Editorial for EJEL Volume 14 Issue 4

Rozhan M. Idrus and Nurkhamimi Zainuddin

Welcome to this special edition of EJEL, which shares a selection of extended papers initially presented at the 11th International Conference on E-Learning (ICEL), which was held in June 2016 at the Universiti Sains Islam Malaysia. In this issue five papers are presented which discuss and reflect on research into the assistive role of technology and the realization of redesigning the learning environment for more learner focussed challenges facing the educational experience of the 21st century.

Technology is becoming more immersive and more seamless, which has given rise to a 'new pedagogies' paradigm. It is time to explore the origins of pedagogy and the often overlooked traditions of thinking and practice associated with it. As we come full circle with the infusion of technology, pedagogy has to be considered through the lecturers' planning and thinking, as well as the way in which they address the learners, care for and about them and the way they bring learning into and to life.

We are now also faced with a 'new classroom' paradigm where the learner enters a 'classroom' in which it is possible to ascertain where, when and how the learner undertakes educational tasks as the environment is highly digital, virtual and open. With the availability of pedagogically articulated content from open resources and the support of the Internet, students are no longer confined within the four walls, nor the constraint of 'official' schooling hours.

Leveraging the technology itself, teachers must now prepare and present to the learners a buffet of educational resources so that learners have the ability to choose where, when and how they might want to conduct their studies. The teachers play an active facilitating and participatory role in the digital learning environment of the present time. This has been well explored by our contributors in the issue.

The contribution by Wendy Barber and Sherry King is highly engaging, perhaps without them realizing it. Although the issue being addressed is the concept of problem based learning, they have most aptly made the realization that digital learning environments require significant pedagogical shifts on the part of the teacher. Further, in an effort to manifest the educational outcome of problem based learning (PBL) via an online delivery mechanism, they have once again stumbled on the realization that that proficiency in teaching online is fast becoming an essential pedagogical skill. More importantly, the protocol and conduct of PBL via Adobe Connect and the interplay of student-centred and collaborative learning, the shifts in teacher-learner roles and the ability for students to take ownership of the learning; become involved in the assessment process, and define their own course of learning has given rise to what the authors describe as a perception that the pedagogy becomes virtually invisible. In truth, this is the immersive and seamless trait of technology and affordance to teachers to be creative with the pedagogies and have a wider variety of non-specific learning outcomes based on the new needs (as in technology enhanced) of students. There is no doubt that this paper will be referred to from both the use of technology and instructional design of PBL.

The following two contributions highlight the learner-centred teaching and learning experience in 21st century class environment. Through the promotion of e-Learning in the campus of INTI International University, a simple research project was devised to investigate students' perceptions on different learning environment: face-to-face, multimedia and web. In two studies conducted over two years by Yap Wei-Li, Neo Mai and Neo Tse-Kian, the learners were given the opportunities to be taught in the face-to-face teaching approach and the use of the PowerPoint (referred as F2F), and a face-to-face encounter via the interactive multimedia learning module, and at the same time students were allowed to access the same learning module from the computers (referred as MM). They were also allowed to adopt their own independent learning by accessing the web-based interactive multimedia learning module (referred to as Web). This was conducted in a quasi-experimental design. Although the assistive role of educational and multimedia technologies in the experimented Weimer's Learner-Centred Teaching model could promote better learner experiences by increasing retention rate and improving learner motivation, this effort was more of an acculturation process in the use of technologies and creative pedagogies in the campus and the commitment for the provision of facilities in the teaching and learning process.

The acculturation quest for technology enhanced activities in the campus of INTI International University continues through the work of Fui-Theng Leow, Mai Neo and Soon Hin Hew in their use of technologies and media-rich content to co-construct new meaning and knowledge. As simple as it sounds, these key attributes such as improved work relationships, improved leadership, and refined collaborative learning has critical

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impact on students' learning. With the support of web resources, engaged online communication and meaningful presentations utilising the social tools and media for delivering messages, the students' learning experience becomes one with the technology itself in the digital educational environment.

In a manner of natural progression of the (digital) learning environment, the remaining two papers address learning management systems, namely Blackboard and Moodle. From their case study, Vuyisile Nkonki and Siyanda Ntlabathi sought to classify and evaluate the form and function of teaching and learning innovations using Blackboard. Although the SAMR models were used as interpretive lenses for the study, the authors admitted that the transformative learning potential of Blackboard depends on the fundamental reconceptualization and reorganisation of the teaching and learning dynamic. To be fair to Blackboard, it can only serve teaching and learning innovations stemming from the content creator, and not being the initiator of the pedagogical underpinning as it remained a tool at best. At the end of the day, the onus is on the teacher to accentuate 21st century digital learning scenarios via the use of technology (in this case, Blackboard) to significantly transform the teaching and learning tasks.

Nurkhamimi and colleagues presented to us their showcase of the utilization of Moodle in the offerings of postgraduate open and distance learning (ODL) courses by Universiti Sains Islam Malaysia (USIM). Based on Moodle, an e-learning system known as the Global Open Access Learning (GOAL) System was established, serving two mandatory courses (Research Methodology and Data Analysis) and the many applications and features that contribute to the increase of shared knowledge and communication between students. In tandem with Blackboard, the successful use of the Moodle platform in the teaching and learning context critically depends on the teachers having knowledge about the tools, being aware of how they should be used and being capable of organizing all the communication process. Only minor cosmetic and interface issues are required for further enhancement of the appropriate use of the system.

