at KMTC interviewed as part of this study acknowledged the place of online learning as a cheaper and more practical alternative than face-to-face training for professional development. One manager commented that: our training budgets are insufficient and we can’t sponsor every lecturer for a full time course, we hope most of them will enroll in online courses which are cheaper and can be self funded. Institutional funding of OL would signal wide acceptance of the qualifications. Funding, even partially, would also enable the college to keep track of the professional development activities of the staff. Another manager’s comment was that: It is hard to know the number of staff enrolled in OL courses; most of them only come to us after they have completed their courses.
Even in the absence of any available funding, it would be beneficial to the institution and its staff to send a clear message that OL training is valued. One manager noted that: *We don’t discriminate; we actually consider their online qualifications just like any other qualification when interviewing staff for better job position.*

The second part in Table 2 with respect to perceived ease of use can be divided into two types of responses. The responses to the first 2 questions rate OL highly for its practicality, especially in terms of its flexibility for adults.

The last 3 questions all focus on the perceptions of OL versus face-to-face learning. The link between theory and practice when learning materials are delivered online and thus distant from the clinical area is an issue of concern for health education in all countries, not just low income ones like Kenya (Hewitt-Taylor J, 2003). The significance of this concern needs to be evaluated against the fact that much classroom instruction is also predominantly delivered at a distance from the client care environment (Hewitt-Taylor, 2003).

**Table 2: Lecturers’ views about online learning**

<table>
<thead>
<tr>
<th></th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Strongly Disagree</th>
<th>+ Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERCEIVED USEFULNESS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I feel positive about using online learning to further my skills and knowledge.</td>
<td>80.8%</td>
<td>16.7%</td>
<td>2.5%</td>
<td></td>
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</tr>
<tr>
<td>Online learning can give me the same quality of knowledge and skills as face to face learning.</td>
<td>80.8%</td>
<td>11.7%</td>
<td>7.5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I would like to see online learning established in all the universities.</td>
<td>85.0%</td>
<td>9.2%</td>
<td>5.9%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Online qualifications are acceptable and recognized in my institution.</td>
<td>45.8%</td>
<td>45.8%</td>
<td>8.3%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Online qualifications are acceptable and recognized by my professional organization/body.</td>
<td>50.0%</td>
<td>40.8%</td>
<td>9.2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I would encourage my colleagues to try online learning for their professional development.</td>
<td>87.5%</td>
<td>8.3%</td>
<td>4.2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Online learning can improve my knowledge and skills level</td>
<td>89.2%</td>
<td>5.0%</td>
<td>5.8%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Online learning can improve my job performance</td>
<td>83.3%</td>
<td>12.5%</td>
<td>4.2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall, staff development through online learning can improve the quality of training in KMTC</td>
<td>85.8%</td>
<td>10.0%</td>
<td>4.2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>My experience in online learning is/was a successful one(for those who participated or are participating)</td>
<td>27.5%</td>
<td>66.7%</td>
<td>5.8%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PERCEIVED EASE OF USE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I prefer looking for reading materials online than in libraries.</td>
<td>74.2%</td>
<td>16.7%</td>
<td>9.2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Online learning is flexible and suitable for me as an adult learner.</td>
<td>80.8%</td>
<td>11.7%</td>
<td>7.5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>One can successfully complete a course online without face to face sessions</td>
<td>57.9%</td>
<td>21.7%</td>
<td>20.8%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall, online courses are cheaper than those offered through face to face contact.</td>
<td>54.2%</td>
<td>40.8%</td>
<td>10.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I prefer online learning to face to face learning.</td>
<td>55.2%</td>
<td>26.7%</td>
<td>18.3%</td>
<td></td>
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</tr>
</tbody>
</table>

There was modest agreement (54.2%) to the question on the cost of OL compared with face-to-face. With respect to cost, one of the FGD participants commented that: *“Overall, OL is cheaper but the hidden costs like internet and printing can be very distressing to the students if not anticipated.”*

Thus it appears from the answers to questions on lecturers’ overall views on OL that they liked the idea of participating in OL - they feel positive and like the flexibility of it – but that a number of dimensions create some doubt such as the cost, acceptability by the institution and their profession and the benefits of OL against face-to-face learning. This indicates that for OL to be successfully promoted as an alternative to face-to-face for continuous professional development, the accreditation issues need to be resolved and marketed to the lecturers to encourage broad uptake.
Overall the group of lecturers who have participated in OL did not provide strong endorsement of participation. Only 27.5% of those who had participated agreed that OL is successful for them with 66.7% of lecturers indifferent to the question. Since word of mouth may be important for generating ongoing support for and participation in OL, it would be wise for the institution to explore further the reasons for the neutrality towards the success of the OL experience.

4.2 Hypothesis testing

The second part of the data analysis presents tests of association between the lecturers’ demographic profiles and their use and acceptance of OL. This enables the 5 hypotheses presented earlier to be tested and discussed. The test statistics for the 5 hypotheses are in Table 3.

Table 3: Hypothesis tests of lecturers’ views about Online Learning

<table>
<thead>
<tr>
<th>Hypotheses</th>
<th>Pearson Chi-Square</th>
<th>Asymp. Sig. (2-sided)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecturers based in urban areas are more likely to accept and use OL than those based in rural areas</td>
<td>3.290</td>
<td>0.070</td>
</tr>
<tr>
<td>Lecturers who are computer literate are more likely to participate in OL</td>
<td>13.147</td>
<td>0.004</td>
</tr>
<tr>
<td>Experienced lecturers are more likely to use OL</td>
<td>11.313</td>
<td>0.010</td>
</tr>
<tr>
<td>Lecturers with higher qualifications are more likely to use OL</td>
<td>4.706</td>
<td>0.195</td>
</tr>
<tr>
<td>Lecturers with past or current experience in OL are more likely to have positive attitudes towards OL</td>
<td>4.865</td>
<td>0.027</td>
</tr>
</tbody>
</table>

N=120

The first hypothesis is whether lecturers based in urban areas are more likely to participate in OL compared to those based in rural areas. This hypothesis was tested as it is believed that urban and rural environments enjoy some differences in terms of infrastructure. To test this hypothesis, a chi-square test was run between work locations of urban or rural and a value representing past and current participation in online learning. The Chi-square statistic in equal to 3.290 with a p-value of 0.070. Hence we conclude that there is no association between use of online learning and work location (urban or rural).

The second hypothesis is whether lecturers who have better self-assessed computer skills are more likely to participate in OL. In order to test this, a chi square test was run between a computer skills indicator and a value representing current and past OL participation. The chi square statistic is equal to 13.147 with a p-value of 0.004. Hence we conclude that there is an association between the use of online learning among lecturers and their level of self-assessed computer skills.

The third hypothesis addresses the issue of whether lecturers with more years of work experience are more likely to participate in OL than lecturers with less work experience. Based on a Chi-square statistic of 11.313 with a p-value of 0.010, we conclude that there is an association between the lecturers’ participation in online learning and their years of work experience. The relationship may reflect the fact that lecturers who have been longer in their job are more likely to have been exposed to OL and its potential benefits.

The fourth hypothesis is whether lecturers with higher qualifications are more likely to participate in online learning compared to those with lower qualifications. The Chi-square statistic is equal to 4.706 with a p-value equal to 0.195, allowing us to conclude that there is no association between lecturers’ participation in online learning and their qualifications.

Finally, we considered the hypothesis of whether past or current experience in OL is more likely to be associated with a positive attitude towards OL. The result was a Chi-square statistic equal to 4.865 with a p-value of 0.027. Hence we can reject the null hypothesis and we conclude that there is an association between lecturers’ experience in online learning and their positive attitude towards OL. Thus for this sample of lecturers at KMTC, experience or participation in OL is associated with the higher positive attitude towards OL. This result is supported by a review of research on OL by Tallent-Runnels et al (2006).

While this result might seem to contradict the result in Table 2 that only 27.5% of those who had participated in OL agreed that it was successful, the percentage who thought it was successful far outweighed that those.
that thought it was not of 5.8%. The most favoured option for the success or otherwise held by those who had already undertaken OL was neutrality. The issue of neutrality is an obvious candidate for further investigation, especially since this group of lecturers will either recommend or condemn OL to their colleagues.

In further tests of association based on results obtained by the questionnaire, we found no significant association between gender and self-assessed computer skills, between gender and participation in online learning and between age and computer skills.

4.3 Quality issues

An institution pressing forward on the path of recommending OL for its employees’ professional development should be both prudent and cautious. OL courses have the potential to enhance the learning experience where face-to-face courses are either unavailable or too expensive, but the quality of the process and of the OL courses should be carefully evaluated. It is imperative that OL courses are well designed and well implemented in accordance with sound educational theories (Tallent-Runnels MK et al., 2006). The ability of students to effectively use any technology associated with course materials must be considered in course design, so that any such applications enhance student learning. For clinical education, well-designed curricula are essential regardless of the method of delivery (Chumley-Jones H et al., 2002).

The quality issues were highlighted in the FGD. One of the lecturers commented: But the most discouraging thing is that online learning opportunities are not readily available in our country and even if you get one, you are worried about authenticity and quality of the providers.

5. Conclusion

Based on the findings of this study, it can be concluded that there is a high level of acceptability of the idea of undertaking further training using OL. User attitudes towards web-based training were undoubtedly positive. Kenya as a low income country makes an interesting case for analysis as quality and availability of technology is likely to be different to that of the richer countries. However, we find little evidence that the quality and availability of technology is impacting on the decision of whether to undertake an OL course or not. Rather it appears that some of the practicalities of OL training create uncertainties in the minds of the lecturers. There seemed to be some hesitation about the benefits of OL over face-to-face learning in light of the clinical nature of the subjects being studied and also about the accreditation of OL courses. The two questions which address the preferences of OL versus face-to-face registered the highest disagreement of all the answers.

The results are not surprising when considered in the context of OL training worldwide. Bassett notes that classroom training is still the norm for most training (Bassett, 2006). Companies in the United States conduct only 30% of training using OL methods (Hashim, 2008). On the surface, OL seems like a good option for time and financially constrained professionals. But in fact, the challenges of OL are many and include the difficulty of remaining motivated and self-directed. Indeed a comprehensive cost benefit analysis of OL may indicate that whereas the direct cost of OL is less than that of face-to-face teaching, the indirect costs of OL may be higher due to a high drop-out rate. The fact that those who have already participated in OL did not strongly agree about its success provides support to possible high indirect costs of OL.

Given the reservations expressed by respondents to the question on the benefits of OL, hybrid approaches to learning which integrate face-to-face learning with online learning merit some discussion in any decision to introduce more CPD courses at Kenya Medical Training Colleges. Blended learning has the potential flexibility to accommodate the varied requirements of courses, disciplines and levels of course, together with the needs of a wide variety of learners (López-Pérez MV et al., 2011). What makes blended learning particularly effective is its ability to facilitate a community of inquiry for open communication and at the same time allow limitless access to information on the Internet (Garrison DR and Kanuka H, 2004). A study by López-Pérez et al (2011) shows that the implementation of blended learning has a positive effect on reducing dropout rates and in raising exam pass rates in the subject.

In the FGD, it was noted that: Online learning is more theoretical than practical; it is not good for practical subjects like nursing and For practical subjects, I would advocate for a blended methodology whereby OL still comes with some face to face sessions.
In the case of the suitability of OL or other modes of learning for the Kenya Medical Training College, a full assessment of the costs and benefits of OL would require an analysis of data over many years. Obviously this current study due to a limited time frame has not been able to undertake a comprehensive analysis. The results presented here do highlight both some of the advantages of OL and some of the ongoing problems.

There is no doubt that OL particularly where it is supported by a face-to-face component has much to offer an institution like KTMC which is endeavouring to improve the CPD training for its staff. There are a number of features of the KTMC environment which support this conclusion. First, KTMC is a multiple campus college with both urban and rural colleges with considerable distances between them. Second, the complexity and breadth of health and nursing education content coupled with the scarcity of expertise and resources required for effective CPD makes OL delivery a reasonable proposition for both the lecturers themselves and the organisation.

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Escalating the use of Web 2.0 Technology in Secondary Schools in the United Kingdom: Barriers and Enablers Beyond Teacher Training

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Abstract: This paper reports on research that took place at Nottingham Trent University (NTU) and Sheffield Hallam University (SHU), United Kingdom, over two years. The project formed the basis of an iterative, interpretive, action research study focussing on a particular set of participants – trainee teachers. The insights gained from the initial cycle fed into planning the second cycle, for which the action plan was modified and the research process repeated (Zuber-Skerritt 1992). The research project focuses on the use of Web 2.0 technology, specifically web logs, (or blogs) with trainee teachers, both during their university programme and during the first year of teaching as full-time newly qualified teachers. The purpose of this research was to add to a developing body of knowledge identifying whether technology used by trainee teachers during their training course can be cascaded into their practice once qualified. Participants from the two collaborating universities were introduced to blogs and blogging during their time at university, and encouraged to use it for themselves, and to also think about how it could be used in their own classrooms when they were teaching. Questionnaires were used to ascertain their thoughts on the use of blogs during training, and these were followed up with interviews with a number of the trainees to determine the cascading of this technology, once they had become newly qualified teachers (NQTs) and were teaching in schools. These interviews explored the reasons for enabling or inhibiting the use of blogs in their teaching in school. This paper presents the findings of the research and discusses the enablers and inhibitors that were identified in the light of current research findings. The research supports the view that developing innovative use of technology in the classroom is complex and experiences during training are not always transferred into practice.

Keywords: pre-service teacher education; secondary school teachers; technology uses in education; teaching methods, weblogs, blogs

1. Introduction

Developments in Web 2.0 technology have seen an increased usage in secondary education, which is reflected in teacher training courses across Europe. At Nottingham Trent University (NTU) and Sheffield Hallam University (SHU) in the United Kingdom (UK), research has taken place over the last two years in the use of Web 2.0 technology in Initial Teacher Education courses. This paper focuses on how Web 2.0 technology, specifically web logs (blogs), are developed as a learning and teaching tool within secondary teacher education, and how this is cascaded into secondary schools. The research which was undertaken identifies the enablers and barriers to trainee teachers with respect to their use of Web 2.0 technology in their transition into full-time employment as newly qualified teachers (NQTs).

The speed of change in technology within education across Europe means that it is essential for trainee teachers to be familiar with the latest technology as a means for enhancing their own teaching and learning skills and those of their pupils. Clear links are established between teacher training and information communications technology (ICT) across Europe in a report by Pelgrum and Doornekamp (2009). The report, commissioned by the European Commission (EC), indicates that of the 28 European countries that took part in the report, 78% recognised that ICT in teacher training has a ‘high to medium’ need of monitoring (Pelgrum & Doornekamp 2009). The report further indicates that of the 28 countries, 90% regard pedagogical support for teachers as being of a ‘high to medium need’. The figure was similar for pedagogical ICT competencies of trainee teachers, although a ‘high need’ was significantly increased for trainee teachers (ibid 2009, p 54). One country representative in the report is quoted as stating ‘We want all teachers to display a full repertoire of pedagogical skills with technology’ (ibid, 2009, p 41).

The trainees at NTU and SHU who took part in the research reported in this paper were all on a one year Post Graduate Certificate in Education (PGCE) course for trainee teachers (Europe = Second Cycle) working in the secondary education phase (age 11-18). The PGCE courses at both universities follow a similar pattern, both
being one-year courses involving time in secondary schools as well as periods in university. In the first term the trainee teachers spend approximately six weeks in university followed by approximately seven weeks in a secondary school setting. The trainees then return to university in the second term for a further seven to eight weeks, followed by approximately thirteen weeks in a different secondary school setting before completing the course. The research reported in this article reflects two phases. Phase one took place during the PGCE one year course. Phase two took place when the trainees had finished their PGCE and were working as full-time NQTs in secondary schools.

Blogs are described as a ‘web application which contains periodic time stamped posts automatically arranged in a chronological order’ (Mason & Rennie 2006). They have become widely used across the internet as a tool, partially because of their accessibility, and partially because of their ease of use, allowing non-technical people to contribute to websites (Hramiak et al. 2009).

Using blogs as an embedded part of teacher training enables trainee teachers to understand the wider implications of Web 2.0 technologies within a broad learning context. The practical uses of blogs during teacher training is far more powerful as an introduction to the tool than merely reading about it in the literature. Hammond et al indicate that the introduction of technologies during teacher training enables trainee teachers to develop an understanding of related pedagogy (Hammond et al. 2009). Trainee teachers also need opportunity to develop confidence that the use of this technology will ‘support the achievement of higher level goals’ (Gaffney 2010).

2. Literature review

There are mixed findings reported by researchers on the use of Web 2.0 technologies in teacher education. For example, Divintini et al report limited use of blogs by teacher trainees (Divintini et al. 2005) and research undertaken with dyslexia and trainee teachers, found that blogging could be time consuming and question its value (Oti & Clarke 2007). Martindale and Wiley (2005) quote millions of people using blogs all over the world but indicate limited success when using blogs for educational purposes, (Beldarrain 2006; Martindale & Wiley 2005).

However, researchers such as Bonk and Zhang (2006), and Hramiak et al (2009) report success with the use of Web 2.0 technologies and trainee teachers. Larose et al (2009) argue that practices observed by trainees during training might optimise the chances of these future teachers using technology in their own classrooms (Larose et al. 2009). Reports in the educational press have also indicated that there may be some positive resistance to the use of e-learning and associated technology with teacher trainees by academics, the latter being reluctant to adopt technology in their sessions with trainees (Attwood 2009).

Research findings align the successful integration of technologies in the classroom with appropriate pedagogy. For example Mukama and Andersson found the need to develop school based curricula and appropriate pedagogy to allow trainee teachers time to develop criticality with respect to new ICT based tools (Mukama & Andersson 2007). A study by Hammond et al (2009) found that a pedagogical rationale was an important success factor when trainee teachers used new technologies and could result in an inclination to use ICT, or a propensity to see its value in the classroom (Hammond et al. 2009). Hammond et al’s study also resonates with the findings of Davies et al (2008) indicating that a more ecological approach may be at play with respect to the use of information technology by teachers in classrooms, suggesting that the interaction of the trainee and the environment is pivotal (Davis et al. 2008; Galan & Blanco 2004). Also Granberg (2009) found that where teachers share a pedagogical vision, then the difficulties of integrating information technology into courses can be overcome. In Granberg’s study, in which trainee teachers were required to use information technology as part of their teaching and then to cascade this use, it was found that, in the absence of formal structures for pedagogical discussions, teachers could experience barriers when trying to develop ICT supported methods of teaching and learning (Granberg 2009).

Beyond teacher training, researchers report more confident results in the use of blogs in education. For example Beldarrain (2006) reports success with fostering student interaction on-line using blogs. Kim, in completing a literature review of barriers to successfully integrating ICT in teaching, concluded that ‘It is worth attempting to implement a blog in educational fields’ (Kim 2008). Other researchers have analysed the dimensions of blogs in relation to successful use in some university and college contexts, and the role they
might play in education and professional contexts (Oravec 2003). Recent reports from Australia indicate a use of blogs as part of a range of tools used to transform a face to face course at masters level to one that was predominantly online in order to improve student communication during placement (Hoven 2006), while Instone reported positively on the use of multi-participant blogs as a component of a professional development program for managers (Instone 2005).

The aims of the research reported in this paper was to add to this growing body of knowledge, and to identify whether technology used by trainee teachers during their training course, supported by appropriate pedagogy, was cascaded into their own practice once they had qualified. The research also identified the enablers and inhibitors once the trainees were in their first year of teaching.

3. Methodology and methods

The methodology used for this research was action research as discussed by Carr and Kemmis, Kolb, Lewin, Whitehead and McNiff and Zuber-Skerritt (Carr & Kemmis 1986; Kolb 1984; Lewin 1946; Whitehead & McNiff 2006; Zuber-Skerritt 1992). Action research theorists adopt a methodical, iterative approach to research, embracing a hierarchical cycle of problem identification, action planning, implementation, evaluation, and reflection. The insights gained from the initial cycle feed into planning the second cycle, for which the action plan is modified and the research process repeated. This theory has been applied to Higher Education by Zuber-Skerritt (1992) whereby the researcher is considered to be involved in the process:

‘The ultimate aim [of action research] should be to improve practice in a systematic way and, if warranted, to suggest and make changes to the environment, context or conditions in which that practice takes place, and which impede desirable improvement and effective future development.’ (Zuber-Skerritt 1992).

The acknowledged founder of action research, Lewin, developed the basic principles and recognised the participatory nature of action research in relation to social change. Masters (1995) uses McKernan (1988) in her discussion in which she argues that action research as a method of inquiry has evolved and is rooted in scientific methodology (McKernan 1988). Action research produces both knowledge and new ways of ‘understanding practice’ (Noffke & Somekh 2009).

Two phases of research took place reflecting the cyclical nature of action research. The methods used for each stage are reported below. Throughout the research the authors wanted to embrace the use of new technologies and provide opportunity for trainee teachers to develop skills in using blogs, identify where the use of this technology would enhance the experience of their pupils, and be confident in using blogs in teaching and learning, supported by the trainee teachers’ developing understanding of appropriate pedagogy. The authors believed it was important to introduce the technology methodically and reflectively to encourage similar processes for their trainee teachers to follow once they were qualified teachers. Drawing on the experiences of other researchers discussed in the literature survey the authors ensured opportunity for criticality, a shared pedagogy, as well as support and encouragement from university tutors, school based mentors and their peer group; these are all cited by McNiff and Whitehead as essential for successful action research. (McNiff & Whitehead 2009).

A predominantly qualitative and interpretive approach was taken for this study (Bogdan & Biklen 1998). The research represents small scale research investigating a particular set of trainee teachers at different institutions on similar training courses; the Post Graduate Certificate of Education. The collaboration between NTU and SHU focussed on collating similar data sets (Groom & Maunonen-Eskelinen 2006) to identify how the blogs supported reflective practice and as a classroom resource (phase one) and then investigated its cascading into schools (phase two). The use of multiple sources of evidence, gained from using different methods to collect the data provided triangulation of data and added rigour to the conclusions drawn from the data (Cohen et al. 2007).

The use of blogs at both universities by the trainee teachers in the two respective cohorts for the duration of their time on the PGCE course was mandatory. There were eighteen trainees in the SHU cohort and fifteen trainees in the NTU cohort, totalling 33. Both cohorts comprised of male and female teacher trainees with an age range from 21 to 55. All had access to ICT facilities throughout their university course including the blog tool. The blog tool was different at each institution: at SHU this was part of their Virtual Learning Environment.
In phase one, an analysis was undertaken by the two universities to determine attitudes and perceptions of blogging as a tool for reflective practice which developed into the use of blogs as a resource in the secondary school classroom (Hramiak et al. 2008). The data collection for this analysis was via questionnaires. In addition, an evaluation and review of existing practice within the two courses at NTU and SHU in this area of teacher training was undertaken. Trainees were introduced to the pedagogy of using blogs in secondary schools and encouraged to identify a range of activities in secondary education where blogs could enhance the curriculum, both within and outside the classroom. At NTU observations of the use of blogs while the trainees were teaching, and their evidence of using blogs as a classroom resource was recorded.

In phase two a total of five trainees from the SHU cohort and five trainees from the NTU cohort, now qualified teachers, were interviewed. These participants were selected to provide a representative sample based on age and gender. The interviews followed open questions to identify if and how trainees were using blogs in their own teaching in schools now they were qualified teachers, or if they had included the use of blogs in their planning for the academic year. Questions were also used to ascertain what the respondents perceived the barriers to be if they were not cascading the use of blogs into their teaching. Where possible, interviews were conducted face to face, this depended on availability of trainees at the different institutions. Where face to face interviews were not possible the participants were interviewed via the telephone. Interviews were conducted during the second term of the academic year in which the respondents were fully qualified teachers. At NTU, an invitation was also sent to the remainder of the phase one cohort resulting in an additional seven participants completing an on-line questionnaire which had been designed to reflect the interview questions and which also provided opportunity for additional comments and data. This represented a total of seventeen respondents, that is, 50% from phase one who participated in phase two.

### Table 1: A summation of the methodology for each phase is indicated below:

<table>
<thead>
<tr>
<th>University</th>
<th>Phase 1 (as part of taught University Course)</th>
<th>Phase 2 (students from phase one are now newly qualified teachers)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Participants</td>
<td>Data collected</td>
</tr>
<tr>
<td>NTU</td>
<td>15</td>
<td>Questionnaire + observations of teaching</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHU</td>
<td>18</td>
<td>Questionnaire</td>
</tr>
<tr>
<td>NTU and SHU</td>
<td>Analysis undertaken to determine attitudes and perceptions of blogging by trainee teachers. Evaluation and review of existing practice within the PGCE at each University.</td>
<td></td>
</tr>
</tbody>
</table>

The data collected from phase two was analysed looking at similarities and differences between the trainees from NTU and SHU. Analysis also took place to provide evidence of enablers and inhibitors to cascading the use of blogs into the newly qualified teachers’ professional practice. These findings are described in the next section of this paper.