The selection of papers for this Special Issue demonstrate the evolution and future direction of e-learning research and the interdisciplinary nature of the e-learning field, which can be positioned within the focus to the learner and learning experiences as well as key attributes in achieving core competencies of the future generations. The acculturation is encouraging as we seek to align the capacity and capability of multimedia computing to excite, motivate and alleviate educational experiences to a new realm.

Rozhan M. Idrus & Nurkhamimi Zainuddin
Guest Editors

Teacher-Student Perspectives of Invisible Pedagogy: New Directions in Online Problem-Based Learning Environments

Wendy Barber and Sherry King
Faculty of Education, University of Ontario Institute of Technology, Oshawa, Ontario, Canada
Faculty of Pre-Health Studies., Confederation College, Thunder Bay, Ontario, Canada
wendy.barber@uoit.ca
skingsherry@confederationc.ca

Abstract: Universities and institutions of higher education are facing economic pressures to sustain large classes, while simultaneously maintaining the quality of the online learning environment (Deming et al, 2015).. Digital learning environments require significant pedagogical shifts on the part of the teacher.. This paper is a qualitative examination of the nature of teaching in the digital age, and the significant changes facing teachers in the 21C. The authors describe key features of quality distance pedagogy that were exhibited during 12 weeks of a synchronous undergraduate course held in Adobe Connect. The central research questions are 1. How can problem-based learning pedagogy enable instructors to form smaller cohesive groups of students that take greater responsibility for their own learning? 2. What strategies can be used by teachers to develop communities of practice and inquiry? 3. How can an instructorin a large virtual class co-create the level of social capital that is required to build and maintain the relationships that are a necessary condition for a high quality learning experience? and 4. What are the perceptions of teachers about the challenges and benefits of facilitating a high quality problem based learning environment through invisible pedagogy?

The research is grounded in literature through the work of Cousins and Bissar (2012), Kaufman (2013), Badge, Saunders and Cann (2012), Flavin (2012) and McNeill, Gosper and Xu (2012). These authors examine how teachers and learners adapt to the digital age. In addition, more recent work by Bowers and Kumar (2015), Hoadley (2016), Deming et al (2015) and Gunduz et al (2016) are examined.In these digital spaces, teachersbecome facilitators, guides, collaborators and learners themselves, thus making traditional pedagogy virtually invisible.

Further, the paper uses qualitative semi-structured interviews of two assistant professors who instructed the two groups of undergraduate students The teachers identify challenges and successes to using problem based learning as a tool for attaining 21C learning outcomes in digital learning spaces.

Keywords/phrases: Teacher Development, Online Pedagogy, Problem-Based Learning

1 Introduction

It is clear that teachers in the 21C exist in a world that continually reinvents itself. Thus, a key skill for online teachers becomes "learning how to teach in a digital world". The development of new knowledge outpaces instructors' abilities to keep up with content, and one need only acknowledge that our first action when investigating a new phenomenon or problem is "to google it". We may seek out further assistance or expertise from others, but our initial reaction is to use the technology to find the answers for ourselves. Not only have we invented a new verb to describe this self-directed learning process, but this, in itself, demonstrates that 21C learners are in the driver's seat. In anew world that is evolving constantly, educators require different and broader competencies than what have been considered in traditional teacher-centred pedagogy.

As costs of tuition continue to rise, the popularity and accessibility of such digital learning environments becomes more available to students. Bowers and Kumar believe that

> *In the past decade online education has experienced dramatic growth. According to a recent report from Sloan Consortium (Allen & Seaman, 2011) there are currently more than 6.1 million students enrolled in at least one online course. The growth rate for online enrollments (10%) has exceeded the growth in the overall higher education student population (less than 1%) in the United States. The report estimates that 31% of students enrolled in higher education take at least one online course. To address the increasing demand of online education, it is estimated that about 90% of higher education institutions offer some form of online education. Online education has now become an integral part of long-term strategy for over 65% of higher education institutions. Online learning is no longer considered a new phenomenon and has become an important part of our education system. (2015, p. 27).*

Reference this paper: Barber W and King S "Teacher-Student Perspectives of Invisible Pedagogy: New Directions in Online Problem-Based Learning Environments" *The Electronic Journal of e-Learning Volume 14 Issue 4 2016, (pp235-243)* available online at www.ejel.org

This phenomenon of increasing numbers and decreasing costs of online education has a significant impact on instructors, who may now face the possibility of learning to teach well online or be out of a job. As evidenced by the comments of the teachers interviewed in this research, proficiency in teaching online is fast becoming an essential pedagogical skill. Institutions who move more of their courses online can have significant financial savings, as long as the quality of online pedagogy is maintained. Deming et al (2015) concur that

> *online education is concentrated in large for-profit chains and less-selective public institutions. We find that colleges with a higher share of online students charge lower tuition prices. We present evidence of declining real and relative prices for full-time undergraduate online education from 2006 to 2013. Although the pattern of results suggests some hope that online technology can "bend the cost curve" in higher education, the impact of online learning on education quality remains uncertain.(2015, p. 496)*

Further to this, our pedagogy is being reshaped by the digital world to have a wider variety of non-specific learning outcomes based on the new needs of students. Within the context of this online environment, the traditional roles of teacher and learner became reciprocal and symbiotic. The pace of information flow and knowledge mobilization in 21C learning environments mean that instructors no longer act as top down experts. Several authors have re-defined the essential skills required of the 21C learner. Many of these authors concur that these skills include the development of creativity, self-motivation, innovation, problem-solving and collaboration skills (McNeill, Gosper & Xu, 2012; Voogt, Erstad, Dede & Mishra, 2013; Kaufman, 2013). Several institutions, including the World Economic Forum (2016), the Conference Board of Canada (2015) and the Ontario Ministry of Training Colleges and Universities (2015) concur that teachers need to provide opportunities for students to develop these types of characteristics. As a result, online pedagogy cannot be in lecture format, it must be shaped in ways that students can co-develop the learning goals and work within challenging and supportive environments to develop these "new basics" of 21c skills. Clearly, these are also skills that are developed by students in a problem-based learning context. According to Savin-Baden (2007) there are significant characteristics of PBL that include the following:

Table 1. Characteristics of Problem Based Learning.

Complex real world situations that have no one 'right' answer are the organizing focus for learning.
Students work in teams to confront the problem, to identify learning gaps, and to develop viable solutions.
Students gain new information through self-directed learning.
Staff act as facilitators
Problems lead to the development of clinical problem-solving capabilities. (Savin-Badin, 2007)

In a PBL learning environment, the focus is on student-centred and collaborative learning, moving beyond cooperative learning to an environment where critical feedback and challenge between peers and instructor are essential. Shifts in teacher-learner roles occur, students take ownership of the learning, become involved in the assessment process, and define their own course of learning. Thus, there is a perception that the pedagogy becomes virtually invisible.

This approach to teaching is one avenue to better prepare students for the situations that await them beyond the walls of post-secondary education. Although universities have not traditionally been in the position of preparing students for specific work roles in the economy, financial and other pressures are continually pressing for institutions of higher education to prepare students for the "real world of work". Due to the fact that the world is in a continual state of flux, it becomes almost impossible for universities to predict which content is key for students to learn. This is especially so due to the fact that over the course of an undergraduate's four years in school the jobs for which they apply at the end may not yet exist. Thus, it becomes incumbent upon university instructors to shift their pedagogy, put students at the centre of the learning experience and provide opportunities, situations and experiences to develop the kinds of broad competencies that are required for the 21C economy. Although it has not been the historical purview of universities to provide society with workers, the 21C economic situation of colleges and universities requires them to market themselves as institutions from which students will graduate prepared and ready to enter the workforce.

In response to this, an interesting set of parameters has been proposed by the Conference Board of Canada Employability Skills 2000+ (Conference Board of Canada, 2000). These 21C skills include (a) Fundamental Skills

(the ability to communicate, manage information, think and solve problems, and use numbers), (b) Teamwork Skills (the ability to work with others and participate in projects and tasks), and (c) Personal Management Skills (the ability to learn continuously, demonstrate positive attitudes and behaviors, be responsible, be adaptable and work safely). These align clearly with some of the elements that surround a problem-based learning pedagogy, one which essentially puts students at the centre of the process and renders the instructor perceptually "invisible".

2 Methodology

This research was conducted in two phases using qualitative case study methodology (Merriam (1998).

Phase One: Participants in the study were two groups of 30 students taking a synchronous undergraduate class in a fully online environment. The instructors were Assistant Professors in the Faculty of Education. Classes met once per week using video conferencing through Adobe Connect. Students completed a Likert style questionnaire pre and post course to indicate their level of comfort, engagement and competence in an online community, as well as their self-reported level of their ability to be self-directed learners and take responsibility for their own learning. Further to this, a focus group for each of the two groups was convened in Adobe connect after the course had completed to discuss each of the three research questions. 1. How did a PBL structure help/not help students to take greater responsibility for their learning as a member of a small group? 2. What strategies did the instructor use to develop communities of practice and inquiry? And 3. How did the instructor create or develop/not develop greater social capital in the online class. The researchers analyzed and coded the data to identify key themes that emerged through the class recordings, focus groups, and questionnaire results.

Phase Two: The two instructors of each section were interviewed for one hour each using semi-structured qualitative questions to answer the fourth research question: 4. What are the perceptions of teachers about the challenges and benefits of facilitating a high quality problem based learning environment through invisible pedagogy? Interview questions included:

- What was your previous experience using Problem Based Learning?
- What was your previous experience teaching in synchronous Adobe Connect?
- What were the challenges you faced using Problem Based Learning?
- What challenges or barriers did you encounter in fully online pedagogy?
- Did the roles change between you and the students and if so how?
- How would you describe the level of social capital in your class?
- Did the level of social capital have an effect on the learning experiences of your students?
- What means of assessment did you use in the course?
- Were these different than types of assessment you use in face to face courses?
- Can you describe the students' responses to using problem-based learning?
- Do you believe invisible pedagogy is a good pedagogical tool in digital learning environments?

3 Data Collection

Ethical review was passed (Research Ethics Board # 14-029) and informed consent of participants was obtained. Data were collected via recordings of classes in Adobe connect, including both formal and informal chat rooms for review. Recordings of classes were kept on a secure server located at the university. Students were asked to maintain weekly comments in Blackboard chat rooms and use this as a journal format to record their observations about their online community. Anecdotal information from focus groups was recorded and kept on a secure server. Observations of external professional learning communities created by the students in Linked In and Facebook were obtained. In phase two, interviews were recorded and then transcribed and analyzed by the researcher. Transcripts were stored in a password protected file on a university server and audio recordings were then destroyed as per the ethical review.