### 4. Findings

The findings from the study are described in detail by phase, in this section following.

#### 4.1 Reflections on findings from phase 1

As stated above, the use of blogs was mandatory for all the trainee teachers in phase one. During the first term of the course the trainee teachers at both universities were introduced to using blogs, both as a reflective tool as part of their professional development (Hramiak et al. 2009), and as a classroom tool supported by pedagogy (Hammond et al. 2009). The teacher trainees were encouraged, prior to their first secondary school experience, to identify possible uses of blogs in the secondary curriculum and to build this into their developing repertoire of learning and teaching methods. At the end of the first school placement a review took place with the trainees; the results of this were drawn on to inform changes in their training, prior to their
second placement, thus following the cyclical nature of action research. In the second term further discussion on using blogs in the classroom, and opportunities to share their experiences from their first school experience, again supported by pedagogy, took place. In addition the secondary school curriculum was explored to identify appropriate opportunities for using blogs in the classroom and for out of school learning. During this second term trainees were encouraged to cascade their use of blogs into their teaching and share their experience with their peers. Observations of the trainees on teaching practice by university tutors reported observing the use of blogs in a variety of ways, such as a reflective tool by the trainee teacher, and within the classroom such as group reflections on the development of projects and for recording a field trip.

By the completion of their course the trainee teachers had developed blogs for reflection as part of their professional development requirement and had examples of using blogs to support their teaching and classroom practice. This latter usage was predominately in their second placement where their classroom experience was more developed and the trainee teachers were more confident with pedagogy, thus ensuring the blog tool was a resource to support learning and teaching rather than used as a tool driving the learning. At the end of their PGCE course qualitative data indicated that the teacher trainees were planning to develop the use of blogs in their teaching and saw Web 2.0 technologies as a way of engaging secondary school pupils.

In general class discussions between trainees during university seminars it was noted that all of the trainee teachers found the engagement of their pupils increased when they used blogs as an appropriate tool in their classrooms. Some reported that the motivation of their pupils also increased. At NTU a discussion of the use of blogs by the trainee teachers aligned to Bloom’s taxonomy identified examples of higher levels of achievement when they had used the blogs in their classrooms. The trainees reported that this did require carefully planning but the additional time spent planning the use of this tool was:

’vedefinitely worth it ... seeing the pupils’ motivation and achievement increased resulted in greater engagement. Being able to use different media in the blogs also helped pupils with learning difficulties to produce a higher level of work’.

This approach to cascading the use of blogs into their teaching as part of their university training, supported by experienced tutors and developed over two years, proved successful. At NTU mentors in schools who were experienced teachers supporting the teacher trainees while on placement, were also asked to encourage the use of this technology while the trainee teachers were on placement. These mentors reported that the trainee teachers were encouraged to lead staff development events in using this technology, providing further evidence of successful cascading during their training. Trainees therefore completed their PGCE course with a portfolio of uses of blogs supported by their personal experiences and knowledge of pedagogy.

4.2 Phase 2: Cascading the blogs into classroom practice

Findings from the data indicated that while the respondents continued to reflect on their developing professional practice only one ex-trainee from each university was using a blogging tool for this purpose at the time the research was conducted. The remainder had changed to annotating their lesson plans, word processing, or handwriting their reflections.

Forty-nine per cent of ex-trainees from each cohort had utilised blogs within their classrooms; in each case this was a different ex-trainee to those using the blogs for reflection. Sixty seven per cent of the respondents were intending to develop the use of blogs within their classroom practice in the next twelve months. In addition fifty per cent of the respondents indicated that they had either trained colleagues in how to use blogs, or had been asked to run a training session within their school.

When asked why the blogs in their classrooms a variety of barriers were identified: pupils lacked the skills for this technology; there was insufficient time in the curriculum to teach them the necessary skills; the school’s virtual learning environment did not support a blog tool; there was a lack of support to introduce new technologies; there were problems accessing blogging sites due to their school internet firewalls; the school policy relating to e-safety did not support the use of blogs.

Comments from respondents included:

‘We have discussed briefly about using blogs in the classroom but because of firewall settings it will not be easy including it in our planning as this might not work’.
Another respondent commented that

‘[...]no plans to use it with the pupils as the VLE [virtual learning environment] doesn’t allow ‘communications’ such as blogging due to bullying, and most staff don’t use it’ (the VLE)

Another reported

‘We have only just got a VLE and there is a blog on it but I don’t use it’.

Respondents also commented on the lack of support with thirty per cent commenting on the level of support in using blogs during their teacher training year (phase one), but did not have the same level of support now they were qualified (phase two). These respondents stated that they were too inexperienced and new to their respective schools to start up a group with other interested colleagues where they could have established a mutual support group.

‘...there was no cascading or training on blogs with colleagues.’

There were some positive responses. For example, one of the teachers who was using blogs in teaching was particularly positive, and had been identified as the digital champion for the school. He was using blogs for his Key Stage four and five classes (age fourteen to eighteen) and had built this into formative assessment thus encouraging his pupils to develop their use of blogs. He reported that he was teaching them to reflect on project development through their blogs. This teacher had also used blogs with some Key Stage three (age twelve to thirteen) children and commented that the blogs were engaging the children:

‘...the kids love it, it’s sexing up the curriculum’

5. Analysis and discussion

The analysis suggests that there were several factors which influenced the teachers in cascading their use of blogs into their teaching once they had completed their PGCE, some of which reflects the research of others as discussed below.

5.1 Barriers to cascading the use of blogs into teaching

Research by Stuart et al (2009) reports that the ICT competence of school leaders may determine whether or not ICT is championed in a school (Stuart et al. 2009). This aligns to comments by forty five per cent of the respondents in phase two of this research, which included a perceived lack of support and vision by managers of the schools they were working in which is discussed further in 5.3 below. The data analysis indicated that a more positive culture to the use of innovative technologies would help new teachers to cascade this into their teaching.

Bingimlas (2009) draws on existing literature including Grabe and Grabe (2007) to identify barriers to the integration of ICT in education, (Bingimlas 2009; Grabe & Grabe 2007). From the literature he identifies barriers at teacher level as a lack of teacher confidence, resistance to change and negative attitudes; and barriers at school level as lack of time, lack of accessibility and lack of effective training and lack of technical support. Not all of Bingimlas’ identified barriers at teacher level would be fully relevant to the respondents in this research as they all experienced the use of blogs as part of their PGCE course both in University and while on school placement. However, there were comments from the respondents relating to perceived negative attitudes in school being a barrier to cascading. Lack of time and accessibility to blog software were identified in this research and thus correlate with Bingimlas; lack of training and technical support were not reported. This may be because the respondents in this research were trainee ICT teachers who were familiar with the technology prior to entering teaching.

Hodgkinson-Williams et al reported that the ‘community’ aspect of teachers (both virtual and physical) might affect the take up of ICT in schools (Hodgkinson-Williams et al. 2008). Findings in this research indicate that the student teachers supported each other through communities of practice while at University. However, the data indicated that once they became full-time teachers they did not continue with existing communities and lacked confidence to build a new community of practice in the schools where they were employed:

‘If there was a group of us in school pushing to use the blogs and supporting each other it might take off’.
This may be an area for further research because it raises questions of why the NQTs only looked to those within their own school for support when new technologies provide opportunities of setting up or joining existing communities of practice across the world.

Other studies have shown that a more organic approach to ICT teacher training is required to support the evolution of a teacher’s classroom. This type of approach supports a more ecological view of the diffusion of ICT innovations in education (Davis et al. 2008). A more organic type of training was arguably experienced by the participants of this study, in that they learnt in a gradual way over time for the duration of their course from mentors, tutors, and from each other. This organic approach, however, does not seem to have had the positive effect that Davies et al’s (2008) study would imply. It may be that the ‘ecological climate’ of schools, once the respondents were teaching in them as qualified teachers, was a much harsher climate, with less facilities and time, thus denying them the opportunities to reflect and engage with new technologies in the same way they did when they were trainee teachers.

In a recent study by Sorebo et al (2009) self determination theory was used to try to predict whether or not teachers would continue with e-learning in their own practice. The results showed that basic psychological needs and intrinsic motivation were useful indicators (Sorebo et al. 2009). This reflects findings in this research; respondents all indicated that they were motivated to use web blogs and other new technologies in their teaching. Motivation would therefore be included in the enablers.

In a study by Kilbourn and Alvarez, (2008) trainee teachers found it difficult to integrate information technology critically into their classrooms (Kilbourne & Alvarez 2008). This is something that has arguably, in part, been borne out by this study. This is also reflected by Mukama & Andersson’s study, which indicated that teachers needed time to become able to use ICT critically in their practice (Mukama & Andersson 2007). In the research reported in this paper the respondents stated that they had the time and support to be critical when introducing innovations while trainee teachers, but lacked this time once they became qualified teachers.

Granberg’s study (2009) stressed the need for an attitude of preparedness for change with an emphasis on the learning process. This was borne out by the data in the study reported here which found that the participants could not overcome the barriers of time for introducing new technologies.

The respondents also reported that access to blogging software was a barrier to cascading this use into their professional role. This had not been reported during their PGCE course. Hammond et al (2009), Ofsted (2009), Pelgrum and Doornekamp (2009) and Gaffney (2010) discuss access as a potential barrier in terms of access to technology. Data from this research indicated access to blog software was a barrier to some. Access was reported as being blocked by internet firewalls set up internally by rigorous systems required by school managers, externally by local authority broadband consortiums and by restrictions to the school virtual learning platform by managers keen only to use the school virtual learning platform which did not have a blog tool.

5.2 Enablers to cascading the use of blogs into teaching

The British Educational and Communications Technology Agency, Becta, (2003) identify five enablers as being necessary to provide good learning opportunities in secondary schools: ICT resources, school leadership, ICT leadership, general teaching, and ICT teaching (British Educational and Communications Technology Agency 2003). However, Becta makes the point that these enablers are ‘not sufficient in themselves to provide good ICT learning opportunities’. A report produced by the UK’s Office for Standards in Education (Ofsted) based on evidence of school inspections in England from 2005-2008 on the importance of ICT in primary and secondary schools (2009) also comment on the importance of the vision of school leaders for the place of ICT in learning, infrastructure, resources and staff training, thus suggesting that these are significant in enabling the good learning opportunities in schools (Office for Standards in Educaiton 2009).

The data in the research reported in this paper identified that the main enabler to the cascading of blogs into classroom practice was the experience of the respondents from their PGCE experiences. All the respondents reported confidence in using blogs and all were able to cite examples of using blogs in their teaching during their PGCE. All respondents were also able to explain the pedagogy of using blogs in their teaching, were able to engage critically in discussing the use of blogs in their classrooms, and understood the importance of the
appropriateness and relevance of choosing to use blogging to engage their pupils and enhance the delivery of the curriculum. However, for the majority this confidence and experience gained in university had not yet been harnessed in their NQT year.

Those who had support from colleagues in their school reported that they had utilised blogs and were encouraged by the engagement of their pupils in developing this usage and also in introducing other Web 2.0 technologies. One respondent stated:

'I used a blog tool for the [GCSE] group to record the development of their project. The group enjoyed this so much that I am going to introduce a Wiki to develop group project work'.

Time was both an inhibitor and an enabler. Examples cited were that while they were trainee teachers, time was an enabler, that is they had sufficient time to use the blogs and identify where in the curriculum blogs could be used to engage pupils and enhance their learning. Once they had qualified and become NQTs, however, the lack of time meant that time became an inhibitor. One respondent commented:

‘In a 50-60 hour week, sometimes 80 hours, it was the last thing [I] considered doing’.

6. Conclusion

In the literature review the authors referred to Hammond et al’s (2009) findings that the knowledge of how and when to use technology in the classroom, together with an understanding of the pedagogy, provided teacher trainees with an inclination to use ICT, or a propensity to see its value in the classroom (Hammond et al. 2009). While the teacher trainees in the study reported in this paper were confident in the use of blogs in the classroom, they knew where the technology could be used to enhance the secondary curriculum, and had a good understanding of the pedagogy, there were additional inhibitors once they were in schools without the support and encouragement of their university tutors, mentors and peers.

Reference is also made earlier to a study by Mukama and Andersson, (2007) which indicated the need to provide teachers with appropriate pedagogy and time to develop criticality with respect to the new ICT based tools. In the research reported in this paper the teachers had been provided with appropriate pedagogy and had been encouraged to develop criticality, but other issues such as time, access and support became greater inhibitors in the school environment. There is also resonance with Van Schie (1997) that ‘the dissemination of knowledge and experience of the use of ICT however amongst all stakeholder in the educational system is relatively slow’ (Van Schie 1997).

While the media suggests a proliferation of new technologies are being used in secondary schools, this research and that of others cited in this paper would suggest a different picture. This research indicates that it is important that teacher trainees are introduced to using new technologies underpinned by an understanding of pedagogy. Blogs are a way forward for this, providing, as they do, a useful tool to support reflection, share experiences and increase interaction amongst participants. The research also indicates that school managers should be encouraged to embrace the enthusiasm and skills of NQTs who often have high level skills, motivation, confidence, criticality, knowledge and understanding of when and how to use new technologies in the classroom. These recommendations reflect Gaffney’s findings; the ‘need to ensure the use of [technological] tools is pedagogically sound and strategically planned’(Gaffney 2010).

The school culture also needs to be open to embedding new technologies within the curriculum. Senior managers may want to encourage newly qualified teachers to offer workshops and support to cascade new technologies and the associated pedagogy into their school curriculum. This again is reflected in Gaffney’s report (2010, 12) ‘whole-school valuing of digital technologies and associated curriculum resources, especially by the school executive, makes a difference’ and also correlates with Becta and Ofsted findings set out in the previous section. Higher education institutions may want to encourage teacher training students to join existing support networks, or set up their own, to provide support for using technologies innovatively once qualified. An example of this would be the Vital site, funded by the Department for Education, which provides a global community for teachers, and trainee teachers, to share and collaborate in the use of new technologies (www.vital.ac.uk).

As more schools embrace new technologies this research should provide answers to potential barriers and inhibitors. A more organic approach to using technology with and for teacher development may be more
successful for NQTs. This research indicates that early professional development should be ongoing and assumptions about new teachers as champions of the technology with which they are familiar may be over optimistic. Also, if we are to draw on Web 2.0 technologies such as blogs to enhance the secondary curriculum and engage learners, (in the ways described above) we must encourage school managers to consider how to reduce the barriers to using the technology, provide greater opportunities for the use of sharing of experiences of using new technologies by teachers, provide the time for teachers to develop these new technologies within their classrooms and encourage teachers to work more collaboratively.

References

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An Intelligent Personalized e-Assessment Tool Developed and Implemented for a Greek Lyric Poetry Undergraduate Course

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Abstract: The scope of this paper is to present the development of a web-based evaluation system that adjusts to the level of knowledge of each student. The underlying concept is to split the questions into pools (bins) of distinct difficulty at the same time assigning a different level of accuracy to each possible answer that the student may select. Given the weighted success score computed at each round, the system raises or lowers the level of the questions asked in the following round, thus adjusting the difficulty of the test according to the students' performance. Once the score of the student improves or declines, the system again adjusts the difficulty of the questions accordingly until convergence is achieved and the students' performance becomes stable. It is believed that the proposed evaluation system predicts the level of knowledge of the students in more correct ways compared with the traditional (non-adaptive) questionnaires, while giving the students the motivation to rerun the test until they become familiar with the course content. To illustrate the evaluation methodology proposed, an online system was developed and implemented for the evaluation of sixty-eight undergraduates attending a Greek Lyric Poetry course at the Department of Classics in Aristotle University of Thessaloniki, Greece. The results of the evaluation process, with the observations made, both about the operation of the system in real conditions and the performance of the students, are also discussed in the paper.

Keywords: e-learning; online assessment; adaptive assessment; learning management systems; web-based systems; ancient Greek literature; Greek lyric poetry

1. Introduction

The establishment of e-learning both as an academic educational discipline and as a learning medium through the vast expansion of the World Wide Web during the last three decades (Kahiigi et al., 2008) calls for the implementation of Learning Management Systems (LMS) as one of the prominent characteristics of developing e-tools in higher education worldwide (Duffy & Kirkley, 2004; Oncu & Cakir, 2011). Through the constant flow, the invention and storage of information on the web, e-learning tested the boundaries of time and space as strictly defined by the conservative mode of education (Graff, 2003; Collins & Halversont, 2010). Nowadays, e-learning tools have become more sophisticated (Oncu & Cakir, 2011).

1.1 Key features of advanced sophistication in effective e-learning

Adaptiveness is a key-notion to the effective sophistication of e-learning (Wang, 2010; Yalcinalp & Gulbahar, 2010), because the latter is inherently linked to the learners' prior knowledge (Mitchell et al., 2005; Smits et al., 2008). An LMS is called "adaptive", when, firstly, it includes a pre-planned reconstruction of the space in which the student operates (or should move); secondly, it directs the student toward the solution of a problem through rational decision making; thirdly, it provides personalized and ideal help at the right moment; fourthly and lastly, it repeats key-points of the course, when LMS "senses" that its user has deviated from its routine.

In general, there are two categories of adaptive, personalized, “smart” processes of learning incorporated into the modern composite distance learning environments. The first one is adaptive presentation: this smart application can adapt the content of hypermedia pages to the learner’s objectives, knowledge and general profile. Therefore, these pages are not static but created or composed on a personal level. In this way, the well-read students receive more detailed and in-depth information, as opposed to the more unprepared to whom only explanations are mainly provided.

The second one is adaptive navigation, which supports the learner, while the learner navigates in a dynamically configured Internet environment (for example, through modulation of visible hyperlinks). The ways to customize the links have been studied and analyzed in the international secondary literature. Examples of this technology exist today in a number of sites (for example, www.cnn.com), which provide a personalized content (Kaplan et al., 1998).
It is noted that according to some researchers these two aforementioned categories, namely, adaptive presentation of teaching materials and adaptive navigation, form the category of Adaptive Educational Hypermedia (Triantafillou et al., 2003; Mampadi et al., 2011). According to this distinction, through Adaptive Educational Hypermedia the user has sufficient freedom of choice during the user's web-navigation (Triantafillou et al., 2003; Mampadi et al., 2011), as opposed to Intelligent Tutoring Systems through which the system checks largely what is presented to the user.

1.2 Assessment and the effective use of online questionnaires

In this framework of constant e-evolution, assessment as an intrinsic corollary of the learning process has also been reinvented, either as its definitive conclusion (summative assessment), or as a helpful medium for weighing the “mental load” (formative assessment) provided to the students through the learning process (Graff, 2003; Hwang & Chang, 2011). Its role in the learning process is still highly valued (OECD 2010 PISA Executive Summary: Results), because its double purpose is to provide feedback not only to guide the learner throughout the learning process (Oncu & Cakir, 2011), but also to help the instructor reform the guidance offered to the students and the teaching activities (Wang, 2011). It is exactly this feedback that accounts for the positive effects of an assessment on learning (Wang, 2011) and, because of these effects, the idea of “assessment as teaching and learning strategy” has been proposed (Wang, 2010).

Today, the link of LMS with assessment remains a requirement (Oncu & Cakir, 2011), although the importance of CBE (Computer Based Assessment) has been documented (Terzis & Economides, 2011). So far, only Hyde et al., 2004 have comprehensively surveyed the role of assessment in LMS with exclusive emphasis on Vocational Education and Training (VET) programs. As already stressed, a similar survey on the role of assessment in LMS with exclusive emphasis on Academic Education (AE) is long overdue, although there is an explicitly expressed interest on this subject (Govindasamy, 2002; Byrnes & Ellis, 2006; Bang, 2006; Selwyn, 2007; Jones & Healing, 2010).

The use of online questionnaires for collecting data and providing feedback has been popularized by the increasing use of the Internet and the proliferation of Online Learning Environments (Ortigosa et al., 2010; Oncu & Cakir, 2011). Especially, in the case of Adaptive Hypermedia Systems (AHS), online questionnaires provide feedback and information about the user, and are stored and maintained to establish the user model (Kobsa, 2001). Adaptiveness as a key feature of AHS depends on this user model. Moreover, one of the students’ features, usually detected through online questionnaires and often used for adaptiveness purposes, is their learning style (Ortigosa et al., 2010). In addition, the increasing number of students, enrolled in tertiary education (Costa et al. 2010), calls for alternates to on-campus teaching (Krause et al., 2005; Greyling et al., 2008). These alternates are provided using web-based delivery of course content and assessment (Anderson et al., 2002).

The proposed AH-questionnaire bears two major instructional characteristics of dynamic assessment. Firstly, it provides people with an opportunity to learn (Bransford et al., 1987; Graff, 2003; Wang, 2010). Secondly, both instruction and feedback could be built into the testing process (Elliott, 2003).

In this framework, it is possible to use the specific questionnaire in either the synchronous and asynchronous learning context, if adjusted appropriately (Offir et al., 2008). A major advantage of the proposed AH-questionnaire is that both formats of dynamic assessment can be used (Sternberg & Grigorenko, 2001), enabling its use for self-assessment and self-improvement, especially in e-learning contexts.

Despite the above advantages in the use of online questionnaires, major difficulties are often present as in all problems solved by automated processes. These problems are usually associated with traditional assessment methods (either electronic or manual) that ask a specific, predefined set of questions, uniformly to all students while disregarding issues raised by the following disclaimers: some questions are answered at random and their potential accurate guess cannot be trapped during evaluation; the inherent rigid nature of the non-adaptive questionnaires does not promote the use of the assessment as part of the overall learning process; even if the answers to the questions posed are indeed provided, this is often made after the examination, therefore, having limited impact to the learning outcome; it is rare that a student goes through the same questionnaire more than once, without being compelled to; students often act in an unpredictable way (Graff, 2003), not only with their answers but also in actions (for example, logging out of the system without a reason,
unexpected selection of non-relevant navigation buttons, abrupt termination of the evaluation and such like); any questionnaire, however detailed, is inherently a different process compared with a personalized one-to-one oral examination. It is typical, during an oral assessment where the student provides inconsistent answers, for the tutor to ask a larger number of questions of various difficulties, until the tutor comes to a conclusion on the student’s actual level of knowledge.

In this context, the purposes of this research is, firstly, to develop a methodology for adaptive e-assessment and e-learning system that can quickly evaluate the current level of students’ knowledge and automatically build a student-dependent scenario by adjusting the difficulty of the questions; secondly, to implement this methodology into an online system that can integrate the e-assessment and e-learning process; thirdly, to ensure that the developed system can operate in academic conditions and keep track of the history of student’s behavior so it can automatically compute the best successful rate out of all student efforts; fourthly, to apply the tool in an actual class, with emphasis on a course of Ancient Greek Literature where, to the best of the authors’ knowledge, it has never been used, with the only exception of Camastra et al., 2005, focusing exclusively on Latin literature; fifthly, to study the relevance of the system in an academic environment and at the same time the behavior of the students while using the adaptive tool; and lastly, to investigate the contribution of the tool in the improvement of the students’ performance.

It is foreseen that the methodology and system developed simultaneously act as both as e-assessment and e-learning tool. There follows a discussion of the structure of the system and its application in class.

2. Methodology

2.1 The concept and principles of the proposed adaptive system

As already mentioned, the purpose of this study is to propose the development and the use of an up-to-date learning management tool to enable the intelligent adaptation of e-learning teaching and assessment depending on the level of knowledge and behavior of its end-user. This entails that the help and knowledge, which the end-user acquires through the system is tailored to the knowledge level that the user has acquired at the time of the user’s participation in the electronic environment. This goal is pursued through an electronic assessment of adaptive difficulty, decided during run-time based on the system, by, firstly, distinguishing the questions according to their varying difficulty and allocating them in various pools, and, secondly, assigning an “accuracy” index to each possible answer provided to the end-user (in other words, the student’s response is not treated on a “right / wrong” basis, but also on the additional “how right or how wrong the reply was” information, both defined *a priori* by the instructor.

Based on the student’s (user’s) answers, the algorithm computes a temporary (namely, partial) score and draws the following questions from a specific pool (bin) of the corresponding difficulty. In each way, each test is eventually a different experience of a different evaluation scenario. The process finishes when the student, while shifting from one knowledge (difficulty) level to the other, exhausts all twenty-five questions corresponding to the relevant level.

Based on this weighted structure between questions and students’ responses, the system computes the weighted score and defines the difficulty of the questions of the next evaluation round. In this way, each student has a unique and different experience every time the student runs the evaluation test, ensuring a different path and, thus, a different “learning scenario”. Through the student’s continuous effort to achieve higher scores and discover different evaluation paths, the e-evaluation environment is turned into a complementary e-learning scheme.