Table 2: Elements of Invisible Pedagogy: the Role of Teacher and Student in PBL vs Traditional University Lecture Environments

Pedagogy in PBL	**Pedagogy in Traditional Lecture**
Student-centred	Teacher-centred
Real world situations	Theoretical situations
Collaborative work	Individual work
Co-constructed solutions	Individual solutions
Multiple outcomes	One correct outcome

Assessment in PBL	**Assessment in Traditional Lecture**
Uses real world tasks often assessed in groups	Theoretical concepts individually tested
Collaborative assessment	Individual assessment
Students involved in assessment criteria	Teacher develops assessment criteria
Many possible solutions are correct	One or few possible solutions are correct
Assessment embedded formatively throughout the learning process	Assessment is summative at the end of a course or unit

Community in PBL	**Community in Traditional Lecture**
Community-based learning	Individual learning
Inquiry-based learning allows students to drive learning outcomes	Teacher sets learning outcomes
Students take ownership of learning by selecting problems	Teacher retains power by setting the problems to be solved
Learning is dynamic and ongoing	Learning is contained within course outcomes
Community extends beyond course parameters through digital means	Any group work is contained within confines of the course
Social Capital is at a high level	Social Capital is not connected to learning
Student Engagement at a high level and depends on peer interaction and teacher as facilitator	Student Engagement depends on teacher as leader

Table 3: Teacher Interviews:

Topic	**Instructor #1**	**Instructor #2**
Previous PBL experience	I had never taught with PBL so I found it very frustrating I wasn't sure how to structure the course, I'm great with the tech aspect but didn't really do the PBL part well	I've been looking at PBL since I have taught this way for a while, but, transferring to online has been challenging.
Previous Adobe experience	Very comfortable using Adobe Connect	Very comfortable using Adobe Connect
Challenges of PBL	Students either buy in or buy out and I don't know if it's how I structured the course but they kept needing direct instruction	Well, I teach in a college program where the motivation is challenging because my students, many of whom are in poverty or living on Aboriginal reserve. So, I think the PBL model would help them but I'm not sure it worked so well this time.
Challenges of fully online pedagogy	I think fully online pedagogy is the way to go. I'm not sure which is the best way though as I have taught asynchronous and video based Lots more challenges I think for students who don't have the same access depending on band width and other tech stuff	Access to high speed technology
Roles of teacher and learner	Well at the beginning I thought I was the teacher, then I thought I lost control in PBL, but I stuck with it and in the end, some students took it as a 'bird course' and others really invested So I guess – I have to learn to step back	Here I have to be the teacher, because, that is what the community and the culture expect. I, as a teacher, have respect. So strange compared to what I grew up with in a city. I hope someday these roles change but I

	and they have to learn to step up	don't see it happening for awhile.
Level of social capital	There was lots of social capital in the tech savvy students. I worried about those in international situations that due to time zones and lack of good wi fi they might not feel they belonged	In the community there is a high level of social capital. A high level of respect, and also lots of problems. But in this class, I think students found a digital home
Social capital and learning	I believe social capital, or basically taking the time to know and understand your students, is a huge factor in them learning online.	Yes community means a lot, but it depends if the students know about and have social media accounts and have ethics on how to use them.
Means of assessment	I wasn't sure if I did this well I gave them a rubric for self and peer assessment, but I did feel pressured by the college to produce grades based on written assignments	I used traditional things like quizzes and tests, but it didn't really measure what I thought I wanted to see, things like greater independence and confidence.
Online vs. F2F assessment	I'm really not sure about this yet. As in how do we do online assessment and make sure it's the same student doing the task?	I really think in this community at this time face to face is better than online.
Students' responses to PBL	Well, I wasn't very good at it so they weren't either at the beginning. But then we created this space where we could talk. And then it worked.	In some ways it is how they grew up. For the students who came to class, they had a very positive response to PBL.

4 Key Themes

(i) Problem Based Pedagogy: Student responses to the PBL environment were overwhelmingly positive, however two general trends occurred based on student demographics. For those undergraduates who had recently left a secondary school environment that was based on traditional pedagogy, they found the problem based strategies frustrating. Having not been empowered to be self-directed or to be involved in guiding their own learning, many wanted to be told what to do, how to go about it and what the results should look like. By contrast, mature students (who were working full time and pursuing their undergraduate degree online part time) found the constructivist and social elements of PBL very engaging. As adult learners, they responded very well to the independence, autonomy, and self-direction of the assignments. In addition, having had work experience, this may have prepared them better to work as part of a collaborative team, to contribute their own strengths, accept others' input, and demonstrate a willingness to work as a team. Mature students tended to demonstrate more of the Conference Board of Canada (2000) skills already in place, and this may have been why they embraced PBL readily, as it mirrored what they experienced in their own professional world of work. Teachers with little experience in PBL found the experience challenging, and the process of adaptation can take time, so a recommendation would be to have colleagues share experiences in PBL, share assessment strategies, and dialogue about the successes and challenges of implementing a digital PBL learning space.

(ii) Role of the Teacher: Invisible pedagogy does not mean the teacher is absent, nor does it imply that the pedagogy is simple. In fact, done well, it can be more challenging, more artful, more creative and widely diverse. The instructor must step out of his/her traditional role and become the disruptor, creating situations and experiences that both challenge, inspire, support students while providing critical feedback throughout the process. This is what Flavin (2012) refers to as "disruptive technologies" (p. 103). He states that "when digital technologies are brought into the classroom setting, the lecturer may have to relinquish some of their authority, thus impacting on the 'rules' and 'division of labour' nodes in order to enable enhanced learning" (Flavin, 2012, p. 104). Cochrane (2012) identifies this unique sharing of the digital learning environment as one of the critical success factors in mobile learning. He states that features of a successful virtual learning environment include

> *Pedagogical integration of technology into the course and assessment, lecturer modelling of the pedagogical use of the tools, creating a supportive learning community, and creating sustained interaction that explicitly scaffolds the development of ontological shifts that is the reconceptualization of what it means to teach and learn within social constructivist paradigms, both for the lecturers and the students. (Cochrane, 2012, p. 125)*

Further to this, "invisible teachers", in fact, must be willing to step out of the way; they must demonstrate an ongoing aptitude to embrace new technologies as they develop, in order to help students, not from a position at centre stage, but quietly from the background, empowering students to choose and develop the 21C skills they need. In certain cultural settings, where teachers are imbued with respect almost automatically, this shift to having student-centred pedagogy may be challenging. However, using mobile devices that students already use for social networking can aid in the transition to helping students see the possibility of learning anywhere and anytime on their phones or other devices. Teachers themselves "need to acquire 21st century competencies as well as become competent in supporting 21st century learning" (Voogt, Erstad, Dede & Mishra, 2013, p.408).

(iii) Online Community: Lin and Lee (2006) state that "the online community can be defined as a social relationship aggregation, facilitated by internet-based technology, in which users communicate and build personal relationships"(p. 480). Wenger and Synder (2000) believe that "online communities facilitate virtual collaboration among community members with the potential of transforming the activities of off-line into an online context" (in Lin & Lee, 2000, p. 480). While this social element of online learning remains a predominant challenge to educators, effective online pedagogy relies on how skilled the instructor is at developing and sustaining a sense of belonging to the digital community. By combining problem-based learning and a strong sense of community, educators can become adept at helping students become independent autonomous learners who are capable of solving the complex problems facing 21C learners. Instead of taking the power role normally assumed by the teacher, instructors become equal members of the community, bringing unique strengths and learning needs themselves. In this way, instructors blend into the community, become one with the background. By appearing to be on a level field with students, the teacher's role in the community disappears, and reappears as something completely different – as facilitator, lurker, guide and co-learner. As evidenced by the teacher interviews, there may be some cultural differences in accepting online learning and this can create a barrier to accepting new ways to build digital communities. Teachers need to align their pedagogy with the values in the local culture to enable digital learning to be more accessible and user friendly.

(iv) Development of Social Capital: Kearney et al (2012) attest that learning "is a situated social endeavor" (p. 1). Students in these classes invested a great deal of time in developing social networks within the course, many indicated that they also created a Linked In or Facebook group to supplement their contact with peers, following Twitter feeds on their mobile devices outside of scheduled class time. Kearney et al (2012) reiterate that "this socio-cultural view of learning takes into consideration both technical characteristics as well as social and personal learning processes" (p. 2). LittleJohn, Beetham and McGill (2012) agree that the social elements of learning are being embraced by students, and that "learners are responding to the new technical and social opportunities with little help from the formal education system" (p. 551). Student responses in the anecdotal focus groups indicated that they felt safe to take risks, ask questions and go to peers for support and present seminars with confidence. Many attributed this to the PBL climate of the course, and the expectation that a community of mutual respect had been developed. Within this relationship-based community, it became the norm to challenge, ask critical questions, provide feedback and respond to it constructively. As a result, the level of engagement, motivation and the quality of products generated by students increased. Again, it is important to understand, what the cultural values are when discussing social capital. In addition, it is key to consider whether there is an equitable access to technology.

(v) Development of 21C Skills: As McNeill, Gosper and Xu (2012) state, "universities increasingly acknowledge the value of skills such as problem solving, critical thinking and creativity, yet the curriculum needs to be designed to support and scaffold development of these skills. 92012, p. 283). They go on to state that "academics who were likely to introduce the development of student creativity in their curriculum found that confidence emerged as a key characteristic" (2012, p. 284) Students in this PBL class demonstrated skills in collaboration, the ability to come to a variety of workable and diverse solutions, and they also acknowledged that each member of the community, while possessing different skills, had an important and valuable place in the group. These are critical skills for anyone working in the knowledge economy. LittleJohn, Beetham and McGill (2012) indicate that the nature of the workplace has changed, and digital forms of information are changing the meaning of what it means to work. They state that these changes are being exacerbated by three factors

> *First, workplaces are being transformed such that production and practice are increasingly knowledge driven. Second, work problems are becoming more complex and third, people are*

> *regularly and repeatedly transitioning into new roles and careers, necessitating life-long learning. (2012, p.547)*

Students in this study were often mature adults who had changed careers several times, and during the focus groups it was mentioned several times that the PBL approach to learning enabled them to contextualize their learning to their workplace, as well as develop the confidence and competence to use digital tools to solve work-related problems. During the teacher interviews, both instructors mentioned the ongoing challenges of keeping up with new developments in technologies, and the difficulty of having students know more about the technology than they did as instructors. However, once they accepted it, they began to take more of the learner's role, and they found this began to equalize roles in the community. They did mention, however, that there still existed some challenges begin bound by the university/college grading system, noting that it was somewhat artificial to give students power during class, and then take back the power when it came time for giving grades. As a result, they started to dialogue about alternative means for assessing students, and they both appreciated the ongoing conversation about what assessment and evaluation can, or should look like when assessing 21C skills.