In terms of the overall concept, the above process is a form of adaptive evaluation, the natural continuation of different levels of intelligence (curriculum sequence, problem solving, adaptive presentation and adaptive navigation).

2.2 System structure

When looking at the system architecture, the e-evaluation system structure can be broken into various steps as follows:
2.2.1 Step 1: The classification of questions into categories based on their difficulty

The instructor has to create a large pool of various questions, each corresponding to several levels of difficulty, the latter defined in the scale 0 to 100 (with 100 as the most difficult question). It is necessary to group the questions into sub-pools of similar difficulty, each (pool) having the same number of eligible questions. For the demonstration and the implementation presented here, one-hundred and twenty-five questions are used, divided into five categories (sub-pools) of differentiated difficulty. The coefficient of difficulty of questions in each category is given in Table 1:

Table 1: Question difficult levels and corresponding difficulty coefficient

<table>
<thead>
<tr>
<th>Difficulty Level</th>
<th>Difficulty level coefficient (in the scale 0 to 100%)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0% to 20%</td>
<td>Trivial</td>
</tr>
<tr>
<td>2</td>
<td>20% to 40%</td>
<td>Quite simple</td>
</tr>
<tr>
<td>3</td>
<td>40% to 60%</td>
<td>Medium difficulty</td>
</tr>
<tr>
<td>4</td>
<td>60% to 80%</td>
<td>Quite demanding</td>
</tr>
</tbody>
</table>

2.2.2 Step 2: Classification of possible answers based on their level of accuracy

Each question can be answered using multiple choices, which in the present demonstration is decided as equal to 5. It is the instructor’s responsibility to assign a weighted score to each answer based on the students’ different success rate, which can be equal to 100%, 75%, 50%, 25% or 0% respectively (100% corresponding to a correct answer).

2.2.3 Step 3: Evaluation initialization (1st round)

Once the user (student) starts the evaluation test, the user has to answer the first bulk of five questions, each drawn from a different category of difficulty. Depending on the question’s difficulty level (where i=1 to 5 different level of question difficulty), and the user’s response success rate (where j=1 to 5 different answer “correctness”), a preliminary (first round) partial evaluation score PSk=1 (k corresponding to evaluation round 1), is computed using a simple weighted average formula:

$$PS_1 = \frac{\sum_{i=1}^{5} a_i \beta_i}{\sum_{i=1}^{5} a_i} = \frac{a_1 \beta_1 + a_2 \beta_2 + a_3 \beta_3 + a_4 \beta_4 + a_5 \beta_5}{a_1 + a_2 + a_3 + a_4 + a_5}$$

A typical example of this first round partial score, where the students answers correctly (100%) only the simplest question a₁ (with difficulty 15%), while also answers a question of difficulty level 2 (with a₂=37%) partially correct (at a success rate 75%), a question of moderate difficulty (with a₃=56%) with moderate success (50%), a demanding question (a₄=73%) in a wrong way (success rate 25%) and completely fails to answer the most difficult question a₅=92%) is given below:

$$PS_1 = \frac{\sum_{i=1}^{5} a_i \beta_i}{\sum_{i=1}^{5} a_i} = \frac{15 \times 100 + 37 \times 75 + 56 \times 50 + 73 \times 25 + 92 \times 0}{15 + 37 + 56 + 73 + 92} = 32.60\%$$

2.2.4 Step 4: Decision on the difficulty level of each following round of questions

At this stage the system classifies the user in a preliminary way, and, thus, makes a first assessment of the level of questions that correspond to the user’s knowledge level (as defined in Table 1). For instance, in the example presented above, a first partial score of 32.6% would lead the system to draw five new questions, all from the pool of difficulty 2. In case the user achieves a good score, the system poses the difficult questions, which offer better difficulty rates so as the user keep the score high. On the contrary, in the event the user achieves a moderate or average score, the system adapts to a corresponding difficulty level and offers the user a new set of questions that better match the level of knowledge so the user can achieve a better score. If the user’s
(student’s) score drops further, the system offers even easier questions so the user can recover and improve his total score, then more difficult questions are gradually posed.

In every evaluation round, the partial evaluation score $PS_k$ (k corresponding to the round number), can be derived as follows:

$$PS_k = \frac{\sum_{i=1}^{5} a_i \beta_i}{\sum_{i=1}^{5} a_i}$$

In other words, at the end of each round $k$, the partial evaluation score $PS_k$ is derived as the ratio of the sum of the products of the difficulty weight (coefficient) by its corresponding success rate $\alpha \beta$, of all questions posed to the student (whose number is equal to the number of rounds $k$ multiplied by five [5] questions per round) divided by the sum of the individual difficulty weights $\alpha$ of each question.

### 2.2.5 Step 5: Next rounds and evaluation termination

Every time a question is asked it is marked as used and cannot be posed twice in the future (namely, in the same test session). The adaptation of the question’s difficulty based on the partial score of the user is continued until the questions of a specific difficulty level are exhausted and the system finally returns the final overall score. Clearly, the minimum number of rounds that a student has to complete is five, and the minimum number of questions is $5 \times 5 = 25$. But this situation corresponds to the rare case where the student’s score constantly corresponds to a single difficulty level (from those defined in Table 1). For instance, the student starts with 32.6% but keeps in the range 20% to 40% (difficulty level 2) for five successive rounds.

However, in the typical case that the student’s performance is not consistent, namely, the student starts with a good score, not kept high, or the student scores low in the first rounds, but significantly improves in the following, the user gradually changes difficulty levels and, hence, the system is compelled to offer additional sets of questions until the user’s score stabilizes and the student’s evaluation can be deemed reliable. More details on the proposed concept are available elsewhere (Xanthou, 2006).

### 3. Architecture of the web-based system

#### 3.1 Adaptation of the system for an actual Greek Lyric Poetry undergraduate course

Apart from introducing the above concept for e-evaluation and e-learning, and presenting the fundamental ideas behind it, it was deemed necessary to develop an online system so the merits and drawbacks of the algorithm could be better identified. Furthermore, it was aimed to use this system for a student evaluation at university level. The following section presents the implementation of the above algorithm through the analytical pool of one-hundred and twenty-five questions devised to support the teaching of a compulsory undergraduate course on Greek lyric poetry [GLP (=Greek Lyric Poetry), course ID=105], offered in the curriculum of Classics at the School of Philology of Aristotle University of Thessaloniki, in Greece. More specifically, the content of the course included a description of the life of the Greek lyric poet Pindar and a critical analysis of his literary works. Moreover, the course content was articulated in modules that were provided in two forms: (a) as seventy five RLOs (Reusable Learning Objects) and (b) as lectures delivered in an amphitheatre with students keeping notes and references made by the instructor to both primary sources (ancient Greek texts) and secondary bibliography (monographs and articles) for further reading. In addition, during lectures the instructor discussed important issues of critical analysis of Pindaric texts. As a result, the subsequent questions of the e-assessment tool focused on the mental load of information provided through RLOs and viva voce teaching. Based on the previously mentioned provision, the one-hundred and twenty-five questions have multiple answers (each characterized by a different success rate), and each question has its own difficulty level. It is noted that a similar pool of questions with suitable modifications can be used as a model for teaching the work of other Greek poets, both ancient (e.g., Aeschylus, Sophocles, Euripides) and modern (e.g. Solomos, Palamas, Sikelianos).
3.2 PHP module development and system substructuring

The implementation of the specific system was based on the use of the PHP: Hypertext Preprocessor (PHP) programming language, particularly efficient for developing web applications with dynamic content that enable user interaction. A PHP page is processed by a compatible web server (typically an Apache server with a My Structured Query Language [MySQL] database), to produce, in real-time, the final content sent to the users’ browser as HyperText Markup Language (HTML) code. It is noted that the specific programming language was used not only because of being popular (today more than 16.000.000 web sites, at a rate of more than 35% of web pages, are using scripts written in PHP language), but primarily because PHP is essentially an open and free web development environment. A sample view of the developed MySQL content is shown in Figure 1:

<table>
<thead>
<tr>
<th>Question ID</th>
<th>Question Text</th>
<th>Question Weight</th>
<th>Answer 1</th>
<th>Answer 2</th>
<th>Answer 3</th>
<th>Answer 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>How many are the cultural sources of lyric poetry?</td>
<td>30</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>What is the time span designated as “archaic age”?</td>
<td>10</td>
<td>Eight century B.C.E. – middle fifth century B.C.E.</td>
<td>The end of the Dark Ages and the beginning of the classical era</td>
<td>The period which precedes classical era</td>
<td>The period between 1200 and 800 B.C.E.</td>
</tr>
<tr>
<td>3</td>
<td>What is the preponderant political formation of archaic age in Greece?</td>
<td>10</td>
<td>A unit of state organization smaller than the city</td>
<td>The city along with the rural space</td>
<td>The kingdom-state</td>
<td>The city-state</td>
</tr>
<tr>
<td>4</td>
<td>Where was the oldest political formation of city-state founded?</td>
<td>30</td>
<td>In Continental Greece</td>
<td>In Attica</td>
<td>In Athens</td>
<td>In Peloponnese</td>
</tr>
</tbody>
</table>

Figure 1: Sample view of the MySQL content (in Greek, up), English index (bottom)
While the complete structure of the system is illustrated in Figure 2:

Figure 2: Overview of the evaluation scheme developed

It is noted that the database consists of three relational tables, namely: firstly, sessions (i.e., a complete test comprising of a number of rounds independently taken by a student), storing data related to each test (session): time and date of the test, name of student, student identification, student e-mail, final score achieved; secondly, questions, storing data related to questions: question identification, question text, answers identification, question weight, individual answers success rate; thirdly, scores, storing data related to the history of partial scores in each test (session): partial scores and corresponding round identification, final session score.

Primary keys (such as session identifications) are used to make sure that each test will be treated and stored as an individual identity. All three database tables can be easily exported as spreadsheets for further post-processing. The outcome of the online test (questionnaire) in real-time is shown in Figure 3.

4. Implementation in class

4.1 Preparation of the evaluation process and the results management

Having established the concept of the adaptive e-evaluation and developed the web-based system for the case of the Greek lyric poetry course, it was decided to implement the system under real conditions, that is, for the actual evaluation of the students in class. For this purpose, all students were invited on a specific date and time to the Joint Computer Laboratory (Room 104) of the School of Philosophy at Aristotle University of Thessaloniki and were split into five groups. They were all notified beforehand that participation in the process is optional and their final scores will be used anonymously to extract results on their interaction with the e-tool. Upon their acceptance to enter the process they signed their name and identification number in a list. Responsible for organizing and implementing the evaluation process was the author (who developed the methodology and the software and is also familiar with the specific academic field (Xanthou, 2007; Xanthou, 2010) in the framework of her postdoctoral research funded by the Hellenic State Scholarships Foundation and supervised by Professor John N. Kazazis, the scientific and academic teacher responsible for the course. First, the students were given the web address (http://155.207.34.75/questions.php) to access the system online. Then, the students could finish the test in their own time at their own will or to repeat it as many times as they preferred. The motivation here was to improve their score, but, above all, to become familiar with the context of the course by exploring various paths and evaluation scenarios. All results were stored in real-time on the web server. After the test, the records related to the students’ performance were exported into Excel files and processed separately in the form discussed below. Moreover, the students were encouraged to repeat the test at home, using their own computers and accessing the system with their own user name, password and
identification number. In addition, they were also encouraged to answer the questions posed by the adaptive system simultaneously using the reading material for the specific undergraduate course.

Question Number: 107, Question difficulty (%): 30, Question number: 2, Question successfully answered (%): 75
Question Number: 110, Question difficulty (%): 30, Question number: 3, Question successfully answered (%): 75
Question Number: 121, Question difficulty (%): 30, Question number: 2, Question successfully answered (%): 75
Question Number: 36, Question difficulty (%): 30, Question number: 1, Question successfully answered (%): 25
Question Number: 113, Question difficulty (%): 30, Question number: 2, Question successfully answered (%): 75

Overall percentage of success: 40.67%

As a result of your answers given so far and your overall percentage of success the following sequence of five questions with difficulty degree 41-60 is posed

Question [24]: Based on how lyric poetry is performed, i.e. by a solo performer or a chorus, what are genres of lyric poetry?
  - Aeolic and choral
  - Monodic and a chorus
  - Monodic and lyric
  - Monodic and choral

Question [48]: In which literary sources do we find the earliest attested information on monody and choral songs?
  - In epic poets, in general
  - In Hesiod
  - In Homer
  - In Homeric epic poetry

Question [50]: What testimony is there in the Odyssey regarding the monodic song?
  - Homer describes Calypso singing, while leaning over her shuttle.
  - Homer describes gods and men singing in various social occasions, e.g. when they work, they mourn a dead person etc.
  - Homer describes in Achilles’ shield a young man singing the linos, a traditional song for the death of the god of vegetation.
  - Homer describes Hephaisos singing while manufacturing Achilles’ shield.

Figure 3: System run-time (in Greek, up), English index (bottom)

4.2 Implementation results and observations

4.2.1 Sample size and scores achieved

The first statistics that the instructor had to compute and evaluate were related to the scores achieved by the students as a whole (independent of how many times each student took the test). As seen in Figure 4, the distribution of the final score is reasonable, in the sense that from a qualitative point of view, it resembles a normal distribution around a mean value equal to 59.5%. This observation implies that the test was neither too easy nor too difficult, a fact that is paramount given the inherent adaptive nature of the algorithm used. It is also noted that the number of tests (one-hundred and one) was 60% higher than the number of students that
took the test (sixty-eight), and clearly, almost half the students repeated the test to improve their score. It is also noted that in thirteen cases, the students restarted the test at their own will, because their score in the first round was equal to zero. Therefore, it can be considered that the overall sample size was equal to one hundred and fourteen tests.

**Figure 4**: Distribution of final (total) scores achieved by the students during the examination in class (sample size: one-hundred and one sessions completed by sixty-eight students)

**4.2.2 Rounds needed until a final score was assigned**

As already described above in Section 4, the number of rounds required until the system can assign a final score to the student is not fixed. On the contrary, it depends on the consistency of the students’ response. In other words, if the student’s performance abruptly drops or improves from one round to another, the system imposes additional questions until the performance of the student stabilizes.

**Figure 5**: Overview of the complete cloud, i.e. trend, of partial scores achieved in the same session against the number of rounds needed until the system converged and assigned a final score

This adaptive behavior of the online evaluation system is clearly illustrated in Figure 5, where the cloud of all sessions recorded is shown as the partial score history against the round number. It is also observed that in general, most students’ performance history tends to converge after five to eight rounds around the mean value of 59.5% described earlier.
Figure 6: Overview of the distribution of the number of rounds needed for the student to be assigned a final score by the evaluation system (final score assigned once any bin of questions of a given difficulty is exhausted). It is noted that the scores achieved in only 1-4 rounds are temporary and correspond to cases where the students quit the test due to poor initial performance.

This is further illustrated in Figure 6 where the distribution of the number of rounds needed for the student to be assigned a final score is plotted.

4.2.3 Discussion of the results

Since Figure 5 presents only a broad overview of the system performance and no detailed observations can be made to the many data plotted in the same chart, it is deemed preferable to present below few characteristic cases of partial scoring history. In particular, the progress of the partial score development in five characteristic sessions (tests) is plotted in Figure 7:

Figure 7: Characteristic sessions stored during the implementation of the system in class. Partial scores progress with round identification until final score is assigned.

Clearly, sessions 78 and 4 finish at the fifth round, because the students that took the specific tests were consistent in their performance (namely, the student in session 78 never dropped below 80% and remained in difficulty level 5 during the whole test, while on the other hand, the student in session 4 could never make it higher than difficulty level 1 because the score remained below 20% in all rounds). Session 75 and 9 required a larger number of rounds until the final score was assigned, because during the tests the student’s partial score...
shifted between two and three difficulty levels respectively. As for session 73, the most interesting of all, it took the system thirteen rounds until it could assign a final score, because the student started by scoring low (4%), then significantly improved the student’s performance by rising to just higher than 60% on the seventh round. From this stage onward, the student could not score higher and kept relatively close to the boundary between difficulty level 3 and 4. The system offered the student the opportunity to score higher, but this was not made feasible, given the level of knowledge, finally assessed at 63%, as shown in Table 2.

Table 2: Example of score build up for the case of session 73 (as it relates to Figure 7)

<table>
<thead>
<tr>
<th>Round Identification</th>
<th>Partial Score</th>
<th>Bin used for questions times bin was used</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-</td>
<td>All Bins (one question each)</td>
</tr>
<tr>
<td>1</td>
<td>4.00%</td>
<td>Bin 1 (0% to 20%)</td>
</tr>
<tr>
<td>2</td>
<td>14.00%</td>
<td>Bin 1 (0% to 20%)</td>
</tr>
<tr>
<td>3</td>
<td>20.57%</td>
<td>Bin 2 (20% to 40%)</td>
</tr>
<tr>
<td>4</td>
<td>44.40%</td>
<td>Bin 3 (40% to 60%)</td>
</tr>
<tr>
<td>5</td>
<td>49.60%</td>
<td>Bin 3 (40% to 60%)</td>
</tr>
<tr>
<td>6</td>
<td>54.70%</td>
<td>Bin 3 (40% to 60%)</td>
</tr>
<tr>
<td>7</td>
<td>59.76%</td>
<td>Bin 3 (40% to 60%)</td>
</tr>
<tr>
<td>8</td>
<td>60.63%</td>
<td>Bin 4 (60% to 80%)</td>
</tr>
<tr>
<td>9</td>
<td>60.51%</td>
<td>Bin 4 (60% to 80%)</td>
</tr>
<tr>
<td>10</td>
<td>61.05%</td>
<td>Bin 4 (60% to 80%)</td>
</tr>
<tr>
<td>11</td>
<td>60.90%</td>
<td>Bin 4 (60% to 80%)</td>
</tr>
<tr>
<td>12</td>
<td>61.28%</td>
<td>Bin 4 (60% to 80%)</td>
</tr>
</tbody>
</table>

It is believed that the system interacts with the student. This means that its gradual adaptation to the student’s performance provides an insight that would not be available using conventional questionnaires, which given the student’s response during the first five rounds (namely, twenty-five questions), would have provided a significantly lower score (25%).

Three additional points should be discussed here based on the server records (Figure 8):

Figure 8: Overview of the students’ performance and behavior

Firstly, the cases, where the student’s performance was consistent (namely, no abrupt changes in their score was observed and as such all questions were drawn from a single pool of a given difficulty level), were only 23%; secondly, the cases, where more rounds were needed until the system could assign a reliable score, was approximately double (47%), a fact that demonstrates the necessity of adaptation in the evaluation process;
thirdly, in 30% of the cases, the students decided to restart the test before the assignment of a final score, that is, in fewer than five rounds, because they considered that the partial scores in the first rounds were low. It is believed that this indicates the motivation of the students to repeat the test by being more careful and better prepared. This motivation for rerunning the test is further demonstrated in Figure 9:

![Figure 9: Score achieved and number of tests taken by the same student](image)

where the final score achieved is plotted against the number of times that the same student repeated the test. Clearly, almost always, the more the students repeated the test, the higher was their performance, although the evaluation scenario was different by definition. It can, therefore, be claimed that the specific e-evaluation system is at the same time a useful e-learning tool that encourages students to be involved in the evaluation process, while managing to evaluate them in a justified and reliable way.

5. Key-issues and concepts related to the literature review and the research findings

The main goal of this paper was to propose an adaptive e-assessment tool for an academic course on Greek Lyric Poetry, devised exclusively for the students, who attended it. The author designed the proposed tool after taking into consideration the possible benefits, limitations and issues raised for the students who eventually used this tool. Its major long-term benefit that it proposed a personalized management of the “mental load” of a learning process. In that sense, it could be used either as a definitive conclusion (summative assessment), or as a helpful medium for weighing the “mental load” (formative assessment) of a learning process. Moreover, it could help a student restructure the way the student processes knowledge. This means that the student could use the adaptive e-assessment tool in combination with the hardcopy material provided by the instructor, or use it to check the credibility of the knowledge extracted from e-resources. Another advantage of this adaptive e-assessment tool is that it could be used simultaneously by more than students working as a group, thus promoting synergy and discussions between them on issues they believe are important for understanding major issues of the course regarding ancient Greek civilization and literature. This promotes the students’ awareness as researchers and users of the internet, since they could look up their answer into the vast e-library of the internet and assess the credibility of the e-sources.

6. Conclusions and recommendations

The aim of this paper is to propose the concept and to develop the computational framework for an intelligent, e-evaluation and e-learning tool that adapts to the performance of the student during an online questionnaire with a special emphasis on teaching a course on Greek Lyric Poetry at academic level. As both the questions and the potential answers are weighted according to their relative difficulty and accuracy respectively, the system decides in successive rounds the new knowledge level that the student is to be tested against. After describing the idea behind this evaluation approach, the paper also describes in detail the development of the corresponding algorithm as well as the online system structure. Furthermore, the system was tailored to the needs of an actual undergraduate course on choral Lyric Poetry and was actually implemented in class. It is noted that, to the best of the knowledge of the author, this is the first time that such a tool has been developed and used for Ancient Greek literature.
The main conclusions drawn by the specific research effort can be summarized as follows: firstly, the adaptive evaluation framework proposed is a feasible and effective alternative, which provides a more realistic assessment of the student’s level of knowledge, because it reveals cases where many questions have to be posed until a final evaluation can be made. Such cases in which the student had to pass through additional evaluation rounds, were found approximately double compared with the cases where the student's performance was consistent (or easily predictable); secondly, the adaptive nature of the online questionnaire, and the many evaluation scenarios and paths that the student may explore, provides the system with an attractive e-learning tool as well; thirdly, the performance of the students was usually found to be improved with the increasing number of tests taken, although the evaluation scenario was different in each case.

Based on the above information, it can be claimed that, while the physical presence and contact with the instructor is always the communicative medium par excellence, concerning the transmission of knowledge, similar adaptive educational tools can significantly contribute toward a more interactive, and hence, more efficient, meritocratic educational framework that cannot be reproduced using conventional or traditional means.

A major goal that could be met in the future is the adaptation of the e-assessment tool for other courses linked with teaching ancient Greek literature, which includes many different literary genres. Apart from that the designer could develop an added application for the students to write their comments, while they use the e-assessment, for the instructor to see and weigh further the reason for their answer. This could provide the instructor with further feedback on the students’ choices and reach to a better assessment of their overall score.

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References


Using Action Research to Investigate Social Networking Technologies

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Abstract: This article outlines the first cycle of an Action Research (AR) investigation into why professional learners are not using the Social Networking Technologies (SNTs) of their bespoke website. It presents the rationale of how this study came about, the ontological and epistemological stance of the authors and how this led to the particular choice of contextual based AR enquiry. This article includes reference to some of the most salient literature on AR and discusses the ethical and practical constraints that surround this type of research. The first cycle of AR findings are presented and identify a number of key areas where the website is failing; including a lack of speed in responding to learner queries, negative user perceptions of not ‘owning’ the website, a lack of synchronous private chat rooms, user time constraints, negative user experiences of not being online simultaneously and of a broader failure in unifying school and university websites to promote wider social networking opportunities. In response to these findings, this article puts forward a table which includes an identification of the issues and themes, the methods utilised and how the findings were derived, reflections upon what they indicate, and an action strategy for implementation alongside questions for future research. This article concludes by stating that the action plan will be implemented and assessed in the next cycle of AR which is viewed by the authors as being part of a contextually valid, lifelong AR spiral process.

Keywords: action research, reflective practitioner, social networking technologies, continuous professional development

1. Introduction

It is useful to begin by clearly outlining the rationale for this research and to provide a background perspective of the authors. The area of interest is with regards to the under usage of the Social Networking Technologies (SNTs) with learners that attend one day Continuous Professional Development (CPD) workshops. The learners are professionals based within the UK construction industry that have transient physical contact with one another after their one day workshops. Learners have expressed a desire to strengthen their support and networking opportunities with one another, but due to their long hours working culture and environments, they often feel quite isolated. A website has been designed that includes SNT’s but, so far it is rarely used, as shown in reconnaissance with the students both face-to-face and with a lack of logged online use. There is a need get to the heart of why this is happening. Although this study is UK based, it could be argued that the findings possess a relevance for international based users of SNTs, including the importance of establishing collaborative communities of learning that engage in critical thinking, which arguably forms an integral part of successful e-learning (Balcaen and Hirtz, 2007). The usage of SNTs is in line with remit of the Engineering and Physical Sciences Research Council Strategic Framework 2003-2007 which impacts upon the School of the Built Environment’s strategic plan. The framework outlines the need for training and technologies that are ‘fit for purpose’ in the world of both Higher Education (HE) and work and for the promotion of improved Equality and Diversity (E&D) access in the usage of learning and networking technologies. Enquiries were made to utilise AR with other teachers in the school and university as a whole, especially those who are experienced in the successful use of SNTs, but unfortunately, time and workload commitments prevented this in this instance. The authors agree with Prendergast (2009) who states that “The structure of schools works against those who wish to collaborate. Timetables, rotary systems, regimented curriculum...work against those who wish to experiment together to improve teaching methods...” (Prendergast, 2009, p.2).

The ontological and epistemological perspective of the authors is rooted in social constructivism. This stance impacts upon the particular choice of AR and research methods utilized. This perspective emerged after a number of years exploring differing viewpoints on the nature of the world and of knowledge and learning processes. In essence, knowledge is viewed as being a socially constructed process which is subject to selective interpretation and retention within differing learning contexts and environments. Educators are viewed as being facilitators of learning that encourage self reflection and collaboration, rather than imparting the direct transfer of knowledge. Learning needs to be ‘deep’, as opposed to ‘surface’ based (Martin and Saljo, 1976). Learning occurs when knowledge is explored and reflected upon regarding its relevance, interest and use to...
the individual. There is also a need to promote student engagement (Knight, 2002) within ‘zones of proximal development’ (Vygotsky, 1930). In other words, what is learned will be affected by the knowledge, skills, levels and types of collaborations with both peers and the learning facilitator. The authors recognize that this perspective will not fit all disciplinary subjects, viewpoints and learning contexts. However, it does within this particular context where students need a practical approach to learning, by being able to self-reflect upon what can be applied in the professional world where they work in the UK construction industry.

The learners need help in strengthening their supportive networks with others where they are often quite isolated due to their professional job roles and responsibilities. This awareness of context and social constructivist stance, will aid to evaluate and, where necessary, change areas of practice. (Prosser and Trigwell, 1999, p.160). In the first stage of this investigation the authors needed to compare what has been achieved with what they would like to have achieved (Cowan, 1998) and the writing style outlined by Moon (1999) has been of central importance in the process of being a ‘reflective practitioner’. The inherent values and beliefs of the authors also embrace freedom, student empowerment, democracy and E&D. These values and beliefs are not subject specific, but should arguably be universal to all learning facilitators. Therefore, although the learners are not students in the traditional view of HE, they are part of the learning community; and should be given the same level of rights and access to comprehensive learning support and facilities that fit their individual needs and learning context.

2. Reference to and review of relevant literature

Action Research (AR), in essence, does exactly ‘what is says on the tin’. It is about ‘research through action’. It is usually conceptualized as a collaborative process which involves an iterative feedback from individuals or groups who are most likely to be affected by the research itself; although this is not always the case. In itself, AR is about making proactive changes, either to an environment, a system, a process or a practice and it is only by trying to make changes within a particular context, that practitioners will learn about it better and how to continuously improve it. The founder of AR, Kurt Lewin (1946) sums this up with his famous quote “If you want truly to understand something, try to change it” (Lewin, 1946). AR is not just about making changes though; it is about making continuous improvements and analysing and reflecting upon these within iterative AR cycles. In AR, behaviour is seen as the function of both an individual’s characteristics and the environment/context in which they are situated. This methodology was taken up by the teacher/practitioner movement in the 1970s-80s and led to the view that the design, delivery, process and theory of learning are mutually dependant within proactive cycles of positive change and improvement. Kolb (1984) was heavily influenced by AR in his model of experiential learning; which views learning as a four stage cycle, involving concrete experience, reflective observation, abstract conceptualisation and active experimentation.

Carr and Kemmis (1986) argue that all approaches to AR outline the same view of the need for a methodical, iterative approach in identifying problems, action planning, implementation, evaluation and critical reflection. The findings from this process then feed into second (or third) cycles, and so on. However, there are four main AR approaches that can be distinguished between one another; these being traditional, radical, educational and contextual. Traditional AR focuses upon the importance of worker-management relations, information systems and of democracy while maintaining the status quo but with changes in power structures. Radical AR focuses upon emancipation and the overcoming of power structures. It has roots in Marxist theory and is also often utilized as part of Feminist AR which strives towards moves of emancipation through AR processes for minority groups in society. Educational AR focuses upon the role of teachers/facilitators in the education sector. It states that teachers need to be more involved in community based issues. Focusing on the curriculum, CPD and learning in particular, social context can be incorporated within this approach. AR researchers in universities can also expand this educational AR approach to working alongside primary and secondary school teachers on community projects. Finally, contextual AR (that the authors have chosen) views learning as contextual i.e. affected by the social environment, to which the learners in this instance are based in the UK construction industry. Learners are seen as both designers and co-researchers in the learning design and practice process and this type of AR most closely fits with the views of the authors on social constructivism. Change is seen as a consensus and contextual based process of learning through action, self-reflection and iterative feedback and acting upon this within an ongoing collaborative process.

The Higher Education Funding Council for England (HEFCE, 2006) states that most academics recognise that good research is an important part of good teaching and that the two need to inform one another within an
iterative process of improvement. However, there has been some debate as to whether the two concepts are supportive or compatible with one another. The position from HEFCE is that they are (Badley, 2002). An important issue though is how does any knowledge gained become ‘public knowledge’? The answer may lie with how feedback is fed into the curricula, programmes and modules. The Boyer Commission (1998) cited by Badley (2002), models the links in terms of: 1) marital relationship, 2) impending divorce 3) scholarly relationship or 4) holy alliance. Some groups view the relationship as marital, i.e. that the two work together to achieve a common goal. Conversely, others see an ‘impending divorce’ of the two as drifting apart, with differing goals and motivations. This could occur due to Information Technology (IT) and globalization or issues of differing class sizes, schools and so on. With a scholarly relationship, (the view the authors more closely follow), integration, application and teaching, can assist with areas of reflective practice, inter-connection and practical solutions between theory and practice that are relevant to both the learning facilitator and students. Knowledge is not just transmitted, but evolves between the two and extends over time. Those that outline a ‘holy alliance’ view the world, understanding and knowledge as being unreliable and uncertain. Teaching is seen to be about enabling individuals to deal with this uncertainty; both teachers and researchers are not happy about change and want to stick with current, and safe, paradigms and ideas with a resulting collusion between the two to ‘do their best’ in an uncertain and unpredictable world.

Biglan (1973) argues that differing disciplines can also view the nature of knowledge and research methods differently. Hard disciplines are typified as atomistic, cumulative, competitive and quantitative, whereas soft disciplines are reiterative, holistic, collaborative and more qualitative. Pure and hard knowledge is more concerned with mastery of protocols, tools and techniques and outputs/products, whereas soft and applied knowledge is more concerned with its ongoing direct usage and application; although the authors are aware that disciplines can straddle different areas over time. The discipline and context of the learners in this investigation was located within the area of ‘soft skills’ and managerial subject content, as such, it was located about half way between the hard and soft disciplines and more heavily located in the applied discipline area. Knowledge was achieved with learning facilitation, with small groups engaged in Action Learning (AL) to encourage ‘learning by doing’ group collaborations and self-reflection.

Disciplines can also differ between universities, departments and Faculties and over time as determined by organisational guidelines Higher Education Academy (HEA, 2009). The ethos of a particular school and university can potentially impact upon research and teaching practices. The authors are happy to be working in a school where the view of ‘theory into practice’ is supported within the disciplinary subject area. The guidelines within the HEA (2009) incorporate an awareness of the merits of using Problem Based Learning (PBL) as outlined by the Centre for Education in the Built Environment (CEBE, 2009). Learning activities, PBL and learning portfolios can indeed assist, and assessment tasks can outline whether these objectives have been achieved. However, within the particular learning context of this investigation, there is no need to introduce PBL at present, as many of the learners already come to the workshops with an expansive and varied list of issues, topics, problems and areas for discussion and ‘action’.

3. Ethical considerations

Prior to carrying out the AR, the authors obtained the necessary informed consent to undertake the research from the University of Salford Governance and Ethics Committee. The authors also gained signed permission and consent from the learners and provided an information sheet and ethical code of conduct which outlined the background to the investigation and voluntary nature of their participation in the study alongside stating the confidentiality and anonymity of their feedback. The authors recognise that it would be unethical to have an expectation that the learners would necessarily agree to participate in the AR. Therefore, learners were given the right to not participate and to also withdraw their involvement without prejudice or disadvantage to their receipt of free CPD training, at any stage; to which their data would be immediately destroyed. Participants were informed that the intended use of the data was to improve their student learning and networking experiences and that the findings may also be anonymously referenced for peer reviewed journal publications. The authors discussed the nature of the research with the Head of School as well as with peers and colleagues. As the workshops were only one day long, with the research occurring during the lunch hour break, the authors would like to argue that their role as ‘researcher’ did not impact, in a negative way, on their role of being a learning ‘facilitator’, as the research occurred during the lunch hour. Also, the research was looking at changing and improving the website SNTs for the direct benefit of the participants. How this was done, and the justifications for the research methods chosen, will now be addressed.
4. Evaluation of research methods

Before undertaking the research, the authors realised that there was a need to consider the method of data collection and reason for collecting it in light of the social constructivist stance and learning context. Figure 1 outlines the flow by which the ontological and epistemological stance of the authors impacted upon on the research process and methods utilised. The social constructivist values and belief systems held by the authors led to the particular choice of contextual based AR.

![Figure 1: Background perspective and spiral research journey](image)

The authors also decided to collect qualitative data due to the collaborative and highly communicative based learning context of the workshops. From the start of the investigation, insights emerged from the learners themselves and from the lack of usage of the SNTs; of their initial concerns and problems. From this base, the authors designed a very basic semi-structured questionnaire and focus group list of topics to further investigate and explore these issues. The design of the research tools and methods were left deliberately skeletal to allow for additional findings to emerge during the first cycle of the contextual AR research process. This supported the social constructivist stance of the authors that learning and research are inherently social, contextual and collaborative processes. AL was utilized within the workshops due to its highly interactive and contextual learning based nature. The authors envision that future cycles of AR will lead to an evolution and change in the content of questionnaires and focus group topics, as both the learners and learning facilitator reflect and collaborate on topics and themes within an emergent learning and research process.

Due to the transient nature of contact with the learners, the majority of which work full time within the UK construction industry, there was a need to utilise a method which recognises the inherent difficulties in contacting them. The learners were only available for AR during their lunch hour, in between the morning training session and the afternoon AL set. One-to-one semi-structured interviews were considered but this was found to be an unpopular option at a prior trial workshop event. Furthermore, the authors reflected later that interviews would be unethical as they would work against the collaborative group based context of the workshops. Initial enquiries were made into the availability of participants to meet at other times for one to one interviews, but learners were either disinterested, did not want to do it or were too busy to enable this to happen. What was useful about making these initial enquiries was that it enabled the authors to reflect upon an initial error of judgement to using this method with discussions with learners at a prior workshop.

Participants that gave their signed consent were randomly selected. All participants were handed a copy, and emailed in advance, of the Research Information and Consent Form, which included an outline of the background to the study and the ethical code of conduct. The background to the study and ethical code of conduct was also verbalised at the workshop. There were 8 participants randomly chosen who had given their signed permission. The group then chose themselves, to sit at any of the four available tables in the room. Non participants sat at the other tables to have their lunch and network with colleagues, as normally happens at the workshops. The focus group session lasted approximately 45 minutes. It was not taped. This was because the participants did not want to be taped; therefore, it would have been unethical to do so. However, extensive written notes of the group discussions were taken. The debate covered the issues of their personal
experiences, values and beliefs and thoughts, inclusive of the ‘research-teaching nexus’, and recommendations for the website. Questions were formulated with the aim of minimising the ‘imparting of information’ in themselves, or to introduce leading questions that contained inherent positive or negative assumptions. Researcher involvement in focus group was kept to a minimum, except in the few instances where conversation topics had run their course.

At an additional workshop, learners were emailed in advance and handed out the Research Information and Consent Form. The short (10 to 15 minute) semi-structured questionnaires were distributed during the lunch hour. In total, 12 out of a room of 30 people of varied professions, ages, ethnicity and genders (although over 80 per cent were women) agreed to participate in their completion. The questionnaires were kept deliberately short, to enable participants to have time for their lunch break and chat and network with other colleagues during their lunch hour. The questionnaires were handed back at the end of the lunch hour.

The authors have kept a journal of the focus group events and of reflections made both during and after the first cycle of AR. In terms of time (nearly four weeks in between the focus group and the semi-structured questionnaires), journal entries were useful in tracking the research ‘journey’ through this process. To enhance reflection, analysis and ongoing discussion, participants were emailed with the identified issues that they had raised; to further the ongoing and cyclical debate into how to enhance the usage of the website. The authors also made entries in individual home journals on their experiences and reflections to draw upon over the coming weeks and months as the cycles of AR continue. Although at the beginning it was felt that there was too much data; further reflections on the questionnaires, focus group and reflective journals have enabled the authors to begin to make sense of it. In this first cycle of AR, the authors read through the notes of all the data and entered this into one master document. This included individual home journal comments by each of the researchers on their reflections over the past two months of both the focus group and questionnaire respondents. As this was being done, additional comments and reflections that were not made previously were achieved. Next, the data was coded using keyword analysis; first in general themes, then more specific themes, while also cross checking with the original notes made alongside those in the master document for added rigour. However, as firm social constructivists, the authors did not attempt to generalise any of the findings beyond the specific research context.

5. Findings

The first theme identified an issue of the website being perceived as being unmonitored, and therefore, interest for its use was reduced:

If I place a post on the notice board, I want a response fairly quickly, otherwise why should I bother? If they take too long to reply I either forget I’ve posted something, solved the query myself or just lose interest in it anyway!

Another identified theme was an overall perception that the learners do not have ‘ownership’ of the website, and therefore their levels of engagement and interest became reduced:

We don’t often get asked what our opinion is on it. I have lots of opinions, but really I don’t see a lot of emails or announcements about the website, so I just forget about it.

Some learners want to use SNTs for group based discussions, networking and collaborations, whereas others identified the theme of wanting privacy for one-to-one gossip and chats, an option which is not currently available on the website. Two out of the eight focus group respondents stated that the lack of private chat rooms discouraged them in using the website:

If I want to have a chat and say have something to say about someone at work, I don’t want it plastered for all to see. Why can’t you set up the option for private chat rooms?

An additional identified theme consists of two inter-linked parts. Firstly, one of time constraints and secondly, of the limited availability of others [at the same time] for collaboration:

I don’t have the time to use the chat rooms on the website. Also, when I went on the website...and entered the chat room, nobody was on it, so it can’t be popular, so I haven’t been on it since.
If there are no users on the website at the same time, there is no one to interact, collaborate and therefore learn with. This is a major issue and loops back into the original problem of how to encourage greater usage of the website.

6. Discussion

With regards to the first identified theme, it can be argued that if technologies are perceived as being unmonitored or do not answer queries quickly, they may rapidly be viewed as being boring or obsolete. Indeed, Pask and Scott (1972) argue that the human brains using technologies are prone to such tiredness and boredom. Time and resources need to be made readily available to keep learners motivated. It should be stated that the authors are aware that there are many diverse reasons why SNTs may not be used, including issues such as ease of use, relevance and so on. However, this theme was found to be a prevalent in all of the feedback received.

The second identified theme concerned the lack of perceived user ‘ownership’ of the website. Findings indicated that this had a negative impact upon levels of learner engagement and interest and this outcome is supported by research (Knight, 2002). The researchers need to address this concern by relaying more frequently that the website is indeed ‘owned’ by the learners and future cycles of AR will be able to research and assess if this has a positive affect on increasing usage of the website.

The third theme identified a request by some of the learners for private chat rooms. Originally the website was designed to promote collaboration and wide group networking with others of varying knowledge, skills and abilities. It is not clear as yet whether private chat rooms would promote smaller one-to-one chat at the expense of larger group collaborative learning activities. If this happens, would this be a bad outcome? Is it ethical to expect certain uses of the website and discourage other types of uses? The authors recognise that learners have differing learning styles, abilities and preferences (Gardner, 1999). In the next cycle of AR, the authors will trial the introduction of private chat rooms and analyse, evaluate and reflect upon this.

The final identified theme from the learners is with regards to a lack of available time (and people) for synchronous chat opportunities. There is a need to research if, by addressing the other identified themes, whether this theme is dealt with by default as a result. It is not possible to enable busy professionals to have more time; but perhaps there is the opportunity to motivate them to make more time available. By making the website more ‘attractive’, in suiting their needs better, more people may go online at the same time and, this, in turn, may facilitate greater opportunities for ‘zones’ with others (Vygotsky, 1930).

A final theme which came about with conversations with colleagues is of a lack of cohesion with school and university websites. Indeed, improved traffic flow between websites could assist with concerns over a lack of people being online at the same. It can be stated that this is a complex area and further discussions and liaisons with the Head of School are needed. However, theorists such as Prendergast (2009) state that AR is not ‘formal research’ that is generalisable beyond the context of the learners that have been studied. He argues that it cannot inform HE to enact political or social change. What it can do though, is to provide ‘indicators’ for more formal research that conform to validity and reliability, should other researchers wish to do so.

It is important to note upon evaluation that the authors are still in the AR spiral. There are still issues and themes being discovered and the action plan, as shown in Table 1, will explore these issues further. The authors view AR as being a lifelong process. Just as learning is a cyclical and lifelong process with no singular ‘input/output’ process or end (Worrall and Bell, 2007) so the authors view the process of AR. Every context, group and particular social milieu of learners need to be empowered to be able to provide continuous feedback to the learning facilitator on their needs and requirements; this is in order to improve the learning process that more fully contributes to models of best practice as a ‘reflective practitioner’. Further to listing these themes, Table 1 lists evidence of its origin, author reflections, action strategies and provides questions for study in future AR spirals.

The authors view the first cycle of outcomes as valid as they are providing valuable indicators of how to improve and change aspects of learning facilitator practice. The authors have benefited from this process, so would argue that it is valid; although other theorists may disagree with this with this viewpoint. The beliefs and
values currently held remain unchanged i.e. they are firmly rooted within social constructivism with a strong support for learner equity, freedom, social balance and student empowerment, in line with the University of Salford’s framework (University of Salford E&D Strategy, 2006-2015).

### Table 1: Themes, origins, reflections and action strategy

<table>
<thead>
<tr>
<th>Identified Theme</th>
<th>Evidence of importance</th>
<th>Reflection</th>
<th>Action Strategy and questions for further study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of quick response to queries on the notice board – this is de-motivating.</td>
<td>Questionnaires and focus group</td>
<td>No monitoring of the website notice boards as often as needed. Learners have noticed it and this has de-motivated them to use the website</td>
<td>Facilitate greater motivation by monitoring and dealing with notice board queries at least once a day. Carry out next cycle of AR in two months after participants have time to evaluate the change</td>
</tr>
<tr>
<td>Perception of users not ‘owning’ (or having a say) in the website, therefore a lack of engagement/student empowerment and disinterested</td>
<td>Questionnaires and focus group</td>
<td>The website has laid fallow, and student engagement is difficult when this happens. Now an identified demand for this. Previous thinking was that they were disinterested</td>
<td>Communicate via email, face to face and at each workshop verbally that the website is ‘owned’ by the learners. Find out during next cycle of AR if this is motivating/has impacted positively upon levels of learner engagement</td>
</tr>
<tr>
<td>No private synchronous chat rooms</td>
<td>Focus group: two participants stated non-use of entire website because of lack of private synchronous chat room</td>
<td>Need to think whether to cater for both public and private chat rooms. How important is this? Will this facilitate collaborative working or just one-to-one chats in with limited contact with others? Is it ethical to expect a certain use for the website?</td>
<td>In the next cycle of AR, introduce and evaluate the impact of private chat rooms – to research whether this encourages (or discourages) the use of the website – and impact upon collaborative networking. Evaluate the ethics of what to do next</td>
</tr>
<tr>
<td>a) Not enough time to use the website</td>
<td>Questionnaire and focus group</td>
<td>Unable to facilitate users having more time to use the website – but can motivate them more to donate more time to use it. Need to get them interested –so that more people are online at the same time (e.g. scheduled online sessions, linkages to other websites?) to promote collaboration – which encourages return and use of the website</td>
<td>Introduce and analyse in next cycle of AR ‘pre-set’ synchronous ‘time on line sessions’. Email participants with a set date and time when we will be online to support and respond to online chat room queries and message board queries. Research whether this is a popular process which and meets the needs of users and reflect on feedback</td>
</tr>
<tr>
<td>b) no one/few users on the website at the same</td>
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<tr>
<td>Colleagues report lack of unity with CPD website and school website (for university students who attend the workshops)</td>
<td>Discussion of research findings with project colleagues</td>
<td>This is a school/Faculty and University wide issue and therefore it is difficult to resolve in the short term. Need to liaise further with colleagues and Faculty/school Heads to ascertain how closer integration is achieved</td>
<td>Liaise with Head of School and Head of Faculty to enquire how (and in what way) the website and CPD content and delivery can link in closer with Faculty/University and School websites to promote scholarly unity and collaboration</td>
</tr>
</tbody>
</table>

7. Conclusions: A lifelong spiral

AR may not been seen by all as a valid and reliable approach and method of research. It certainly cannot be generalized beyond this particular research context. However, it possesses a validity as it has helped the authors to identify important areas of change, and has led to an action strategy for evaluation in the next cycle of AR. At all stages of the first cycle, there has been an attempt to follow ethical guidelines and frameworks. The initial cycle has highlighted that learners want websites that are frequently monitored, that they feel that they ‘own’, with private chat room options, to encourage them to ‘donate’ some of their finite time on the website, with greater confidence that other users will be on the website at the same time for synchronous chat opportunities. The first cycle also highlighted a lack of cohesion with school and university websites,
which highlights a broader area of consideration and debate for the future. The authors are looking forward to implementing and evaluating the action strategy that was derived within in the next AR cycle, and beyond, that within a lifelong cycle of AR.

There will be others who are engaging in different AR approaches, some with the aim, to which others disagree can occur, of affecting institutional change. The authors do not. The school evolves its curriculum (in a limited fashion) with insights direct from industry. However, this change does not tend to reflect the views of students as part of the teacher-student nexus. From the standpoint of social constructivism and contextual AR, the authors aim to enact positive change within the AR context of the learners being taught and researched. However, what can be done is to ‘scholarly’ inform colleagues of the AR findings (Badley, 2002). What they do with this feedback is yet to be seen. Institutions, subject-specific disciplines and contexts, learners, teachers/facilitators (and even wider society) also have differing, strategies and policies. Furthermore, student assessment is changing, partly due to both modularization and policy changes (Holroyd, 2000). There is no ‘one size fits all’ on type or mode of delivery for every subject or context (Rowland, 2006). To change effectively, there is a need for institutional support embedded in “codes...values of equity, integrity and justice” (Holroyd, 2000). Impacts of change can also be affected by the timing of assessments, staff workload, work based learning, feedback, plagiarism and regulations (QAA, 2009). The authors of this article do not aim to enact institutional change, but to improve their roles as ‘reflective practitioners’. The authors will scholarly inform colleagues of their findings and look forward to seeing what the future holds.

References


A Case Study on the Adoption and use of Synchronous Virtual Classrooms

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Abstract: This is a case study of faculty adoption and use of Horizon Wimba Virtual Classroom in online courses at a Southeastern University in the United States. The purpose of this case study was to explore faculty adoption and use of Horizon Wimba in their online courses. This inquiry is based on Yen et al. (2010) adoption factors (organizational, social, personal and technological) and the features of the virtual classroom. The research questions are 1) What factors and features influence faculty adoption of the Wimba Virtual Classroom? 2) How do faculty rate the Wimba Virtual Classroom using the characteristics of innovation? 3) How do faculty classify themselves using Roger’s model of diffusion of innovation? 4) How do faculty use the Wimba Virtual Classroom in their teaching? Roger’s diffusion of innovation was used as the theoretical framework for faculty adoption of virtual classroom. In the Fall of 2010, faculty were surveyed and interviewed about their decision to adopt and use Wimba. This case study provides meaningful information for administrators interested in promoting technology enhanced learning on their campuses and for faculty considering adoption.

Keywords: virtual classroom, synchronous, online learning, technology adoption

1. Introduction

Distance education operations have evolved through generations (Taylor, 1995) where a variety of technologies have been used. The Correspondence Model based on print technology; the Multimedia Model based on print, audio, and video technologies; the Tele-learning Model, based on applications of telecommunications technologies to provide opportunities for synchronous communication; and the Flexible Learning Model based on online delivery via the Internet are four generations described in the Taylor Model. A fifth generation, the Interactive Learning Model, includes two-way interactive audio/video desktop conferencing, virtual classrooms, web2.0 tools, and mobile technology. As a result of the rapid technological change a growing number of institutions have adopted internet-based course delivery (Liaw, Huang & Chen, 2007) and have invested heavily in technology (Trentin, 2006; Yohon & Zimmerman, 2006). Massy and Zemsky (1995) conclude that higher education cannot become more productive or hold costs down unless colleges and universities embrace technological tools for teaching and learning. Yet, some faculty members embrace technology while others resist. In the 21st century, it is imperative for faculty to adopt technology for instructional purposes.