(vi) Student Self-Responsibility: During the course of the twelve weeks students built a considerable amount of what they determined to call "social capital". This networking and ability to create and sustain relationships within the learning community was a key feature in helping students take more responsibility for their own learning. An interesting feature that emerged was that students also felt an element of responsibility to the community, to come to class prepared, to engage in discussions, to prepare thought-provoking seminars and case study presentations. Self-responsibility did not mean "going it alone", and as the course progressed students indicated that because of the community they had built they felt safer to ask questions, take risks and help one another. What evolved was not only an improvement in student self-responsibility, but a redefinition of it. Being self-directed also meant a reliance on others for critical feedback, discussion and challenge, as well as being prepared to provide reciprocal feedback for peers to enable their learning and development.

5 Discussion

This paper examines four primary research questions: 1. How can problem-based learning pedagogy enable instructors to form smaller cohesive groups of students that take greater responsibility for their own learning? 2. What strategies can be used by teachers o develop communities of practice and inquiry?? 3. How can an instructor in a large virtual class co-create the level of social capital that is required to build and maintain the relationships that are a necessary condition for a high quality learning experience? 4. What are the perceptions of teachers about the challenges and benefits of facilitating a high quality problem based learning environment through invisible pedagogy?

To answer question one, it is clear from the surveys and comments of students and the observations of the instructor that PBL pedagogy can work effectively to enable instructors to step out of the way, to empower students in smaller groups to take ownership of the learning. While the research began asking the question of how individuals can take greater self-responsibility, it became apparent that the PBL process also means individuals feel a greater responsibility to their community of inquiry. Students commented that they felt the seminars each week were improving, that each member of the group felt a certain obligation to their peers to be well prepared and deliver an engaging and thought provoking seminar or case study. Thus, it is only by allowing students more control, that the instructor can take on large classes effectively. By investing up front and modelling a PBL structure, smaller groups of students can grow into the autonomy required to develop successful pods within a large class.

Responses to question two involve strategies to build online communities. In this case, the initial use of Digital Moments, a community building strategy in the first few classes means that individuals share in an Adobe connect video pod a photo or visual image that shows the community a bit about themselves, their learning backgrounds, reasons for taking the course, age and stage of career, and their personal goals and learning outcomes. In this way, the instructor can see more readily how to create diverse groups, can identify the students having greater experience with PBL, and those that may need greater support. In addition, it appears important that students connect outside of class time, using social media, Twitter, Facebook or LinkedIn. This occurred around the third week of the twelve week course. This phase appears to be important in order for students to invest more of themselves in the course, since they become more accountable to one another and thereby own the learning experience more fully.

Third, how can a network of students in a large virtual class create the level of social capital that is required to build and maintain the relationships that are a necessary condition for a high quality learning experience? Many of the students in this class were simultaneously taking classes with other instructors who were not using a full PBL pedagogical model. Often they commented that the level of social capital in this class was far superior to courses where they did not connect to others. Several students said they had taken full courses and "not even known anyone's names", whereas it became a norm in this class for students to know one another. It was not, in fact, necessary for all students to connect or get along with everyone, but respect for diversity was a key factor. By sharing personal backgrounds (work, family, weekly challenges) the students gravitated to those with whom they felt they had commonalities. At the same time they worked collaboratively in diverse groups, often commenting that this diversity was an important feature in helping them to think critically outside of their own sociocultural perspective and to see with one another's "lenses".

Finally, teachers' perspectives indicated that they appreciated the opportunity to reflect collaboratively about teaching online and using problem-based learning strategies to develop greater social capital and sense of community. An important observation by both teachers indicated that they felt the pressure to 'keep up' with new technologies, and often found their students knew more about the latest affordances than they did. However, they successfully learned to adapt and relinquish some control as they themselves were placed in the role of the learner. In addition, teachers mentioned the need to move towards more open educational resources (OER) as this would be a big step forward in increasing access for low income communities. Further, isolated or rural communities can greatly benefit from online education that may not have been accessible due to long distances from colleges or universities, so students would be able to remain in their local communities while getting a digital education. While the idea of 'invisible pedagogy' was appealing to the instructors, they acknowledged that it would be a work in progess because both they and their students were products of a more traditional teacher-centred model.

Overall, several key themes emerged through this learning environment that ultimately wove together to create increased levels of student self-responsibility. The primary aspect included a focus on a problem-based pedagogy which clearly put students at the centre of the learning process. Second, there were significant changes in the roles of the teacher-learner, requiring the instructor to step into the background and have less of a "top down expert" presence. Third, it became critical that there was the development of an online community of learners that broadened to the larger digital world beyond the class. Using social media and mobile devices, students stayed connected beyond traditional class time. This then resulted in a significant level of social capital and networking, which increased student engagement, commitment, accountability to peers and improved the quality of assignments they produced. Teacher reflections indicated clearly that they favoured open access educational resources, and felt that problem based learning was a unique and successful strategy for facilitating the development of 21C skills. Finally, the interdependent combination of all these themes created an environment in which students could develop the confidence and competence that they needed to be successful in a digital workplace.