The purpose of this case study was to explore faculty adoption and use of Horizon Wimba in their online courses based on Yen et al. (2010) adoption factors (organizational, social, personal and technological) and based on different features of the virtual classroom. In the next section, we review the literature on diffusion of innovation, and on the factors that impact technology adoption by faculty. We then focus on the online synchronous and asynchronous technology and finally review research on virtual classrooms specifically focusing on Horizon Wimba.

1.1 Diffusion of innovations

Numerous studies have examined the faculty adoption of technology in their teaching (e.g., Dewan, Ganley, & Kraemer, 2010; Norton & Bass, 1987). In many adoption studies, the Concerns-Based Adoption Model (Hall & Hord, 1987) and Rogers’ Diffusion of Innovations Theory (Rogers, 2003) have been used to investigate this phenomenon. The Concerns-Based Adoption Model examines the process of adopting innovations (Sherry & Gibson 2002) while the Diffusion of Innovations Theory incorporates the adoption and the diffusion of an innovation. Diffusion of Innovations is a theory of how, why, and at what rate new ideas and technology spread. Rogers (1995) defines an innovation as an idea, practice, or object that is perceived to be new by the
individual, and diffusion as the process through which an innovation is communicated through certain channels over time among the members of a social system. Rogers’ (1995) theory of diffusion of innovations provides a theoretical framework for analyzing technology adoption patterns.

Figure 2: Technology adoption by faculty

According to Rogers (1995), individuals in a social system do not adopt an innovation at the same time; a certain percentage of individuals are relatively earlier or later in adopting a new idea. Based on the innovativeness criterion, the degree to which an individual is relatively earlier in adopting new ideas than other members of a social system, the distribution of various adopter categories forms a normal, bell-shaped curve that illustrates Innovator (2.5%), Early Adopter (13.5%), Early Majority (34%), Late Majority (34%), and Laggards (16%).

Rogers (1995) states that relative advantage, compatibility, complexity, trialability and observability influence an individual’s decision to adopt or reject an innovation. Relative advantage is how improved an innovation is over the previous generation. Compatibility is the level by which the innovation has to be assimilated into an individual’s life. Complexity is how likely it is to be adopted by an individual based on how difficult it is to use. If the innovation is too difficult to use, an individual will not likely adopt it. Trialability determines how easily an innovation may be experimented with as it is being adopted. Observability is the extent that an innovation is visible to others. An innovation that is more visible will drive communication among the individual’s peers and personal networks and will in turn create more positive or negative reactions.

1.2 Adoption of technology by faculty

Multiple studies have investigated key factors responsible for faculty willingness to use technology in their teaching. These factors include organizational support, leadership, effective training and perceived usefulness and ease of use (Ajjan & Hartshorne, 2008; Choudrie & Dwivedi, 2005; Cushman & Klecun 2006; Frank et al., 2004). Funding, lack of equipment, lack of institutional support, disbelief of technology benefits, lack of confidence, and lack of time and knowledge were identified as the major obstacles to successful technology integration (Al-Senaidi, Lin & Poirot, 2009; Nelson & Thompson, 2005; Hardy, 1998; Lam, 2000).

It is important for faculty to see the perceived ease of use and usefulness of technology tools in their teaching practices (Ajjan & Hartshorne, 2008; Choudrie & Dwivedi 2005, Cushman & Klecun 2006; Frank et al., 2004) in order to adopt these tools. Teachers use technologies when they realize that it motivates student learning and improves instruction (Ajjan & Hartshorne, 2008). For technology adoption to be successful, instructors must be willing to change their role in the classroom from being a teacher to a facilitator and students must take responsibility for their learning (Hardy, 1998). This change of teaching philosophy and methods focuses on student-centered teaching and constructivist teaching practices (Rakes, Flowers, Casey, & Santana, 1999). Ertmer, Gopalakrishnan, and Ross (2001) found that exemplary technology-using teachers exhibit more constructivist teaching practices. Successful integration of technology into the classroom depends on altering teachers’ beliefs and philosophy concurrently. Personal factors such as attitude, interest, and training are
relevant for faculty adopting technology (Al-Senaidi, Lin & Poirot, 2009; Saade´ et al., 2007). Faculty who are confident in their ability to handle technology tools are more likely to integrate these tools into their teaching (Hagenson & Castle, 2003; Al-Senaidi, Lin & Poirot, 2009).

1.3 Asynchronous and synchronous technology

Asynchronous and synchronous technologies may be used in online instruction. Asynchronous technologies are highly flexible and can be accessed anytime from anywhere, they include multiple forums such as chat rooms and e-mail services. They allow reflective and thoughtful thinking before responding. Synchronous technologies in the form of audio/video conferencing, like the virtual classroom, are less flexible in terms of time, but can be accessed from anywhere. They render immediate feedback, and allow multi-modality communication. They can remove information overload and require less time and effort to maintain social interaction (Moallem, 2006).

According to the literature (Author & Author, 2010, Brannon & Essex, 2001), there are advantages and disadvantages for synchronous and asynchronous technologies. The advantages to using synchronous technology include more content, psychological arousal, increased motivation, and more social interaction. Paige, Pauli, Sturm, and Fierstein (2011) list immediate feedback to students from instructors, reduced feeling of isolation and a sense of community with the learners as some of the advantages of synchronous interaction. In terms of disadvantages the focus is on quantity not quality, scheduling can be challenging, moderating large groups is difficult, and there is a lack of reflection time.

Asynchronous technology advantages are increased ability to process information, more time to comprehend and write messages, and richer content. Meanwhile the disadvantages are it is difficult to get discussions going with small groups, students feel isolated, the lack of immediate feedback, students not checking in often enough, and less social interaction (Branon & Essex, 2001; Hrastinski, 2008; Johnson, 2006).

Synchronous technologies can be incorporated into online courses for community-building or social learning, whereas asynchronous communication can be integrated for cognitive functions or objective obtainment. Research supports the inclusion of both asynchronous and synchronous technologies into online courses rather than using either one individually (Hrastinski, 2008; Johnson, 2006). Synchronous communication tools are better suited for discussing less complex issues, getting acquainted, or planning tasks. In contrast, asynchronous communication tools are better suited for reflecting on complex issues (Hrastinski, 2008). Instructors should choose the technology based on the objective or task being requiring of students. Synchronous technologies have become more popular as faculty value interactivity in their online courses (McBrien, Jones & Cheng, 2009; Rockinson-Szapkiw & Walker, 2009; Malik, 2010; Paige, Pauli, Sturm, & Fierstein, 2011).

1.4 Virtual classrooms

Virtual classrooms are online environments that allow students and instructors to communicate synchronously using audio, video, text chat, interactive whiteboard, application sharing, instant polling, etc. These features enable faculty and students to interact as if they were face to face in a classroom. Participants can talk to each other, view each other through a webcam, use emoticons, and work together in breakout rooms. Virtual classrooms enhance interactivity and the sense of community. The virtual classroom can be used in online and blended instructional delivery (Author & Author, 2010). Elluminate, Adobe Connect, and Horizon Wimba are some of the synchronous virtual classrooms that are prevalent in higher education whereas Webex and Centro are more commonly used in the corporate sector. Freeware versions of the virtual classroom include DimDim and Wiziq. Use of the virtual classroom is also known as web conferencing or e-conferencing in the literature (Rockinson-Szapkiw & Walker, 2009).

This paper focuses on the Horizon Wimba Virtual Classroom due to availability at the research site. Like other virtual classrooms and conferencing software, Horizon Wimba is a virtual environment with audio, video, application sharing, and content display. The features of Horizon Wimba’s Virtual Classroom are grouped into three categories based on their application: (1) discussion and interaction are facilitated by breakout rooms, emoticons, chats, videos, presentations, polls, quizzes, and surveys; (2) instruction and reinforcement are implemented through the electronic whiteboard, application sharing, and the content area; and (3) classroom
management tools include the ability to upload and store documents, an auto-populated participant list, usage details, and archive options (Wimba, 2009).

1.5 Use of Horizon Wimba

Horizon Wimba was founded in 1998 and the company has exclusively been focused on education (Wimba, 2011a). Wimba is used in more than 40 countries in six continents (Wimba, 2011b). Wimba has made a difference in the way instructors teach and students learn (Author & Author, 2010). Some of the uses described by the developers of Wimba are a) deliver instruction across multiple disciplines b) increase revenue and enrollment c) increase retention rates d) reduce the sense of isolation in the online virtual environment e) make online classroom accessible to the disabled students f) help expanding the curriculum and improving outcomes of the K-12 education system and g) work with publishers to add vocal collaboration to foreign language texts.

![Horizon Wimba virtual classroom](image)

Figure 3. Horizon Wimba virtual classroom

Wimba users at various colleges and universities enjoy the flexibility and appreciate the different mode of delivery. As such they have provided information about its use. For instance, many students have welcomed the access to archives (York St. John University). Wimba was used for training 1200 faculty dispersed geographically in the northern half of Illinois. It saved time and money and increased faculty attendance at the training sessions (Northern Illinois University). Wimba has helped professors overcome the challenge of being forced to cancel class due to professional development opportunities, meetings, or appointments that conflict with their regularly scheduled class sessions and helped them offer classes at all times. They are able teach from the hotel room on the road. Students are also able to participate from anywhere with an internet connection, and can fully participate in the classes (Kansas State University). Wimba was used by faculty and staff to conduct meetings online (College of Southern Nevada). Wimba was also used to conduct Blackboard trainings, professional development seminars, and monthly live orientations for new students (Central Texas College). Wimba has facilitated student mentoring (Boston University). Wimba fosters interactivity, flexibility and high-level student participation in the courses (University of Maryland). Also, Wimba was used to save gas, money, and time while reaching the remote students at Southern State Community College (Wimba, 2011c).

Some of the pedagogical uses of Wimba listed by Zhang (2009) are broadcasting live and recorded lectures; Providing guest speaker sessions, and inviting non-local guest speakers; Enhancing language and speech
classes with the audio/video component; Using the application sharing feature to demonstrate how to use a particular software application; Enhance faculty-student communication; Students can collaborate online by organizing team meetings and continuing discussions outside the regular classroom. In a study conducted by Roberts, McNeece, and Thornton (2007) a majority of the instructors and students reported high levels of satisfaction with the text chat, voice chat, whiteboard, and hand-raising features. Most instructors reported good and fair levels of satisfaction regarding application sharing, polling/quizzing, file sharing, and accessing archives.

In 2010, Author and Author examined student perceptions of features within the Horizon Wimba Virtual Classroom. Online students rated the following features most beneficial: viewing archived virtual classroom sessions, ability to raise their hands, and use the polling feature to respond to questions. The comparison group, students enrolled in a blended course that combines face to face and online instruction, rated desktop sharing and presentation viewing as the most beneficial. Overall, the students in the fully online course rated the virtual classroom features higher than students taking the blended course. The current study seeks to understand faculty perspectives of this innovative technology. Rogers (1995) states the features of an innovation influence its rate of adoption.

2. Purpose of this case study

The innovation in the present investigation is the Horizon Wimba Virtual Classroom. The purpose of this case study was to explore faculty adoption and use of Horizon Wimba in their online courses based on Yen et al. (2010) adoption factors (organizational, social, personal and technological) and the virtual classroom features.

The specific questions that were addressed in this study are:

- What factors and features influence faculty adoption of the Wimba Virtual Classroom?
- How do faculty rate the Wimba Virtual Classroom using the characteristics of innovation?
- How do faculty classify themselves using Rogers’s model of diffusion of innovation?
- How do faculty use the Wimba Virtual Classroom in their teaching?

3. Methodology

This case study was conducted at a Southeastern University in the United States that had Horizon Wimba for five years. This university has 602 full time and 288 part time faculty (UNCW Just the Facts, 2012). Instructors have access to Wimba’s Live Classroom licensed for use with Blackboard. Approximately 5% (N=52) of the faculty use Wimba in their courses. In the fall of 2010, an online survey was administered using SelectSurvey®. The Office of E-learning sent an email with a hyperlink to the survey and a brief message about its purpose to 52 instructors identified as Wimba users. Faculty were informed that their participation was voluntary and of their anonymity. The survey was available for a three-week period and during this time one email reminder was sent. Twenty-three faculty completed the survey, which resulted in a 44% response rate. Although the sample is small, the response rate is higher than many online surveys (Cook, Heath, & Thompson, 2000; Sheehan, 2001). Descriptive statistics were used to report the survey data. At the completion of the survey, faculty were asked to provide contact information if they were willing to participate in a follow-up interview. Ten instructors expressed interest and due to availability six were interviewed several weeks later. Each interview was conducted within the Wimba Virtual Classroom where instructors could see the features as they described their use. The interviews were recorded in Wimba and then transcribed. The content of the transcripts were coded and analyzed for common themes.

3.1 Description of survey

The instrument included two sections. The main section consisted of nine questions regarding the adoption of virtual classrooms. The first four questions corresponded to the organizational, social, personal, and technological factors proposed by Yen, Wu, Cheng, and Huang (2010) and were rated on a four point Likert Scale from Very Important (4) to Very Unimportant (1) on their importance in the respondents’ decision to adopt the Virtual Classroom. Question five was a Yes/No question, if the features of the Virtual classroom influenced the respondents’ adoption of the tool. If the features of the virtual classroom influenced its adoption, then the respondents proceeded to Question six where they made selections from a list of fourteen features in the virtual classroom that influenced their adoption of Wimba. Question seven was a Likert Scale
question on the frequency of using the virtual classroom features. Each feature was rated on a five point Likert Scale that went from All the time (5) to Never (1). In Question eight, Faculty rated the Wimba virtual classroom on the different characteristics of innovation using a four point Likert Scale ranging from Strongly Agree (4) to Strongly Disagree (1). In the last question in this section, faculty classified themselves using the model of diffusion as a multiple choice question. The next section of the survey contained questions on gender, age, rank, teaching experience, and Wimba use.

3.2 Follow-up interviews

Semi-structured interview questions were used to expand the survey results and to elicit responses from instructors about how they use Wimba. The interview protocol contained these questions.

- What are the benefits/disadvantages of using the Virtual Classroom?
- What courses do you teach using the Virtual Classroom?
- How do you use the Virtual Classroom in your class(es)?
- How do you use the features of the Virtual Classroom?
- Is there anything that you would like to add?

3.3 Survey respondent profile

There were 5 male and 18 female participants. Most of the respondents were Assistant Professors and Lecturers (3 full-time and 4 part-time lecturers), had been in the profession at least five years, were over thirty years of age, and used Wimba for two or more semesters. Table 1 presents the profile of the 23 participants. The respondents varied in terms of their academic unit, with most coming from Education and Nursing (See Table 2).

Table 1: Survey respondent profile

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Table 2: Survey respondents by department or academic unit

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<th>Department/Unit</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>School of Nursing</td>
<td>7</td>
</tr>
<tr>
<td>Educational Leadership</td>
<td>4</td>
</tr>
<tr>
<td>Instructional Technology, Foundations and Secondary Education</td>
<td>3</td>
</tr>
<tr>
<td>Elementary, Middle Level, and Literacy Education</td>
<td>2</td>
</tr>
<tr>
<td>English</td>
<td>1</td>
</tr>
<tr>
<td>Geography and Geology</td>
<td>1</td>
</tr>
<tr>
<td>Information and Systems Operations</td>
<td>1</td>
</tr>
<tr>
<td>Management</td>
<td>1</td>
</tr>
<tr>
<td>School of Health and Applied Human Sciences</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
</tr>
</tbody>
</table>
4. Results

Research Question 1: What factors and features influence faculty adoption of the Wimba Virtual Classroom?

Faculty reported that a combination of factors influenced their adoption of Wimba. Institutional support (M=3.13) and Institutional Resource Availability (M=3.26) had the highest mean among the Organization factors. Promotes Social Presence among Students (M=3.09) and Promotes Sense of Community (M=2.96) were highly rated among the Social Factors. Improving teaching (M=3.30) and Enhancing Student Learning (M=3.65) had the highest average among personal factors. The ease of setting up Wimba (M=3.74) and the availability of technology had the highest means when considering technological factors. The availability of Wimba was the most influential (M=3.91) aspect in faculty deciding to adopt this technology among all the items, irrespective of categorization (e.g., organizational, social, etc.).

Table 3: Factors that Influenced Faculty in their Decision-making Process of Adopting Wimba

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
<th>M ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Very Unimportant</td>
<td>1</td>
</tr>
<tr>
<td>Organizational</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mandate</td>
<td>30.4</td>
<td>43.5</td>
</tr>
<tr>
<td>Reward availability</td>
<td>30.4</td>
<td>8.7</td>
</tr>
<tr>
<td>Institutional support</td>
<td>4.3</td>
<td>34.8</td>
</tr>
<tr>
<td>Institutional Resource Availability</td>
<td>8.7</td>
<td>21.7</td>
</tr>
<tr>
<td>Social</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peer support</td>
<td>17.4</td>
<td>26.1</td>
</tr>
<tr>
<td>Peer Pressure</td>
<td>26.1</td>
<td>8.7</td>
</tr>
<tr>
<td>Promotes Sense of community</td>
<td>0.0</td>
<td>47.8</td>
</tr>
<tr>
<td>Promotes Social Presence</td>
<td>0.0</td>
<td>43.5</td>
</tr>
<tr>
<td>Personal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personal preference</td>
<td>8.7</td>
<td>47.8</td>
</tr>
<tr>
<td>Personal Motivation</td>
<td>4.3</td>
<td>43.5</td>
</tr>
<tr>
<td>Reduced travel time to campus</td>
<td>21.7</td>
<td>13.0</td>
</tr>
<tr>
<td>Reduced travel cost</td>
<td>26.1</td>
<td>17.4</td>
</tr>
<tr>
<td>Reduced face-to-face lessons</td>
<td>21.7</td>
<td>8.7</td>
</tr>
<tr>
<td>Importance of synch. interaction</td>
<td>4.3</td>
<td>34.8</td>
</tr>
<tr>
<td>Improving my teaching</td>
<td>0.0</td>
<td>34.8</td>
</tr>
<tr>
<td>Enhancing student learning</td>
<td>0.0</td>
<td>17.4</td>
</tr>
<tr>
<td>Technological</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Availability of technology</td>
<td>0.0</td>
<td>4.3</td>
</tr>
<tr>
<td>Easy to set up</td>
<td>0.0</td>
<td>13.0</td>
</tr>
<tr>
<td>Easy to use</td>
<td>0.0</td>
<td>17.4</td>
</tr>
<tr>
<td>My expertise with technology</td>
<td>4.3</td>
<td>43.5</td>
</tr>
</tbody>
</table>

Sixteen faculty indicated that the features of the Virtual Classroom influenced their adoption of the technology. Of these faculty 60.9% said archiving the session, 43.5% stated hand-raising and 43.5% said audio chat influenced adoption. Guest access (17.4%) and downloading the archive as a MP3 (4.3%) were the least reported features influencing faculty adoption of Wimba.

Research Question 2: How do faculty rate the Wimba Virtual Classroom on the characteristics of innovation?

Respondents rated Wimba as advantageous compared to other teaching methodologies and compatible with their existing values, needs, and experiences. These items were rated higher than the other characteristics of innovation. The average ratings were 3.04 and 3.00, respectively.
Table 4: Features in the Wimba virtual classroom that influenced faculty adoption

<table>
<thead>
<tr>
<th>Tool</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Text chat</td>
<td>9</td>
<td>39.1</td>
</tr>
<tr>
<td>Audio chat</td>
<td>10</td>
<td>43.5</td>
</tr>
<tr>
<td>E-board</td>
<td>8</td>
<td>34.8</td>
</tr>
<tr>
<td>Polling</td>
<td>7</td>
<td>30.4</td>
</tr>
<tr>
<td>Hand-raising</td>
<td>10</td>
<td>43.5</td>
</tr>
<tr>
<td>Emoticons</td>
<td>6</td>
<td>26.1</td>
</tr>
<tr>
<td>Archiving the session</td>
<td>14</td>
<td>60.9</td>
</tr>
<tr>
<td>Application sharing</td>
<td>6</td>
<td>26.1</td>
</tr>
<tr>
<td>Sharing weblinks</td>
<td>5</td>
<td>21.7</td>
</tr>
<tr>
<td>Breakout rooms</td>
<td>5</td>
<td>21.7</td>
</tr>
<tr>
<td>Viewing the webcam</td>
<td>7</td>
<td>30.4</td>
</tr>
<tr>
<td>Downloading the archive as MP3</td>
<td>1</td>
<td>4.3</td>
</tr>
<tr>
<td>Guest Access</td>
<td>4</td>
<td>17.4</td>
</tr>
<tr>
<td>Listening to the audio via phone</td>
<td>6</td>
<td>26.1</td>
</tr>
</tbody>
</table>

Table 5: Faculty perceptions of Wimba based on the characteristics of innovation

<table>
<thead>
<tr>
<th>Characteristics of Innovation</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advantageous over current ways of teaching</td>
<td>1 Strongly Disagree 2 3 4 M ± SD</td>
</tr>
<tr>
<td></td>
<td>0.0 21.7 52.2 26.1 3.04±.71</td>
</tr>
<tr>
<td>Compatible with values, needs and experience</td>
<td>4.3 8.7 69.6 17.4 3.00±.67</td>
</tr>
<tr>
<td>Is simple to use</td>
<td>0.0 26.1 21.7 21.7 2.96±.71</td>
</tr>
<tr>
<td>Available for experimentation</td>
<td>0.0 17.4 69.6 13.0 2.96±.56</td>
</tr>
<tr>
<td>Was observable to potential adopters</td>
<td>4.3 26.1 60.9 8.7 2.74±.69</td>
</tr>
</tbody>
</table>

Research Question 3: How would you classify yourself regarding technology using the model of diffusion?

More respondents classified themselves as among the first individuals to adopt an innovation (39.1%), followed by the second fastest category of individuals who adopt an innovation (34.8%) and then “adopt an innovation after a varying degree of time” (21.7%). One person selected “adopt an innovation after the average member of the society” (4.3%).

Research Question 4: How is faculty using the Wimba Virtual Classroom features?

How often do you use these virtual classroom features?

Table 6 reports the respondent’s frequency of using the virtual classroom features. Archiving the session is the most frequently used feature, followed by audio chat, hand-raising, and text chat. Guest access, downloading the archive as MP3, and breakout rooms were the least used unanimously.

Interview Respondent profile

Six participants were interviewed regarding their perceptions and use of the virtual classroom. Three participants were from the nursing school and three participants were from the school of education. One participant taught only graduate courses, two participants taught undergraduate and graduate courses, and
three participants taught only undergraduate courses. Five of the participants were female and one participant was male.

![Figure 3: Faculty adoption of technology](image)

**Table 6: Frequency of use of virtual classroom features**

<table>
<thead>
<tr>
<th>Features</th>
<th>Percentage</th>
<th>NEVER</th>
<th>%</th>
<th>ALL THE TIME</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Text chat</td>
<td></td>
<td>13.0</td>
<td>8.7</td>
<td>26.1</td>
<td>21.7</td>
</tr>
<tr>
<td>Audio chat</td>
<td></td>
<td>13.0</td>
<td>0.0</td>
<td>30.4</td>
<td>26.1</td>
</tr>
<tr>
<td>E-board</td>
<td></td>
<td>17.4</td>
<td>8.7</td>
<td>30.4</td>
<td>17.4</td>
</tr>
<tr>
<td>Polling</td>
<td></td>
<td>43.5</td>
<td>13.0</td>
<td>17.4</td>
<td>17.4</td>
</tr>
<tr>
<td>Hand-raising</td>
<td></td>
<td>8.7</td>
<td>8.7</td>
<td>34.8</td>
<td>13.0</td>
</tr>
<tr>
<td>Emoticons</td>
<td></td>
<td>26.1</td>
<td>13.0</td>
<td>26.1</td>
<td>17.4</td>
</tr>
<tr>
<td>Archiving the session</td>
<td></td>
<td>0.0</td>
<td>0.0</td>
<td>39.1</td>
<td>13.0</td>
</tr>
<tr>
<td>Application sharing</td>
<td></td>
<td>30.4</td>
<td>30.4</td>
<td>13.0</td>
<td>26.1</td>
</tr>
<tr>
<td>Sharing weblinks</td>
<td></td>
<td>30.4</td>
<td>21.7</td>
<td>8.7</td>
<td>21.7</td>
</tr>
<tr>
<td>Breakout rooms</td>
<td></td>
<td>56.5</td>
<td>17.4</td>
<td>8.7</td>
<td>0.0</td>
</tr>
<tr>
<td>Viewing the webcam</td>
<td></td>
<td>43.5</td>
<td>4.3</td>
<td>13.0</td>
<td>8.7</td>
</tr>
<tr>
<td>Downloading archive as MP3</td>
<td></td>
<td>60.9</td>
<td>21.7</td>
<td>4.3</td>
<td>4.3</td>
</tr>
<tr>
<td>Guest Access</td>
<td></td>
<td>52.2</td>
<td>34.8</td>
<td>4.3</td>
<td>4.3</td>
</tr>
<tr>
<td>Listening to audio via phone</td>
<td></td>
<td>52.2</td>
<td>4.3</td>
<td>26.1</td>
<td>8.7</td>
</tr>
</tbody>
</table>

Here are direct quotes from interviewees on how they use Wimba in their specific courses:

“Nursing school has an entirely online program in different parts of the state. So if students are not located here, this synchronous setting works great.” –Instructor of Community Health Nursing, an undergraduate online course

Wimba helps to engage students more using polling. Those who do not answer in face to face class also respond but hard to gauge their knowledge by not being able to see their confused look if they have questions or not.” –Instructor of Instructional Design (School of Education), an undergraduate hybrid course

It helps students login from anywhere and have the freedom of place. Video, sense of being in the room, and ability to share applications and presentations are some of the advantages of
using Wimba. Some of the drawbacks are it has only one video feed, difficulty for students to log in, one student had to call in at times” – Instructor of Computer Applications in Education a graduate online course

“Online students can hear/see each other. Adds to the social community. Even with technical difficulties the students seem to really like it for these uses.” – Instructor of Technology for School Administrators a graduate online course

Interview data regarding the virtual classroom is summarized below. Three out of six participants interviewed indicated that one advantage of incorporating virtual classroom software is it can be accessed from anywhere. Two of the seven faculty members mentioned another advantage of incorporating the virtual classroom tool into fully online courses is that it can enhance student’s connection to campus and adds a social aspect to the course unattainable through asynchronous tools. One faculty member mentioned that different students participate in this format more than students that participate in the asynchronous or face to face format only. Another faculty member mentioned that the live classroom engages students more.

The two major disadvantages mentioned by the participants were the fact that this particular virtual classroom software only allows for one video feed, and that they are at a loss for what to do when students or instructors have technical difficulties. Each of these disadvantages was mentioned by two of the participants. One instructor gave an example of how their audio/microphone went out during the middle of a live session. The only resolution that the instructor could implement was to call a student and have them relay what the instructor was saying to the rest of the class. Another instructor mentioned how difficult it was to read the students and change instructional strategies during class because one cannot see if there is confusion by reading facial expressions.

The virtual classroom features used by the participants were loading PowerPoint files to share, sharing websites, whiteboard, breakout rooms, polling questions, application sharing, website sharing, text chat, and interactive buttons such as hand raising. Five out of six of the participants were using the virtual classroom as a synchronous tool for live meetings. The other participant was using the virtual classroom as an asynchronous tool by recording lectures and allowing students access to the archive recordings. Other participants allowed students to access the archives for further clarification of content or to make up attendance for missed live sessions.

5. Discussion

Several studies revealed that intrinsic factors are stronger motivators than extrinsic factors for faculty participation in online education and use of technology (Maguire, 2005; Parker, 2003; Wilson, 1998). However in the current case study extrinsic technological factors such as availability of technology, ease of set up and ease of use, were rated the highest by faculty adopting the Wimba virtual classroom. This is consistent with the Groves and Zemel (1999) survey, which rated equipment availability and student learning as the most important factors for influencing faculty to adopt technology.

Hannafin and Savenye (1993) reported that the fear of failure in using the technology has been an initial barrier to technology adoption. Faculty may be experts in their discipline and not in the technology that they use to teach. Faculty may be afraid that technology will be difficult to use and fearful that they will be unable to use the technology in front of their students and colleagues (Byron, 1995; Beggs, 2000). This is evident from the results of this case study where more than 80% of the respondents mentioned that they prefer to adopt the virtual classroom based on the factors of easy to set up and ease of use. About 43% also mentioned that their expertise with technology played a role in them adopting Wimba. Wimba has an initial learning curve for the synchronous class sessions to be delivered smoothly without interruptions. Even if a faculty member has mastered the technology, there is always the possibility of internet disconnection, system crashing, or a feature malfunctioning and this might interrupt live class delivery. Paige et al. (2011) reported that the faculty is frustrated with synchronous classrooms because of their limited technology knowledge and their inability to help students when they get disconnected. They also found that faculty emphasized the importance of high speed internet connection and up to date computers for the synchronous virtual classrooms to function smoothly. Faculty might also be hesitant to use the complex features such as a desktop sharing, breakout rooms, video conferencing etc. if they are not confident of the technology and the internet connection.
Among the personal factors, interest in enhancing student learning and interest in improving teaching were rated the highest. Faculty members are concerned with their teaching and want to use Wimba to enhance instruction. A recent investigation of faculty technology adoption, with various modalities, led to the same conclusions about personal interest in teaching and learning (Yen, Wu, Cheng, & Huang, 2010). This corresponds with Beggs (2000) who surveyed faculty and found that improved student learning was rated important by 96.8% of the participants. In prior research, personal motivation to use technology (Lee 2001; Schifter, 2000) was rated low compared to the availability and complexity of the technology. In this case study personal motivation was a factor in the absence of mandates from the university and peer pressure.

Features that influenced adoption of Wimba and Frequency of use

Sixteen of the 23 faculty surveyed stated that the features of the Wimba virtual classroom influenced their adoption. The archiving, audio and text chat, and hand raising were the most used features. This is consistent in the Paige et al. (2011) study where audio chat, text chat and hand raising were used in every Elluminate synchronous virtual classroom session. Archiving the session was reported as the most frequently used feature, followed by audio chat, hand-raising, and text chat. Archiving in a traditional classroom involves videotaping the class lecture and making it available for the students to re-watch. However, in the Wimba room the lecture can be archived by clicking a button. Students can watch the lecture any number of times and see all the interaction that occurred in the classroom, and watch only the portions that they want. It also makes it possible for instructors to observe and reflect on participation patterns (Arbaugh, 2000) and note modifications for subsequent lectures. Rockinson-Szapkiw and Walker’s (2009) description of the use of virtual classrooms in counseling predominately involved archives, audio, and text chat among other features. Class sessions were recorded for students to review and discuss archives of their role-play scenarios. Meanwhile the chat features facilitated student interaction as if they were face to face.

The hand-raising option allows students to get the instructors attention at any time during the synchronous class. It also can be used as a strategy for calling on students or identifying students to perform different activities in the Wimba room. The audio and text chat features allows class participants to chat with one another as a whole class or individually. The audio chat is only available for the whole class in Wimba. The instructor or students can speak to the entire class via audio. Text chat messages can be sent to the entire class or specific individuals privately.

Audio Chat is an important tool for interaction and helps student-student and student-instructor interaction (Zhang, 2009; Malik, 2010; Author & Author, 2010). Audio chat is used mostly in cases where the class sizes are smaller and a live interaction can be maintained. Students can not only talk to their instructor but also to their peers. Zhang (2009) reported that the audio chat option is very convenient because students can ask questions and get an immediate response. Audio chat is also helpful for understanding the speakers intended meaning because inflection and tone can be heard in voices that are not present in text. Text Chat also helps to maintain the interaction in the virtual classroom. The advantages are that it can be used even in large class sizes, and students who are shy and do not want to talk out loud using the microphone can still interact by typing their questions or comments. The instructor gets multiple responses and he/she can read and reply to student’s contributions.

Less used features

Downloading the archive audio as a MP3 and guest access were reported as having the least influence on faculty adoption of Wimba. Downloading the archive as MP3 is a new feature that not many of the instructors have used. Moreover to get the full experience of the Wimba archive students need to be on a computer to watch the video rather than just download the audio. They can listen to and watch the archive directly on the computer without downloading the archive as MP3. The guest access feature is not used much in regular class settings which may be the reason it was a less used feature in this case study. However, it is helpful while inviting guest speakers or conducting meetings where people from different locations can meet to talk. In this case study, faculty had not used breakout rooms much. Break out rooms allow the facilitator to split the class into small groups in their own virtual classrooms to complete group work. This is a complex feature compared to other features and faculty may be less inclined to try it especially without prior training. Depending on the content that is taught, the class size, and the activities that are conducted breakout rooms may or may not be used (Rockinson-Szapkiw & Walker, 2009; Arbaugh, 2000). In the Paige et al. (2011) study, desktop sharing,
application sharing, polling, breakout rooms, quiz manager, closed captioning, web tour and use of webcams were the less used features in the elluminate synchronous virtual classroom. These are all complex features that require some advanced knowledge of the virtual classroom. The campus that was studied in this case are only in the fifth year of adoption which may account for the little use of these advanced features. The participants of this study mainly use the virtual classroom to conduct lectures and class discussions.

Wimba and the characteristics of innovation

Faculty rated Wimba high on all five different characteristics of innovation–relative advantage, compatibility, complexity and trialibility. In this case study, though none of these characteristics were rated extremely high, they were all rated close to M=3.00 at the agree level.

Relative Advantage. The nature of innovation determines what specific type of relative advantage is important to adopters (Roger, 2005). Wimba has advantages over traditional ways of face to face teaching. Some of the advantages are that faculty are able to use Wimba not only in the online courses but also in their blended courses, to add flexibility in course delivery. They are able to offer virtual office hours. Online students are able to participate in the classes without having to come to campus and the students can collaborate with their peers from their current location (Author & Author, 2010). Some of the other advantages are that synchronous virtual classroom enhances student-to-student and faculty-to-student interaction, enables student-centered teaching approaches, provides opportunities to provide immediate feedback to students and clarify their understanding of instructional content. The advantages are consistent with Shin (2003) who defines transactional presence as the degree to which a distance student perceives the connectedness of the teacher, other students, and the institution.

Compatibility. Faculty considered Wimba to be compatible with other teaching methods. Faculty are able to replicate similar teaching strategies from a face to face classroom within the Wimba room. Faculty are able to call on students, get responses from them immediately, and also do group activities with them. Wimba included similar features (Whiteboard, Text chat, Audio chat, Desktop Share, Breakout rooms, Video chat, Archive, Use emoticons, etc.) as the ones compared between Breeze and Elluminate and is compatible with the other synchronous virtual classrooms (Schullo, Hilbelink,Venable & Barron, 2007). Wimba synchronous virtual classroom system is compatible within existing course management systems such as Blackboard. The Wimba system at this university was integrated with in the Blackboard course management system.

Complexity. In terms of complexity, if an innovation is too difficult to use an individual is less likely to adopt it. Similar to the models proposed by Yen, Wu, Cheng, and Huang (2010), faculty considered ease of use, and ease of set up as important factors for virtual classroom adoption. Wimba is an easy to learn and easy to use tool and faculty were able to use this tool with minimal training. The interface was instutitive enough for both students and faculty to learn the different features. It was noticed that the students felt comfortable navigating the tool from the second class period.

Availability. Wimba is available for faculty to experiment free of charge at the university and they can use it without having to pay any extra cost as the overhead was paid by the university. There was no restriction on the number of rooms that each faculty can use, how long they can use, or how many people can login to each room simultaneously. The Wimba rooms were also available for students to login on their own. Students and faculty also had options to login to the Wimba room using the toll free number, which was beneficial if they were not near a computer. The archives also made it possible for the users to watch the lectures that they might have missed watching in real time. These options might have had the faculty agree on this characteristic of the innovation.

Observability is the extent that an innovation is visible to others. An innovation that is more visible will drive communication among the individual’s peers and personal networks and will in turn create more positive or negative reactions. At this university, only about 10% of the faculty use virtual classroom tool in their courses. Though there was encouragement from the office of elearning, there was still not a visibility at all levels to use this tool. This characteristic of innovation was rated the lowest among the five.

Faculty Classification on technology
More than half of the faculty identified themselves as an innovator or an early adopter of the Wimba technology. Innovators are the first individuals to adopt an innovation and early adopters are the second fastest category of individuals who adopt an innovation. Currently, instructors opt to use this product instead of being required. Innovators are very eager to try new ideas and are able to cope with high degrees of uncertainty about a new innovation at the time of adoption. The Innovator is often less respected in the social system but they play the important role of introducing the new innovation to the social system. The early adopters are highly respected within the social system and are often the opinion leaders. Other potential adopters seek advice from individuals about adoption of new innovations (Rogers, 2003; Yohon & Zimmerman, 2006). In Yohon and Zimmerman’s (2006) study on adoption of software and hardware by faculty they reported that although opportunities to learn technology through workshops and seminars were available faculty members preferred more informal learning opportunities such as talking to other faculty. This may be the case for further Wimba adoption at this University and other institutions. Even though university incentives, such as stipends and workshops may exist its necessary for faculty to take the initiative when using new software in their courses (Trentin, 2006).

The interview data highlighted advantages and disadvantages of using virtual classrooms that have previously been discussed in the literature (Author & Author, 2010, Brannon & Essex, 2001). The description of archive use corroborates the survey findings, as a tool that facilitated adoption and is commonly used. The participants in this case study generally used the Wimba presentation feature to deliver course content regardless of whether the session was recorded or not. In contrast Rockinson-Szapkiw and Walker (2009) discussed more interactive instructional approaches using analogous software. It would seem as though both nursing and education instructors would use similar practices based on the human development aspect of these professions. Developing virtual classroom pedagogy that focuses on various kinds of interaction may prove helpful. While the instructors in this case study identified themselves as innovators and early adopters of the virtual classroom, they may still be at initial stages of discovery and use. It may be recommended that instructors become proficient with the frequently used features—prior to teaching within the virtual classroom—and moving on to more advanced features. Training on the least used, or more complex, features of the virtual classroom such as breakout rooms and MP3 downloads may promote further student engagement and facilitate attainment of course objectives.

Limitations and Future Research

The findings of this case study are based on faculty at one institution and are subject to biases inherent in self-report data. The list of factors or virtual classroom features that were investigated may not be exhaustive. There may be other considerations for faculty adoption that were not covered in the survey. It is important to note that interviewees were selected based on their response to the invitation and availability. While only two disciplines (nursing and education) are represented in the interview data, they are on the cutting-edge in terms of technology use at this institution. The results are not representative of faculty using virtual classrooms or e-conferencing software. It is recommended that research akin to this case study be conducted with a larger sample to determine the generalizability of the results and to determine the internal consistency reliability of the instrument. Adequate sample size for subgroups would facilitate analyses of demographics (e.g., tenure status, faculty rank) and institutional characteristics (e.g., school size, Carnegie Classification) in order to investigate differences. Future research may also examine which types of courses are best suited for Wimba instruction in terms of method of delivery (integrated, blended, networked learning) and format (lecture, seminar). Specific information about the use of features (e.g., content analysis of audio and text chat sessions, the use of emoticons) may provide details about instructor and student interactions within the virtual classroom. Researchers should also assess and explore the impact of computer-mediated teaching and learning strategies (Kilpatrick, 2010).

6. Conclusion

Data from this case study was collected from one institution which has a strong emphasis on teaching excellence and is progressively moving into the online arena. Although the sample size is small this is reflective of the number of innovators and early adopters. Typically there are few faculty that utilize innovative technology (Yohon & Zimmerman, 2006). The survey data provided information on what influenced Wimba adoption, while the interview data described instruction. Although a subset of features led to Wimba adoption and are used frequently, perceived ease of use and usefulness of the technology may impel its use.
Descriptions of virtual classroom use provide meaningful information for administrators interested in promoting technology enhanced learning on their campuses and for faculty considering adoption. Based on the results of this case study, administrators can promote the factors and features that influence decision making to adopt the tool. Based on the interviews in this case study, administrators can also describe the ways how other faculty are using these tools in their classroom, and how beneficial it can be if adopted. This will open doors for adoption of synchronous virtual classroom.

References


Examining Online College Cyber Cheating Methods and Prevention Measures

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Abstract: Academic dishonesty in the online cheating environment of distance education learning has gained traction in the past decade. By a few simple keystrokes, students’ can find a wide array of online services for hire to write research papers, complete homework assignments, or enroll on behalf of the student on record to take the entire online course. While institutions in higher education have seen online learning as a vehicle to increase student enrollments adding to their bottom line, the number of Internet cheating companies to support academic dishonesty has also increased sustainability. Challenges dealing with academic dishonesty in the online area have become more rampant, leaving faculty and college administrators at odds how to prevent such behavior in both traditional and online classes. Finding new tactical tools to prevent cheating but more importantly providing students with an ethical and moral framework why academic dishonesty jeopardizes their future as a productive member of society.

Keywords: e-cheating, turnitin.com, writecheck.com, plagiarism, face-to-face, online

1. Introduction

The growth in online education over the last few years has been exacerbated by a competitive academic environment (Trenholm, 2007). The growth in online education presents both financial rewards for institutions and academic challenges. Given the autonomy of the students and their separation from the instructor, the ability to engage in cheating is inherently easier. Cheating is defined by King, Guyette a transgression against academic integrity which entails taking an unfair advantage that results in a misrepresentation of a student’s ability and grasp of knowledge” (p4). Cheating is also “referred to as academic dishonesty” (Trenholm, 2007, p. 284). Raines, Ricci, Brown, Eggenberger, Hindle, & Schiff (2011) conducted a qualitative study to determine the definition of cheating in the online environment from a student’s perspective. Students defined cheating in an online class as going against university policy, benefiting from someone else’s work and not using your own brain to get an unearned grade (Raine D.A., Ricci, P. Brown, S.L., Eggenberger, T. Hindle, T. & Schiff, Mara, 2011). Raines and his colleagues found some students did not consider any actions to be cheating unless the dishonest behavior in terms of cheating unless they were caught.

Bricault’s (2007) “Academic Dishonesty” provides a backdrop on various topics pertaining to cheating, legal issues and courses of action against such behaviors. Information access on the Web sharing via the Internet, dissemination makes cheating in an asynchronous online environment easier than in a traditional face-to-face classroom. Scanlon (2003) recognized that information technology has increased a student’s ability to plagiarize written assignment. However, Scanlon felt teachers should take on the role of educator initially in cases of academic dishonesty. By reviewing and clearly articulating a school’s academic dishonesty policy, teachers could positively affect a behavioral change. After educating students, institutions should use plagiarism detection software and innovative assignments to further mitigate technology enhance plagiarism. This is acceptable for first-time offenders, but repeat offenders should be dealt with differently; otherwise, students will continue to take the same online class and find new ways to cheat. This is especially true if the student feels there is no accountability is required when caught cheating the first time around. Additionally, instructors will become frustrated when the institution does not provide support to the instructor’s actions against cheating in the online environment. The lack of face-to-face interaction, including tone and facial expression during communication, must be made up for in the online environment; otherwise, students will not view cheating in such a negative light and think that perhaps the next time they do it the same actions-
rather than harsher actions will be taken. Take for example an English Language Learner at a two-year career college. He copy and pasted his final research paper directly from key Web sites provided by a simple Google search. When confronted, he said he didn’t know. The campus was concerned that if the school kicked him out of school for the incident they would be accused of racism. Instead, they allowed him to continue his online classes. He took the same class with the same teacher two more times. Each time, he was caught plagiarizing. He is now in his fourth year at the same school and in the same program. He is no closer to graduation than he was two years ago and his behavior continues a downward spiral. Caught cheating a third time, he swore at his teacher to the point she felt threatened.

However, Stuber-McEwen, Wisley and Hoggatt (2009) found that online students are less likely to cheat compared to traditional face-to-face students. Even though a few studies suggest that online students are less likely to cheat; the methods used to cheat are more complex and varied. Student perception of cheating behavior, attitudes, values and beliefs all must be taken into account. “dishonest behavior usually take the form of self-reporting. Perhaps, online students underreport their cheating behavior, which in-turn may distort the comparison results. Thus, the methods deployed to prevent cheating must be creative and deliberate.

Whether cheating in a face-to-face environment, or in an online environment student cheating behaviors appears to center around a recurrent theme. The “desire to get ahead” (Simkin, & McLeod, 2009, p.441) is the most common explanation for cheating. Other explanations students report includes the desire to help others, procrastination, the need to pass the class, course difficult, it doesn’t matter if I cheat, or cheating is easy (Christe, 2003; Owunwanne, Rustagi, & Dada (2010). Anderman, Cupp and Lane (2010) linked impulsiveness to academic dishonesty. In a virtual environment, there is a sense of disconnect that can easily be interpreted for an attitude that the student won’t get caught, the instructor isn’t actually there, the instructor won’t notice, or the instructor just doesn’t care. The more impulsive a student is the more likely they are to be academically dishonest.

Students, who decided not to engage in cheating, cite a higher moral compass for their positive behavior (Simkin et al, 2009).

Students recognize cheating is wrong; however there are individual and situational factors which influence students’ decisions to act academically dishonest. Individual influences include motivation, both intrinsic and extrinsic. Cramer (2009) discussed, “neutralizing attitudes” (p.295), and a culture of cheaters where value systems and moral behavior of students to complete. Intrinsic motivation includes the desire to learns and gain more knowledge while extrinsic motivation includes grades and recognition. Procrastination is key here, though. Although students may be motivated intrinsically, if they procrastinate, they will resort to extreme measures to submit assignments by the deadline to stay in class. They may begin thinking they’ll only do it once to get by, but the procrastination continues and they find themselves in a pattern to beat the clock. It isn’t like a traditional classroom environment where they must set aside a day and time to devote to lectures and studies. When students are faced with situations where others are cheating, or experience peer pressure their propensity to cheat is magnified (Rettinger & Kramer, 2009).thics also play a large role in how student perceived cheating. Ethics are shaped by an individual’s value system and core beliefs (Owunwanne, Rustagi, & Dada, 2010). If based on a student’s ethical code, cheating is a justified means to an end, then some students may feel cheating behavior is warranted. To justify cheating behavior some student use neutralizing attitudes. Again, I think it has a lot to do with the fact they can’t see a teacher’s disappointed face when they meet to discuss the incident. They don’t necessarily have the same type of respect for their online teachers because they usually never meet them face-to-face. That’s why personalizing the online learning environment is so important. Instructors need to call students, let them hear their voices, upload photos, personalize class and activities to make it “real” to students.

When the internet was in its infancy stage, pilot online college courses were being developed and administered (Grenier-Winter, 1999). Grenier-Winther (1999) expressed concerns about many issues including; pedagogy, time management, student isolationism, new technology instruction, security and copyright infringement in the delivery of online education. Grenier-Winther (1999) also mentioned that assessments would need to be password protected. However, students could easily share the passwords which compromise the integrity of the assessment. An alternative to this is to change the password on a regular basis. If the password constantly changes, the student must put more effort into cheating by arranging
someone else to take the test at a specific time and within the password’s window of validity. This also applies to using timed assessments.

Actual situation: An instructor in an introductory Spanish class at a two-year community college required one-on-one phone conversations with her students during the first week of class. These phone conversations were recorded. When it came time for an assessment, the student was required to call the instructor at a predetermined time for the password. The instructor gave the password only if she recognized the voice as that of the student’s. The student then had a set amount of time to take the assessment (less than 90 minutes) before the password expired, the session timed out, and the student failed to pass the assignment.

Another situation: In math and sciences classes where students work out mathematical equations, they must complete the graded activities via screenshare technology and using a web cam. The sessions are recorded as proof the student completed the activity. The instructor is able to watch the student on the web cam work out the problem either via a shared screen or an interactive white board within the Web meeting room. Courses offered completely online have been around for more than 10 years but concerns about academic dishonesty still exist.

2. Brief literature review of e-cheating in college studies

Etter, Cramer & Finn (2007) compared two distinct student populations to assess their perception on cheating with information technology. One group of students was a private religion affiliated university and the other was a regional research institution. The sample size for the students from the religion affiliated college was 237 students and 202 students for the regional research institution. The student at the church-affiliated indicated that cheating was more offensive compared to the students at the regional research institution. King, Guyette & Piotrowski (2009) also conducted a study to gauge the attitudes of undergraduate students about using technology to cheat online as compared to traditional classroom. Of the 121 undergraduate students at least 73% of the students felt it was easier to cheat on line. However, when here was a written policy against cheating or academic dishonesty the percentage who felt that cheating was appropriate declined significantly (King et al 2009).

Stuber-McEwen, Wiseley, & Of the 225 students 87 were traditional of face-to-face. Of the 225 students 87 were traditional or face-to-face students and 138 were online. The purpose of the study was to determine if students cheated more online or in traditional face to face classes. The results of the study suggest that students cheated in traditional classes as compared to their counterparts in online institutions. The reasons cited for dishonest behavior on online classes was the distance from other students and the teachers. Student reported a feeling isolated and disconnected from the learning environment. They also begin to feel frustrated when they don’t get the help they immediately need. A student may log into class at 11:00 p.m. on Saturday night to attempt all work for the week. When s/he has a question about the material or assignment, the student is frustrated when an immediate answer is not readily available. If the due date is that night, the student may feel inclined to cheat in order to resolve the situation.