6 Conclusion

This paper has provided a qualitative analysis of a case study in problem based learning, where the pedagogy of PBL helps undergraduate students develop greater self-responsibility for the learning process. The authors have argued that a significant outcome of PBL is also the enhancement of what many have termed 21C skills. This is what Littlejohn, Beetham and McGill (2011) refer to as "the capabilities required to thrive in and beyond education, in an age when digital forms of information and communication predominate" (p. 547). Kaufman concurs that "school is not simply about tests and 'checking boxes' of topics and assignments. Rather, schools today should have a mission of developing students as individuals and igniting their creativity" (2013, p. 79). Voogt et al (2013) also attest that it is generally agreed upon that "collaboration, communication, digital literacy, citizenship, problem-solving, critical thinking, creativity and productivity are essential for living in and contributing to our present societies" (p. 404).

Universities and other institutions of higher education have a moral and social obligation to prepare big thinkers for the needs of the 21C. To accomplish this, teachers need the opportunity and resources to develop skills in digital pedagogy. Using open educational resources, this should not come at an additional cost, however, investing in teacher development for online pedagogy will be a significant direction for higher

education. Despite the fact that these colleges and universities are undergoing severe economic cutbacks, surely it is still incumbent upon them to provide education that is relevant, forward thinking and that empowers students to become contributing members of society. While financial pressures may require universities to hold very large classes with one instructor, PBL can be used as a pedagogical strategy to empower students in smaller learning pods. In this way we maintain or enrich the quality of learning by placing it in the hands of the community of students, and the teachers become learners as well.

The problems of the 21C are complex, multi-dimensional and diverse, situated in different geographies, economies and cultures. People living and working in these environments must continually use digital technologies to learn, relearn and come to collaborative solutions. Problem-based pedagogy can be one aspect of higher education that can prepare students for what they will experience in this new world. It prepares them to take responsibility for their own learning as well as contribute to the learning of their colleagues, a skill that they will need as they continually change careers and roles in the workplace. As educators, we must step out of the way, facilitate PBL environments and experiences that help students to leap forward while we, as instructors, simultaneously move quietly into the background. Universities will still need professors, but maybe it's time we begin making their pedagogy invisible.

References

Badge, J., Saunders, N. & Cann, A. (2012). Beyond marks: new tools to visualize student engagement via social networks. *Research in Learning Technology*, 20(16283). doi: 10.3402rlt.v2010/16283

Bowers, J. & Kumar, P. (2015). Students' Perceptions of Teaching and Social Presence: A Comparative Analysis of Face-to-Face and Online Learning Environments. *International Journal of Web-Based Learning and Teaching Technologies* (IJWLTT) 10(1) 27-44.

Cochrane, T. (2012). Secrets of m-learning failures: confronting reality. *Research in Learning Technology*, ALT-C Conference Proceedings, http://dx.doi.org/10.3402/rlts2010.19186

Conference Board of Canada (2000) *A Report on Employability Skills 2000+* http://www.conferenceboard.ca/topics/education/learning-tools/employability-skills.aspx

Cousins, S. & Bissar, D. (2012). Adapting to the digital age: a narrative approach. *Research in Learning Technology*, 20(18976), 1-13.

Deming, D. J., Goldin, C., Katz, L. F., & Yuchtman, N. (2015). Can Online Learning Bend the Higher Education Cost Curve?. *The American Economic Review*, 105(5), 496-501.

Flavin, M. (2012). Disruptive technologies in higher education. *Research in Learning Technology*, ALT-C 2012 Conference Proceedings. http://dx.doi.org/10.3402/rlt.v2010.19184

Gündüz, A.Y., Alemdag, E., Yasar, S. & Erdem, M. (2016) Design of a Problem-Based Online Learning Environment and Evaluation of its Effectiveness. *Turkish Online Journal of Educational Technology* 15(3), 49-57.

Hoadley, C. (2016). Online Pedagogy from the Learning Sciences Perspective. *In The SAGE Handbook of E-learning Research, 2nd ed.*, 25. (C. Haythornthwaite, R. Andrews, J. Fransman, E. Meyers, Eds.)

Kaufman, K. (2013). 21 Ways to 21st century skills: why students need them and ideas for practical implementation. *Kappa Delta Pi Record*, 49(2), 78-83. doi: 10.1080/00228958.2013.786594

Kearney. M., Schuk, S., Burden, K. & Aubusson, P. (2012). Viewing mobile learning from a pedagogical perspective. *Research in Learning Technology*, 20(14406). doi: 10.3402/rlt.v2010.14406

Lin, H. & Lee, G. (2006). Determinants of success for online communities: an empirical study. *Behavior and Information Technology*, 25(6), 479-488.

Littlejohn, A., Beetham, H. & McGill, L. (2012). Learning at the digital frontier: a review of digital literacies in theory and practice. *Journal of Computer Assisted Learning*, 28, 547-556. doi: 10.1111/j.1365-2729.2011.00474.x

McNeill, M., Gosper, M. & Xu, J. (2012). Assessment choices to target higher order learning outcomes: the power of academic empowerment. *Research and Learning Technology*, 20(17595) doi: 10.3402/rlt.v2010.17595

Merriam, S. (1998). *Qualitative Research and Case Study Applications in Education*. San Francisco, CA: Jossey-Bass.

Ontario Ministry of Training, Colleges and Universities (2016). Essential Employability Skills. Retrieved from http://www.tcu.gov.on.ca/pepg/audiences/colleges/progstan/essential.html

Savin-Baden, Maggi. Challenging models and perspectives of problem-based learning. *Management of change: Implementation of problem-based and project-based learning in engineering* (2007): 9-30.