Watson & Sottile (2010) conducted a study of 635 students to find out if students cheated more online or in face-to-face classrooms. Of the 635 students, 451 were female and 175 were male. The remaining 9 students did not report their gender. The results were separated into three sections: self-reported, knowledge of other student cheating and perception of academically dishonest behavior. Over 30% of the students admitted that they cheated on both environments. However, the differences between cheating online and face-to-face were not statistically significant at <.05. Students also admitted that they were more than 4 times as likely to cheat in an online class when compared to face-to-face classes (Watson & Sottile, 2010). Kidwell and Kent (2008) utilized a research instrument created in the United States, by McCabe and Trevino (1993) to ascertain whether students in Australia cheated more in an online classroom when compared to face-to-face classes. Surveys were randomly sent to 1500 students. Only 459 returned surveys were usable with 210 composed of face-to-face students and 248 being online students. The results of the study suggested that online students cheated less that face-to-face student which contradicted prior studies.

Mirza & Staples (2010) wrote about using webcams as an innovative method to reduce or eliminate cheating by nursing students taking an on-line course. Students were required to purchase a webcam and participate in a practice exam session to gain proficiency prior to taking their actual exam. Courses with labs often do this,
too (for example: a biology class may include a mandatory dissection in front of a webcam) After completing the exam the 44 students were given a survey which asked how they felt while being constantly monitored. Students reported that they were less likely to cheat; felt uncomfortable but only 19 thought this webcam would prevent cheating. Webcam use in online examination for higher education is new but state exams such as insurance licensing agencies use webcam to monitor all individuals who take the exam. Instructors can also require students to hold school ID badges or government issued IDs up to the webcam to ensure it is the actual person and not someone else taking the assessment.

Comas-Forgas and Sured-Negre (2010) conducted a study to determine why student choose to plagiarize. The study had both a qualitative and quantitative component. The study was given to 727 randomly selected undergraduate students. Only 19 of the survey were unusable. There were there 4 questions which receive the most responses out of the 16 questions asked. The following reasons why students plagiarize were cited by over half of the students surveyed. The four primary reason students gave for plagiarizing were easy access to information, not enough time, procrastination and too many assignments to complete. For the qualitative part of the study a focus group was conducted. Three major theses that led to Plagiarism were identified. The first reason cited was student behavior, the second was teaching staff causes and finally the internet explosion. The majority of the responses were against teachers. Students cited that a teacher’s behavior and attitudes as the primary reason students plagiarize.

Reasons students choose not to cheat in college give insight to how honest students are about cheating behaviors. Miller, Shoptaugh and Wooldridge (2011) surveyed 1,086 undergraduate and graduate students to link reasons why they did not cheat with how much they cheated. When the reason for not cheating dealt with the fear of getting caught, these students report more incidence of cheating behavior. However, when students reported that they chose not to cheat because of values and integrity, they reported less instances of cheating behavior (Miller, Shoptaugh & Wooldridge, 2011). Online courses need to be designed in such a way that activates intrinsic learning desires. This is the best way to avoid plagiarism and situations involving cheating because the student wants to learn and apply the knowledge to their academic, personal, and/or professional worlds.

3. Cheating in an asynchronous online environment

Students have many options when it comes to receiving unethical assistance in the online class environment. Rowe (2010) cited three common methods students used to cheat in online courses. Students wait to take their assessment so they could get answers from others, students retake assessments based on false claims and students received unauthorized assistance during exams (Rowe, 2010).

4. Online cheating methods

The following sections address online cheating methods, however in face-to-face classes students look at each other’s exams, send signals, or exchange answer in the rest room. Also, teachers in face-to-face classroom were required to walk around and require students to take everything off of their desk and notify them that they cannot leave until the exam is over. There are many more options to cheat online. Students wait for answers, claim fraudulent error messages, collusion, essay plagiarism and buying answers.

Waiting for Answers. In some online courses the instructors allows a few days to take an assessment. Since there is flexibility with which to take an assessment, some students wait until other have an opportunity to take the exam so they can get the answers. Some online courseware programs prevent students from printing out the entire exam at once, but the screen print function allows for each question one at a time to be printed. When exams are due at a specified time, some servers can’t handle to intense load and they crash or temporarily are taken offline. There are also programs that will lock-down the screen once the assessment begins. The assessment is timed and a student cannot navigate anywhere else on the computer until the assessment is submitted. However, the way students get around this is by setting up two computers- one for the assessment and one to browse the Web and find answers.

Fraudulent Error Messages. Students, who are not prepared for an assessment, try to get an advanced look at the questions so they claim the computer systems showed an error message. Since the instructor has to read the email message and reset the exam attempt, the students has more time to prepare and in some cases look up every answer with a preprinted exam. Students do this with papers, too. They submit corrupted files which
By the time the instructor notices and notifies the student, the student has bought at least another 24 hours in most cases.

**Collusion.** Although students take classes from anywhere in the world, there is still an opportunity to collude and work on individual assessments together. Students use cell phones, and the internet to work on assessments together at a distance. Rowe (2010) described methods whereby students still do some of their work themselves. However, some students have the options of having someone take their entire course by providing their login and password. Most learning management systems have a reporting tool that allows the instructor and administration to view I.P. addresses. This helps a little because the school can see if students were using the same computer. If an assessment is submitted by multiple students on the same computer within a short timeframe, we know we have a problem.

**Essay Plagiarism.** Additionally students’ copy and paste entire passages from the internet without citations on essay or short answer assessments. Sometimes there is a requirement to submit essay question responses to plagiarism software, but this method waste a lot of time. Course designers usually try to scaffold these types of assignments so students submit pieces of it over an extended length of time. If they submit a thesis statement, outline, rough draft, etc., it is hard to turn in a paper that doesn’t match what they already submitted.

**Purchase answers.** Websites such as brainmass.com allows student to submit exam questions and purchase the answers. If a student has a lot of time to take an assessment they will be able to locate the answer in time to receive a good grade. Of all the method listed this method may do the most harm. Once the test banks are compromised it is difficult to make up new test questions that are closely aligned with the textbook.

I recently found that a company had published a course shell on the Internet. The school bought the course from the company three years ago and actively uses it. However, the company placed all of the answers to quizzes online as “Instructor Resources” without notifying the proper people at the school. A student finally brought it to our attention that she could simply Google the question and the answer would be in the search results. This is obviously a huge problem because the school paid money for a course and expected the publisher not disclose test answers on the Web.

5. **Methods to employ in order to minimize e-cheating**

Unless there is a requirement for a large amount of synchronous (real-time) interaction between an online instructor and individual student it is difficult to establish an influential rapport. Interaction allows an instructor to become familiar with a student’s background, writing style or testing acumen. By assessing a student’s discussion board posting and relies the instructor can get a feel of how a student writes.

Online assessment must be designed with the belief that student will utilize their text book and any note. When the risk of academic dishonesty is considered throughout the course development stage, courses are more comprehensive (Trenholm, 2007). It is very difficult to prevent all forms of online cheating or plagiarism but there are ways to minimize the academically dishonest behavior (Rowe, 2004). Some common methods to prevent e-Cheating are requiring students to sign and return an academic dishonesty statement, the use of multiple testing centers, the use of a non-related proctor, use testing software that prepares randomized questions so no two exams are exactly alike, protect test bank access, and create multiple versions of each assessment.

Styron & Styron (2010) coined the word e-cheating when describing dishonest behavior in an online course. Traditional exams such as true/false and multiple choice exams provide more opportunity for students to be academically dishonest. Additionally, mobile devices such as cell phone make it easier to cheat in an face-to-face classroom.

6. **Cheating curtailment methods**

King et al., (2009) suggested that instructors use shorter time-lines, or essay question format exams which will assist at curtailing online cheating. Christie (2003) suggested some very creative methods to employ to prevent or curtail cheating in an online classroom. The method suggested included monitoring students activity using
time logs, “setting a trap” (p.57), webcam usage, changing class each semester and creating a class mole (Christie, 2003).

**Policy dissemination.** The immorality of cheating must be accurately portrayed and consequences for being caught must be explained thoroughly (Chiesl 2007). Most schools have academic dishonesty policies which serve as the first line of defense. Since some students do not read the policies, there should be a requirement to click a confirmation button before a student is allowed to enter the online course room. If a student is caught being academically dishonest and claim they did not know the policy then the institution would have legal recourse. Prior studies have shown that having a clearly articulated policy against cheating decreases the behavior.

**Strict Test Taking Time-Line.** When an assessment is taken there is a log of the time when the exam was accessed and completed. Incredibly short times are an indicator that dishonest behavior maybe taking place. Sometimes it is advantageous to give students short time frames to take exams. Where there is not enough time for a student to look up answers or search the internet they are deterred from relying on cheating in the future.

**Cheating Trap:** Setting a trap involves creating a website what purports that it has answers to a particular assessment, however all answers given are incorrect. When a student performs a web search the site used as a trap could be found. Dishonest student would accept the incorrect answers unknowingly.

**Surveillance.** A webcam could be required; however students who are not in view of the camera could still offer assistance. Another issue with a webcam is costs. It may be difficult to require a student to purchase a webcam.

**Class Mole.** The most creative method suggested by Christie (2003) was the use of a class mole. The instructor could enroll as a student under a different name. When students discuss cheating amongst themselves the dishonest students would be caught by the instructor while committing the offense (Christie, 2003). The majority of students won’t discuss this sort of thing within the LMS or the LMS’ messaging system. If it is done, it is done offline and in one-to-one communications.

**Randomized exam questions and responses.** Online class platforms such as Blackboard and WebCT have an assessment features that allow instructor to randomize the questions. All questions available in a pool of questions should be uploaded. If two students attempt to sit next to each other and cheat their exams will be different. Some textbook publishers have web based assessment tools that have so many questions that it is rare for students to have the same questions. These procedures would decrease a student’s ability to collude. When an instructor is given the opportunity to select questions they should select them randomly across different chapters instead selected each chapter in continuous blocks (Chiesl, 2007).

**Statistical Analysis to Detect Common Errors.** Although the following cheating detection method was originally used for face-to-face paper-based exams, perhaps the methodology could be adapted to online exams. When students miss the same questions on a multiple-choice exam there may not be an issue of cheating. However; when students miss the same questions, with a number of the same incorrect choices, there may be a cause for concern. Harpp and Hogan (1993) developed a statistical program that computed “errors in common (EIC, i.e. questions answered incorrectly) and exact errors in common (EEIC, sometimes termed “exact wrongs”)” (p. 307). An EEIC/EIC ratio that exceeded 0.75 gave a possible indication that cheating was happening. Nath and Lovaglia (2009) felt that even though a Harpp-Hogan index exceeded 0.75, this was not enough proof to accuse a student of cheating. To improve on the results and be surer of cheating Nath and Lovaglia (2009) added an additional step to the Harpp-Hogan index by computing a probability index.

The probability index was designed to determine the chance that two students who sat in close proximity to each other did not cheat. To accurately deploy the new EIC index it is useful to have a designated seating chart and/or place sequential serial number on each exam. If a probability index of < .001 is obtained then the associated students are interviewed. A probability index of < .001 means that is less than “one in a thousand (p.5), that two students chose the wrong answers independently. Once the students are interviewed and one or both confesses, the students receive disciplinary actions. Other students may be deterred from continuing the behavior.
Proctoring. Exam proctoring works well when an institution has a testing center where I.D.’s are checked and verified. However, when a student is in a remote location organized proctoring may be an issue. Even when a proctor is present it is difficult to eliminate all forms of cheating (Grenier-Winther, 1999). Without a proctoring program in place the online environment lacks academic rigor necessary to facilitate learning (Lorenzetti, 2006).

7. Plagiarism curtailment strategies

Plagiarism involves using someone else’s words without proving proper citation to give the author proper credit. Plagiarism has been around in colleges since the 1890s (Thompsett & Ahluwalia, 2010). Although many institutions have written policies pertaining to plagiarism, those policies are rarely read by students (Owunwanne, Rustagi & Dada, 2010). Flannery (2004) suggested that students plagiarized because writing papers were seen as irrelevant. Instead of papers on already regurgitated past subject, if students were required to write about a current or relevant topic for a particular subject matter, perhaps students would plagiarize less. Prior to the information technology age, plagiarism was a lot harder to detect. An instructor had to rely on experience and the ability to recognize copied work. The internet and assignment databases make it a lot easier to find out if students are using someone else’s work and take credit.

Similarity Detection Software. The most common way to detect plagiarism is to use similarity index software such as Turnitin.com (http://www.turnitin.com), WriteCheck.com (http://www.writecheck.com), (DupliChecker.com (http://www.duplchecker.com) and others, which checks all submitted papers and computes a similarity index (Scanlon, 2003). The similarity index shows all instances of potential plagiarism. Once a similarity index is obtained the instructor must make a judgment call to determine or further investigate if the student has plagiarized. If the instructor required a very low level of similarity, students will be forced to use original thought in writing papers or answering essay-type questions.

Strict Writing Guidelines. Sterngold (2004) once used paper strengthening techniques which actually worked well as anti-plagiarism techniques. Sterngold’s techniques included requiring students to submit copies of the sources to writing papers relating to a class discussion or book chapter instead of students being able to pick their own topic.

8. Conclusion

Online learning was once a new and exciting opportunity for a school to grow its student body. Today online education presents unique challenges and also unique opportunities (Trenholm, 2007). The primary area of concern when it comes to assessment is academic dishonesty in the form of cheating. There are numerous ways for students to cheat in the asynchronous online environment. It is up to educators to employ more effective measures to curtail the academically dishonest behavior. This paper discussed e-cheating methods, and possible countermeasures to prevent those methods. Written academically dishonesty policies set a good foundation for any preventive program, but a signed document is not enough. Educators must become more technologically savvy in order to develop alternative means of assessment for online classes. More complex and innovative techniques must be developed in an attempt to mitigate dishonest behavior.

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“The Evolution of e-Learning in the Context of 3D Virtual Worlds”

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Abstract: Information and Communication Technologies (ICT) offer new approaches towards knowledge acquisition and collaboration through distance learning processes. Web-based Learning Management Systems (LMS) have transformed the way that education is conducted nowadays. At the same time, the adoption of Virtual Worlds in the educational process is of great importance, not only for the researchers in the field of Web-based Education, but also for the educational community that is interested in applying ICT in education. The main motivation for studying the potential of Virtual Worlds applications in education stems from the capabilities they offer to create a cyberspace where users can interact with other participants (through their avatars) or objects, creating new experiences that are not often feasible in the real world. Within this context, the fundamentals of learning theories have to be analyzed, in order to study their impact on e-learning and Virtual Learning Environments design. The currently available Virtual-World platforms are being presented and qualitatively assessed. Subsequently we focus on Sloodle, which bridges the characteristics of the Moodle LMS with the Open Simulator 3D virtual world functionality.

Keywords: e-learning, virtual worlds, LMS, sloodle

1. Introduction

Information and Computer Technologies have become a constituent part of every human activity (social, economic, cultural etc.), offering innovative information/communication channels and evolution on the existing methods of working, learning and thinking. Especially in the world of education, the challenges focus on extracting useful information through huge piles of data and transforming them to modern and functional knowledge.

According to the principle that efficient learning does not demand the educator and the student being present at the same time in the same place, Distance Learning contributes to the need for education or training through the establishment of Open Universities and the rapid evolution of e-learning. The software tools that support distance learning are Learning Management Systems (LMSs). LMSs are met in the literature (Britain and Liber, 1999) as software tools that combine: computer and communication functionality, on-line methods of learning content provision and educational process management tools through an integrated web-based learning environment. Also, they offer supportive functionality to the educational procedure (i.e. through posting assignments and allowing for participation in synchronous or asynchronous chats or/and through bulletin boards) (Westera, 2005).

Additionally, the development of 3-dimensional Virtual Worlds plays a central role in distance learning (Kahigi et al. 2008; Freitas 2006; Freitas 2008) gathering 3 main features (Dickey, 2005): i) create the illusion of a 3-dimensional environment, ii) support the usage of avatars as virtual representations of human users, iii) offer communication and interaction tools to their users.

The evolution of Virtual Worlds to their current form has its roots in the rapidly evolving field of electronic games. The first effort of creating a Virtual World is dating back to the ‘80s where text-based single-player games were developed (Salt et al., 2008).

Virtual worlds are designed to offer real-time communication tools, interaction capabilities and collaboration empowerment (Dickey, 2005a). Thus, students can gain experiences infeasible to live in the real world. Within this framework (Dillenbourg et al., 2002) studied the characteristics of Virtual Learning Environments (VLEs) and identified several similarities with the characteristics of Virtual Worlds. This led to the belief that although Virtual Worlds were not intended for use as VLEs, they satisfy most of their relevant functionality offering the potential to be involved in the educational procedure.
The increased interest in 3-dimensional Virtual Worlds resulted in the development of numerous similar environments. Relevant research efforts studied their usage potential in education (Eschenbrenner et al., 2008). Some of the most popular 3D VW platforms which can be applied in education are presented in Section 4.

As these virtual environments become more and more popular in educational community, the necessity of their interconnection with LMSs appears as a mandatory step towards future evolution and user adoption. Within this framework, Sloodle (Simulation Linked Object Oriented Dynamic Learning Environment) is an environment that interconnects Virtual Worlds with Moodle LMS by combining their characteristics towards learning support.

The purpose of our paper is to study contemporary learning theories and their application in Virtual Learning Environments. More specifically we will provide:

- A survey on the evolution of learning theories.
- A detailed presentation of LMSs functional specifications and their limitations.
- An analysis of the advantages that stem from the usage of Virtual Worlds in education.
- A thorough analysis of the virtual world platform characteristics.
- A study on the necessity to interconnect LMSs with Virtual Worlds through Sloodle.
- A case study of Sloodle tools in order to justify its usage potential.

2. The evolution of learning theories

E-learning and ICT supported distance education tend to become an integral part of not only primary and secondary schools but also for universities and organizations of private and public sector. Therefore, researchers and stakeholders recognize the fact that approaching the field only through a technological perspective does not guarantee successful knowledge transfer. Thus, the analysis of pedagogical and learning principles under the prism of e-learning techniques appears to be inevitable.

Nowadays, most e-learning systems consist of several modules and functionality (e.g. content and participants’ management, operational environment, communication etc.). Furthermore, they are loosely or not interconnected with no explicit educational objective overruling them. Moreover, within such a distant learning environment, the students should have full control of where, when and how the necessary knowledge can be obtained. An educational path that would be comprised of the content, the educators and the technological tools, should discourage stakeholders from being distracted by numerous available choices that can be utilized. Also, a fundamental feature of such a system is to guide course development and direct relevant didactic plans implementation that have to be followed by the learners. The tradeoff involved in user guidance is between posing burdens in navigation and aimless wandering within the cyberspace (Dietinger and Maurer, 1997).

Mayes (2004) argues that there are no models or learning theories exclusively designed for e-learning but only “electronic” enhancements of them. Furthermore, it is clear that although teachers and students are innovative regarding ICT in education, many efforts have not been widely accepted due to deficient design and implementation outcomes. This problem becomes more complicated as technology evolves and Virtual Worlds are more and more applied as educational tools. Virtual worlds offer the opportunity to the learners to be engaged in activities that continuously measure their performance and assess their apprehension. One should not ignore the fact that according to Dewey (2008), real learning should be based on experiences and in order to gain new knowledge continuous testing and assessment are necessary. From this point of view, traditional learning theories are omnipresent and should not be ignored no matter how intensive the technological progress is.

In this context, education aligns with the needs of the new era that requires open, flexible and learner-centered learning systems where physical presence of trainers and trainees at the same place is not mandatory.
The influence of new technologies and their application in education (see Figure 1 below) led support to the claim that interconnecting the educator with the learner through internet can form a virtual classroom (Keegan, 1995). According to Simonson (2000) distance education is a typical education system where students are located in remote places and communicate with the educator through interactive means and systems.

![Virtual Learning Environments](image)

**Figure 1:** The convergence of ICT with learning theories

The dynamic nature of web-based educational software and the radical changes in the field of learning technologies led to a new view of distance learning that resulted to e-learning. E-learning is wide enough and encompasses every form of distance learning that is employing internet or digital resources. Clark & Mayer (2007) define e-learning as a digitally supported and Internet mediated education that gathers the following characteristics:

- The educational content is closely related to the learning objective.
- Employs educational methods to facilitate learning.
- Makes use of words and images in order to supply content.
- Can be guided by the educator (synchronous e-learning) or designed for individual studying (asynchronous learning).
- Constructs new knowledge and skills that are tightly connected with personal objectives.

The main challenge of e-learning is to enable courses development according to confirmed human learning procedures. Also, it is widely accepted that the influence of ICT on education is optimized when it is appropriately integrated in education practice (Schank & Cleary 1995). Towards this objective we should focus on educational plan design and not on content presentation. This suggests that we are asked to explicitly describe the navigation path within the e-learning environment. Thus, it is necessary to review the relevant learning theories that influence the design and development of learning environments. Also we will study their evolution in order to comply with the contemporary needs of education.

The benefits arising from ICTs empower the traditional methods of course design asking for collaboration among students and requiring their participation in producing a deliverable towards course completion. On the contrary, traditional classroom based teaching procedures conclude with a summary from the teacher ignoring the ICT potential that facilitates students to express themselves through images, audio-video and case studies that may carry a holistic answer to the questions posed in “class”.

According to (Piaget, 1972; Papert and Harel, 1991) constructivism approach suggests that knowledge is constructed upon past experiences and the mental constructions or beliefs that anybody uses in order to understand objects or facts. However, Vygotsky (1962) focused on the communicative and cultural dimension of learning, attempting a social-political approach. A progression of those two theories is social constructivism (Holmes and Gardner, 2006) that introduces a third dimension in the interaction between learner and its environment. This dimension is based on the other participants (learners and educators).
It should be mentioned that in our world of interrelated data, the nature of information that someone holds and the value of the knowledge that will be produced are significant. Moreover, an individual cannot be based only on its own experiences for knowledge acquisition. In the digital era, connectivism (Siemens, 2004a) fills the gap caused by technological development and the new learning environment. Knowledge is regarded as a network of nodes and connections regularly rearranged and reconnected able to produce new knowledge.

Regardless of the technological progress, a common objective of all learning theories is to describe the effort needed in order to acquire knowledge. Cognitive, social-cultural and connectivism theories often focus on different aspects of learning but finally lead to the adoption of collaborative learning as the prevailing one (i.e. virtual learning environments (3-dimensional or not) are a typical example - (Konstantinidis et al., 2010)) through an evolutionary procedure. Collaborative Learning theory preceded computers and is based on a combination of Piaget and Vygotsky theories, composing the relevant social and constructivist features (Dillenbourg et al., 1996; Scardamalia et al., 2006) in a form where two or more people learn or try to learn together.

The main objective of computer supported collaborative learning is to carry out communication among stakeholders (scholars and teachers) and support social interaction (Dillenbourg and Traum, 1999). Collaborative procedures become feasible through collaborative learning networked environments that are designed for distributed and distance learning support (Anderson and Jackson, 2001). Furthermore, (Shih and Yang, 2008; Konstantinidis et al., 2009, 2010) prove that collaborative learning can be empowered through the usage of 3D Virtual Worlds establishing a new e-learning tool.

3. Learning management systems (LMS)

Learning Management Systems (LMS) (that are frequently referred as Digital Class Management systems or Virtual Learning Environments) are software systems that appeared during the second half of 1990s and combine computer-based communication functionality, online support of educational content and tools that manage the educational procedure as an integrated web-based learning environment (Britain and Liber, 1999).

LMSs are widely used for educational and training purposes not only because they are on the edge of technology but also, because they:

- Eliminate temporal and geographic restrictions from learning procedure.
- Offer flexibility during the learning phase.
- Allow for interaction between educators and students.
- Provide reusable resources that are easily maintained.
- Fulfill the relevant requirements and specifications for efficient, quick and educationally correct teaching.

Consequently, LMSs should be used from educators and organizations in order to:

- Create and manage on-line courses.
- Support collaboration among students.
- Provide motivation and resources for creating team spirit.
- Manage questions, quizzes and tests for assessment purposes.
- Manage virtual classrooms where students are geographically distributed and communicate only through internet.

According to Ellis (2009) the main features met in a LMS include: i) Coordination and management of electronic classrooms, ii) Coordination and management of electronic courses – educational content and activities, iii) Personalization through individual profile support for each user, iv) Management of registered students, v) Activities scheduling, vi) Communication between educators and students, vii) User activities monitoring and viii) Reporting functionality.
3.1 Learning management system platforms

Currently, e-learning market is inundated with LMSs that implement most of the features mentioned above. A classification according to these features is out of the scope of this paper. However, a categorization according to the acquisition cost (i.e. commercial or free open source) is depicted in Table 1.

The most popular commercial LMSs are: eCollege (www.ecollege.com), Blackboard (www.blackboard.com) and Saba (http://www.saba.com/). There are many other commercial platforms (like desire2learn - www.desire2learn.com) but these three prevail in the e-learning market. They were primarily designed to fulfill the requirements of universities and they developed strong brand name after being upgraded and redesigned for years.

However, the vast majority of institutions turn to freely available and open source solutions that meet high degree of configuration and adaptation potential. Such a choice, keeps the cost of course management at a minimum rate, allowing the academic community to adjust such a platform through in-house development of add-ins or innovative tools (Franklin and Hart, 2006; G. Papadourakis, Yiannis Kaliakatsos, 2006)

The table below depicts the most widespread LMSs.

Table 1: A list of widespread LMSs

<table>
<thead>
<tr>
<th>LMS</th>
<th>Category (Commercial/Free Open Source)</th>
<th>WebSite</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blackboard</td>
<td>Commercial</td>
<td><a href="http://www.blackboard.com/">http://www.blackboard.com/</a></td>
</tr>
<tr>
<td>Desire2learn</td>
<td>Commercial</td>
<td><a href="http://www.desire2learn.com/">http://www.desire2learn.com/</a></td>
</tr>
<tr>
<td>Ecollege</td>
<td>Commercial</td>
<td><a href="http://pearsonecollege.com/indexlearn">http://pearsonecollege.com/indexlearn</a></td>
</tr>
<tr>
<td>JoomlaLMS</td>
<td>Commercial</td>
<td><a href="http://www.joomlalms.com/">http://www.joomlalms.com/</a></td>
</tr>
<tr>
<td>Saba</td>
<td>Commercial</td>
<td><a href="http://www.saba.com/">http://www.saba.com/</a></td>
</tr>
<tr>
<td>Atutor</td>
<td>Free Open Source</td>
<td><a href="http://www.atutor.ca/">http://www.atutor.ca/</a></td>
</tr>
<tr>
<td>Claroline</td>
<td>Free Open Source</td>
<td><a href="http://www.claroline.net/">http://www.claroline.net/</a></td>
</tr>
<tr>
<td>Moodle</td>
<td>Free Open Source</td>
<td><a href="http://www.moodle.org/">http://www.moodle.org/</a></td>
</tr>
<tr>
<td>DotLRN</td>
<td>Free Open Source</td>
<td><a href="http://www.dotlrn.org/">http://www.dotlrn.org/</a></td>
</tr>
<tr>
<td>OLAT</td>
<td>Free Open Source</td>
<td><a href="http://www.olat.org/">http://www.olat.org/</a></td>
</tr>
</tbody>
</table>

The LMS of choice, for the experimental environment of our case study is Moodle. This decision stems from its open source and freely available characteristics, while one should not ignore its continuous evolvement and upgrade on the basis of social constructivism learning theory. Also, Moodle offers all these capabilities that educators can use to form a virtual electronic class (e.g. Choice and Glossary tools). Finally, it satisfies the requirement for easy access on its database and its source code. Research efforts, have focused on interconnecting Moodle with OpenSim that is the free and open source equivalent to Second Life (Konstantinidis et al., 2010) and will be further investigated in sections 5 and 6.

3.2 Limitations of learning management systems

A critical issue concerning the LMSs is the fact that although stakeholders consider them as e-learning cornerstones, they are not learner or educator – centered (Siemens, 2004b). This results to course-centered functionality rather than to learner-oriented. The learners are bound to specific activities with predefined functionality and time limits. Also, they have no control on the prerequisites for the evolution of their own education. Another weakness of LMSs is the absence of interaction between (i) learner – content, (ii) educator – educator (if applicable), (iii) educator – learner. Although they include a variety of communication support channels between educators and learners, they are solely used as document repositories (Kemp and Livingstone, 2006). On the other hand, only experienced educators use the majority of the offered communication tools. Thus, it is clear that LMSs do not fully support interactive learning. Furthermore, the rare usage of multimedia content is another deficiency of LMSs.

According to Siemens (2004b), LMSs are not efficient to support learner’s performance monitoring and knowledge management. The LMS tools do not enhance the independence of the learners who are not encouraged to take responsibility of their own learning. The course-centered approach of LMSs prohibits learners from defining their own objectives and deadlines and also discourages them from organizing their tasks and their time usage. Also, it prevents cooperation with other users towards creating documents or multimedia content. Furthermore, the learners have to follow a predefined educational path as specified
within the LMS (Quality Improvement Agency, 2008; Illinois Online Network, 2010). Besides, as mentioned by Hughes (2001), the support of the learner’s skills is a necessary part of a person’s self-awareness and self-esteem.

4. Virtual Worlds – characteristics, functionality and examples

Currently available 3D Virtual Worlds are sophisticated platforms that support a set of human activities and interactions, enriching the way we learn, work and socialize. The adoption of Virtual Worlds has been facilitated through internet-based applications that allow for file sharing, virtual meetings, seminars/lectures and scientific experiments (De Freitas, 2008).

Until the wide establishment of communication networks, Virtual Worlds were restricted to what someone could see through a personal computer monitor (Sutherland, 1965). The idea of copying and reconstructing an environment as a Virtual World was born in late ‘80s. Brooks (1988) claimed that computers were powerful enough so as to construct cutting edge models of complicated physical environments. Furthermore, Wooley (1993) and Dibbell (1998) refer to Virtual Worlds in plural suggesting that a computer allows access to a set of virtual worlds and not a single one.

A preliminary definition of Virtual Worlds supplied in (Barfield et al., 1995) states that: “Virtual Worlds are interactive, 3-dimensional virtual environments supported by a computer that implement multiple senses which can be used within”. Bartle (2003), gives a more descriptive definition introducing some new features: “Virtual Worlds offer automated rules that enable users to change the world they live in. Users are represented by avatars and interact with each other in real-time. Finally, a Virtual World is shared and characterized of persistence, preservation and duration as it keeps exist and evolve even if the participants do not interact”. The definition supplied by Dickey (2005a) focuses on the fact that 3-dimensional virtual environments differ with each other although most of them implement three common characteristics (illusion of 3D environment, representation through avatars, interaction and communication tools).

According to the definitions cited above there is not a single concrete definition that encompasses all the characteristics of Virtual Worlds. These characteristics strongly depend on the point of view, but a common set includes: i) Operation in Real-time (synchronous), ii) Awareness of Space, iii) World’s size, iv) Persistence, v) Networks of people, vi) Use of Avatars, vii) Immersion, viii) Interactivity, ix) Use of Objects (along) with scripting, x) Support of various multimedia types and xi) Communication potential.

Apart from their features categorization, Virtual Worlds can also be classified according to their social characteristics (Franceschi et al., 2008) and the functionality they offer (De Freitas, 2008). The main axes of the former category are Virtual Game Worlds and Virtual Open Culture Worlds. The distinct dimensions of the latter category are: Role Playing Worlds, Social Worlds, Working Worlds, Training Worlds and Mirror Worlds.

4.1 Virtual World platforms

The increasing interest in 3D Virtual Worlds drives innovation in numerous relevant environments and their application adoption in education through case studies (Eschenbrenner et al., 2008; Hew and Cheung, 2010). Open Simulator, Second Life, Active Worlds, Project Wonderland and Open Cobalt are some Virtual World platforms that can be applied in any educational procedure. In the following paragraphs we examine their main characteristics and perform a qualitative comparison.

Open Simulator platform development originated as soon as Linden Labs Inc distributed their Second Life client software under GNU LGPL license, making it widely available to users and programmers. Some preliminary efforts resulted to a freely available, open source project named Open Simulator (OpenSim). An Open Simulator installation can host simulated virtual environments, much the same with Second Life due to the adoption of its messaging protocol. This characteristic makes OpenSim accessible through the most popular SL viewers. User registration and account creation are totally free.

OpenSim provides three modes of operation: Standalone, Grid and Hypergrid mode (Fishwick, 2009). In Standalone mode, each user is authorized and interacts with a server before entering the world. One can create and execute as many Regions as it wants, but only in the same machine. On the contrary, Grid mode
gathers a set of services that are usually referred as UGAIM (User, Grid, Asset, Inventory, and Messaging) that comprise the data services. Region services may be executed in different machines (i.e. different regions) and make use of the UGAIM services that are hosted on a separate server (OpenSim Data Service Server). Hypergrid mode implements the idea of a Web of virtual worlds allowing their interconnection over the internet. In this mode, region administrators can place hyperlinks within their maps to regions maintained by others.

Active Worlds is one of the first virtual worlds with more than 2,000,000 downloads of its browser (Active Worlds browser) and 1,000,000 daily hits of the main Active Worlds Universe. The users of Active Worlds can have unique names, enter the world (or universe in Active Worlds terminology) through the Active Worlds browser and navigate in 3D virtual environments built by others. The presence of Active Worlds in education is noteworthy. Active Worlds Education Universe (AWEDU) is a complete universe that focuses on strengthening research and development in education. To this direction it cooperates with numerous educational institutes from all over the world. Educators in AWEDU are capable of defining concepts and theories, teaching in classroom, giving presentations and studying the social aspects of education.

Second Life is one of the most popular Social Virtual Worlds developed by Linden Lab Inc. Second Life hosts more than 1,500,000 user accounts and keeps growing. It gathers characteristics of Virtual Worlds, gaming and messaging applications. Its most significant feature is the scalability potential it possesses. Users may integrate new assets and functionality within the virtual world. In Second Life, a user can interact with other users, navigate to islands (private regions of variable surface) and use sophisticated services. All this functionality allows the usage of Second Life as an advanced educational tool. It follows the client – server model and the open source viewer can be configured at will.

Open Cobalt platform is technologically based upon Croquet project (Smith et al., 2003). In early 2007 it was freely distributed as an open source software under Croquet SDK. Open Cobalt allows the construction, access and shared usage of Virtual Worlds over LAN’s or the Internet with no server installation needed (unlike Second Life architecture). Open Cobalt is more scalable compared with other commercially available virtual world platforms mainly due to the adoption of peer-to-peer technology to support any kind of interaction. On the contrary, the majority of the rest of the platforms adopts the widespread centralized architecture making use of a dedicated server.

Another popular platform is Open Wonderland that was initially developed by Sun Microsystems but since 2010 it is supported by Open Wonderland Foundation. Open Wonderland users can communicate with high fidelity sound, share desktop applications and cooperate on educational, business or social issues. One of the project milestones is its scalable environment.

4.2 Platforms comparison

The following table summarizes the aforementioned platform characteristics. OpenSim and Second Life are the platforms that both support the Linden Scripting Language in order to meet the demand of interconnecting them with Moodle. This necessity excludes the rest platforms from being considered candidates for adoption. Additionally, Second Life was also rejected due to the cost of buying virtual land, group creation and functional configuration that are essential in educational procedure. On the contrary, all this functionality is offered for free by OpenSim allowing the development of innovative services and their configuration. Furthermore, the adoption of open source software should be the first choice for the following educational reasons:

- The trainee notion and imagination should not be restricted.
- The trainee should not have in hand software that offers every single answer.
- The educational procedure should develop that trainee’s curiosity.
- Knowledge should be freely available to anyone with no barriers posed.
- Usage benefits and open research issues of Virtual Worlds in education

During the last decade internet technologies had a significant impact in the educational procedure. They supported the development of various emerging technologies, such as Virtual Learning Environments, that empower interactive learning. 3D Virtual Worlds satisfy many characteristics of Virtual Learning Environments,
providing the potential of new educational experiences. At the same time they offer the appropriate tools so as educators and students cooperate towards efficient learning procedure.

Table 2: Comparison of 3D Virtual World platforms

<table>
<thead>
<tr>
<th></th>
<th>Active Worlds</th>
<th>OpenSim</th>
<th>Second Life (SL)</th>
<th>Open Wonderland</th>
<th>Open Cobalt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open Source</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Free of charge</td>
<td>As a visitor/ Yes</td>
<td>Yes / Yes</td>
<td>As a visitor/ Yes</td>
<td>Yes / Yes</td>
<td>Peer – to Peer network technology</td>
</tr>
<tr>
<td>Programming Language</td>
<td>C</td>
<td>C#</td>
<td>C++</td>
<td>Java</td>
<td>Squeak / Smalltalk</td>
</tr>
<tr>
<td>Support for Virtual Objects</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Avatars</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Configuration</td>
<td>Yes, for free</td>
<td>Yes, for free</td>
<td>Yes, with charge</td>
<td>Yes, for free</td>
<td>Yes, for free</td>
</tr>
<tr>
<td>Educational Tools</td>
<td>No, but there is a special Virtual World named AWEDU</td>
<td>Yes, Sloodle</td>
<td>Yes, Sloodle</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Features</td>
<td>Internet browsing, on-line voice chat, instant messaging etc.</td>
<td>-</td>
<td>Easy content creation, scripts development by end-users</td>
<td>Application Sharing</td>
<td></td>
</tr>
</tbody>
</table>

3D Virtual Worlds that provide user immersion, are a new educational tool that is applied both in traditional and distance learning procedures (Dickey, 2005b). They support constructivism by offering a wide range of usage potential not only to educators but learners too (Eschenbrenner et al., 2008). Another new trend in educational environments design is collaboration among stakeholders within a shared virtual space (Barab et al., 2000). Additionally, special attention should be paid to user created Virtual Worlds that usually form an ideal place for research and development.

The term Virtual Learning Environments – VLEs is wide enough and may be misleading as it can be used to define not only static systems (that can provide learners progress monitoring and content downloading) but multi-user Virtual Worlds too. Dillenbourg (2002), studied the characteristics of Virtual Learning Environments and identified a lot of similarities with Virtual Worlds justifying their employment potential in educational procedure. More specifically, VWs can advance teaching and learning processes through immersion, cooperation between users, realistic simulations and multi-channel communication.
A set of advantages have been pointed out in the literature and include: teaching and conducting educational activities in a secure environment (Dickey, 2005b; Conway, 2007; Goral, 2008; Graves, 2008; Ondrejka, 2008), the empowerment of cooperation and communication (Bronack et al., 2006; Peterson, 2006), engagement of trainees (Foster, 2007; Mason, 2007; Richter et al., 2007), the potential of using an alternative environment as a classroom or laboratory (Conway, 2007; Graves, 2008) and visualization of composite content (Barab et al., 2000).

Apart from the benefits mentioned above some research issues emerge regarding their wide application in nowadays educational procedure. These issues, among others, focus on: specifying high value educational applications (Mantovani et al., 2003; Foster, 2007; Schultze et al., 2008), cost-efficiency analysis and technology evolution (Mantovani et al., 2003), health and security (Bugeja, 2007), and user adoption (Barab et al., 2000; Siau et al., 2004). Any educational activities design should take into account these issues in order to be complete and successful.

Through a detailed analysis of Virtual Learning Environments we conclude that the integration of LMSs with VWs can lead to innovative e-learning environments able to support most of their features. Such an environment is Sloodle that will be further presented in sub-section 5.1.

5. The interconnection necessity between LMSs and Virtual Worlds

Traditional LMSs (that are often referred as Virtual Learning Environments) offer a wide range of services for educational activities support, courses management and students progress auditing. The majority of LMSs support most of these features. However, they pose some restrictions that cause substantial degrade on e-learning efficiency. These restrictions include: course-focused LMSs instead of learner-oriented, limited interaction potential, reduced capabilities of educator originated activities, loss of control from the student side preventing the development of independent educational skills. This causes LMSs, along with their tools, to contribute on content rather than educational procedures (Yasar and Adiguzel, 2010).

These restrictions of LMSs can be surpassed due to the tools offered by Virtual World platforms. Although VWs have not been designed in order to serve educational purposes, they possess the potential to create learner-centered environments than educator-centered ones. The educational process can be improved through learner-centered pedagogies and promoting constructivism and problem-based learning.
5.1 Sloodle: An interconnection plug-in between Moodle and Virtual Worlds

Virtual Worlds enhance the interaction and cooperation among users through immersive environments that are suitable for empirical and constructivist learning. However they do not support asynchronous cooperation of learners that are usually connected with a Virtual World in different time instances and tend not to provide support on course management and learners assessment. Moreover, in contrast to LMSs, VWs have limited capabilities of content storing and formatting. Additionally, some other functionality such as desktop sharing and presentations creation are not easy to accomplish.

Due to the fact that all the VW platforms do not offer a common and enriched subset of educational features, the need of interconnection among traditional LMSs and 3D Virtual Worlds is being increased. Kemp and Livingstone (2006) justified the necessity of such a system. Also, the environment has to assure compatibility with existing LMSs (e.g. Moodle) in order to allow data transfer (e.g. learners’ catalogues, grades, educational content etc.). Sloodle is such an environment that boosts the connection of Moodle with Second Life and OpenSim (Figure 3).

Accordingly, it is safe to deduce that this software, through its tools, covers the functionality mentioned above.

5.2 Sloodle educational activities and tools

Sloodle consists of tools named Objects that have been programmed in the LSL language. The most significant objects and modules are:

- Sloodle Controller
- Sloodle Set
- Registration Booth

Based upon the analysis of Moodle educational culture and the usage advantages of virtual worlds in education we conclude that Sloodle allows the users to create four distinct categories of educational activities (Livingstone and Kemp, 2008):

- Role-playing and simulations
- Group-work and team building
- Events and presentations
- Constructive activities

Figure 3: Sloodle Conceptual model
Some tools that are used to support the educational procedure and implement the methods through which Moodle is embedded within a virtual world (Second Life or OpenSim) (Yasar and Adiguzel, 2010) are the following:

- Web Intercom, that interconnects public text chat in virtual world with a Moodle “chatroom”.
- Multi-function Sloodle Toolbar, that allows avatars (through Attachment) to update a Moodle Blog through the virtual world.
- Sloodle Presenter, implements the necessity for multimedia content presentation.
- Quiz tool, supports learner’s assessment both in virtual world and Moodle.
- Sloodle Quiz Chair, allows users to take multiple-choice tests of Moodle within the virtual world, receiving virtual feedback (i.e. the user rises while the answers are correct and lowers in case of wrong answers).
- Sloodle Pile On Quiz, enables a group of virtual world users to participate in multiple-choice tests that an educator has created in Moodle.
- Sloodle Metagloss, is being used of avatars in order to search for terms through a Moodle glossary that is part of the electronic class.

6. Case study: A Sloodle – based course in Virtual Worlds

The case study objective is to depict most of the educational features offered by Sloodle along with the relevant configuration efforts needed to form an appropriate experimental environment. It attempts to present the necessary steps that someone has to take in order to adapt existing Moodle-based course content to a 3D Virtual World environment.

The experimental environment of our virtual classroom was based on the OpenSim Archive (OAR) functionality. More specifically, we adopted the Educasim VW environment that is freely available on the internet (Odomia, 2009). Educasim is a virtual world implemented for educational purposes containing classes, lecture rooms etc. However, Educasim offers nothing else but the educational environment (the space where students may navigate in) and not the functional components of a classroom. All the necessary functionality was implemented by adopting Sloodle. Thus, its Registration Enrollment Booth was used to assist the registration of avatars in virtual classes. Some other Sloodle modules which were utilized include: Chat Activity, Sloodle Presenter, Quizzes, Choice and Glossary.
The learner-side educational functionality available for use will be depicted through a basic use case scenario. The main activities that will be described concern navigation, interaction with objects, communication, objects creation and avatars configuration within the virtual world. As soon as the educator carries through Sloodle configuration and virtual class implementation, the available functionality to the learner includes:

**Virtual World browsing.** Prior to their participation in Sloodle educational activities, learners have to be familiar with some navigation rules in virtual worlds. They can move their avatars within OpenSim virtual world by the navigation buttons on the graphical user Interface. Also, avatars can *Fly* (by pressing the relevant button), facilitating Virtual World navigation.

**Interaction with Objects.** Avatars can interact with virtual objects by clicking on them. In some cases they can sit on them by choosing the *Site Here* command (e.g. on Quiz Chair).

**Communication.** Avatars can communicate with each other through the *Chat* functionality.

**Object creation.** Avatars can create their own objects through the *Build* set of commands. The creator of a virtual object can define its copyright properties. Also it is able to implement scripts that may offer extra properties on virtual objects when associated with them.

**Avatar configuration.** The users can edit their avatar’s appearance by choosing the *Appearance* command.

The following figure depicts the architecture of the adopted learning environment. Sloodle appears as a middleware among Moodle and OpenSim “translating” functionality between the two systems. Also, it is obvious that it is not a user interface. The user who wants to access the environment is obliged to use a web browser (for Moodle) or a virtual world client (such as Second Life or Hippo viewer, for OpenSim).
6.1 A Sloodle-based course scenario.

Some typical educational activities offered by Sloodle which were implemented within this sample course context are the following:

- Registration – Learner admittance to the course
- Participation in lecture
- Participation in real-time chat.
- Glossary support
- Quiz participation.
- Voting.

The course selected to be taught is entitled “Introduction to WEB 2.0”. Its context was chosen due to the emerging relation of virtual worlds and Web 2.0 technologies on education.

The educational scenario within the virtual world was based on the flow met not only in a traditional class but in a LMS such as Moodle. This scenario includes: learner registration in a course, study of the educational content, communication/chat with classmates or the educator, quiz based assessment, and overall course rating (e.g. content quality).

Upon its admittance in EducaSim virtual world, the learner can read some useful directions about the activities sequence it should follow.
Figure 6: Directions notecard for learners

- **Registration and learner admission.**

The learner is called to spot the Registration Booth according to the supplied directions and get enrolled in a virtual class entering the user code it possesses for Moodle. After registration, the learner appears on the Moodle Avatar List (the Avatar List functionality is Sloodle based and not available in a simple Moodle installation).

Figure 7: User registration in virtual class
Participation in lecture

The learner, according to the educational scenario posed by Moodle, is asked to attend a lecture entitled: “Web 2.0”. The lecture room contains a Sloodle Presenter which allows lecture stream rate control through the relevant buttons at the object’s bottom.

Participation in chat

After attending the lecture, the learner can make use of the Web-Intercom tool in order to raise questions or pose subjects for conversation. The Web-Intercom tool may bring in touch the learners with classmates or educators and also offers the ability for recording. By default, the conversations are being recorded in the relevant Moodle chat room and the educator’s presence is not necessary in virtual world.
Another tool the learner has in hand is Sloodle MetaGloss. A user can request the definition of a term from Moodle glossary, through typing “/def” followed by a word or phrase. A card appears reporting the result of the query.

- Quiz participation

A learner’s knowledge assessment is performed through the Sloodle Quiz Chair that is directly connected with a quiz already implemented in Moodle. Performance recording is also available for each participant. The visualization of the results into the virtual world is achieved through chair lifting for each correct answer. Results overview is also possible through the relevant Moodle quiz tool.
Figure 12: Taking a quiz through the “Sit Here” command

Figure 13: Answering a question and chair lifting
Figure 14: Results overview in Moodle

- Voting

Upon completion of the educational scenario, learners are asked to participate in a poll about their impression of participating in a course offered within a 3-dimensional virtual world. The answers are being also recorded by the Moodle “Choice” tool.

Figure 15: Participation in voting within a virtual world
7. Conclusions

ICTs offer numerous dynamic tools able to provide educational activities that did not exist or could not be implemented in real classes. Their adoption in the educational procedure is not only a significant innovation but an interactive process that affects our perception about learning and teaching. At the same time the application of ICTs in education is being affected through boosting further research on the field.

ICTs in education lead more and more researchers to the adoption of constructivism learning theories within the context of distance and electronic learning. LMSs, like Moodle, which are based on the educational concept of social constructivism along with virtual worlds that encompass most of the VLEs features, can be utilized for educational purposes.

More specifically, VWs that implement constructivism and collaborative educational methods trigger the learners offering an appropriate environment through which anyone can acquire qualitative knowledge, interact with other learners or educators and actively participate in knowledge evolution.

It should also be mentioned that VWs are not a substitute of existing educational technologies, but a mean to support learners’ engagement. The interconnection of a popular LMS (like Moodle) with VWs (like OpenSim) is not only important but interesting too. The interconnection can upgrade the existing capabilities offered by LMSs and VWs. That is the reason behind choosing to study the potential of Sloodle as a method for bringing together Moodle and OpenSim. At this time, research and development around Sloodle focuses on getting advantage of the characteristics met in both environments for benefit of the educational procedure.

Through a detailed analysis of Sloodle we conclude that it gathers a rich set of tools in order to interconnect Moodle courses with OpenSim virtual worlds. The interconnection focuses on combining Moodle characteristics (i.e. structured courses, chatting, projects assignment, quizzes etc) with virtual world characteristics (i.e. avatars, configuration potential, interaction, communication, immersion).

In conclusion, an experimental virtual class was setup on OpenSim and Moodle platforms as a feasibility study. Our work also presented the necessary technological infrastructure for future research on the field of VW supported LMSs. Next steps, should attempt to measure and analyze user adoption of such an innovative technology as Sloodle in order to pave the way for future platform enhancements that will be user-driven and will follow their needs.
References