Voogt, J., Erstad, O., Dede, C. & Mishra, P. (2013). Challenges to learning and schooling in the digital networked world of the 21st century. *Journal of Computer Assisted Learning*, 29, 403-413. doi: 10.1111/jcal.12029

World Economic Forum (2016). The 10 skills you need to thrive in the Fourth Industrial Revolution. Retrieved from http://www.weforum.org/agenda/2016/01/the-10-skills-you-need-to-thrive-in-the-fourth-industrial-revolution

Investigating the Key Attributes to Enhance Students' Learning Experience in 21st Century Class Environment

Fui-Theng Leow[1], Mai Neo[2] and Soon Hin Hew [3]

[1]University of Nottingham, Ningbo, China
[2, 3]Multimedia University, Cyberjaya, Malaysia

Fui-Theng.Leow@nottingham.edu.cn
neo.mai@mmu.edu.my
shhew@mmu.edu.my

Abstract: The 21st century marks the beginning of digital age with the extensive use of digital media, mobile devices, and Internet resources. Recent studies found that this digital era has expanded the landscape of student experiences, and educational technologies as well as increased the educator's awareness on embracing technologies to promote effective learning. This has redefined the meaning of effective learning and the approaches in motivating students. Therefore, redesigning the learning environments plays an important role in enhancing the students' experiences in the university classrooms. In this study, the 21st century class environment is designed by mapping Jonassen's model and Gagne's events to employ the constructivist learning approach, organize the information processing, and design the instructions to support effective learning. In order to study student's perception in the 21st century class environment, this study employed the mixed methods approach, includes conducting exploratory factor analysis on the questionnaire response and the qualitative analysis on students' comments. The research samples were formed by 300 undergraduate degree students who studied at INTI International University, Malaysia. The exploratory factor analysis has identified four main factors, group learning, motivation, skills development and knowledge transfer. In the discussion, this study presents the key attributes, the main contributors to the attributes and its impact on student learning. For instance, the factor of group learning can be stimulated by emphasizing on the identified key attributes, such as improved work relationship, improved leadership, and refined collaborative learning which enhancing student learning experience as they are keen to attempt different approach, and anticipate changes. This study aims to identify the factors and elaborate the key attributes for supporting the strategies in transforming the university class environment to enhances students' learning experiences and promote effective learning.

Keywords: students' learning experience, 21st century class environment, effective learning, key attributes

1 Introduction and Literature Review

The 21st century marks the beginning of digital age with the extensive use of social media, mobile devices, and Internet resources. The arrival of digital revolution is now repositioning the process of teaching and learning with the capabilities to promote effective learning and enhance student learning experience. As opposed to the rote memorization, the social process has expanded the educational landscape by encouraging students to exchange ideas, explore new knowledge, co-construct new meanings, and generate mutual understanding (Vygotsky, 1978; Chisanu, Sumalee, Issara & Charuni, 2012; Harris, Jones & Baba, 2013). Studies also show that the well-designed learning environments play an important role in motivating students to form learner community and work collaboration, where they can pool the talents, reflect opinions and develop their own interpretations for problem-solving (Vygotsky, 1978; Cecez-Kecmanovic & Webb, 2000; Johnson & Johnson, 2008; Chiong & Jovanovic, 2012). However, due to the diversities and the lack of study in re-designing the classroom environments, it was reported that students are overwhelmed by the complexity of collaboration and peer interaction, and teachers place less emphasis on students' interaction and capabilities in the class environments (Cecez-Kecmanovic & Webb, 2000; McLoughlin & Lee, 2010). On the other hand, literatures reveal that effective learning is not guaranteed merely by incorporating digital learning technologies, instead it includes enhancing students' social interaction and motivation. However, today's educators are still lack of understanding on the appropriate use of technologies that best suited a situation and support students' needs (Laurillard, Charlton, Craft, Dimakopoulos, Ljubojevic, Magoulas, Masterman, Pujadas, Whitley & Whittlestone, 2011; Stohlmann, Moore & Roehrig, 2012; Downey, Mohler, Morris & Sanchez, 2012). In this study, the discussion focuses on identifying the key attributes in enhancing students' learning experience that bring positive impact on student learning in the university class environment.

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In constructivism, knowledge cannot be transmitted but can be constructed through the meaning making process that related to the real-world situations. Studies found that effective learning can be promoted when the instructional materials and instructional strategies are determined based on the students' experiences. Particularly, when experiencing the challenges, different collaborative approaches and the use of technologies, it can enhance students' motivation, performance and capabilities. Subsequently, it requires less prompting and teacher support as students become more confident and willing to put forth more effort in the learning environments (Duffy and Jonassen, 1992; Neumann & Hood, 2009; Chitanana, 2012; McLaughlin, Roth, Glatt, Gharkholonarehe, Davidson, Griffin, Mumper, 2014). In addition, the growth of social media and online tools bring further social engagement and generate mutual understanding. The knowledge that acquired from social processes and collaborative efforts among students set the opportunities for students to apply conception into practice, debate with their peers, and compare their own practice with that of their peers. This can strengthen the student-student relationships and stay engaged for continued participation, therefore leading to higher sense of ownership in the student-centred learning environment (Vygotsky, 1978; Neumann & Hood, 2009; *Laurillard, 2009).*

Gagne believed that human learning is the permanent change in human capability and occurs with internal processes and external processes. According to Gagne's theory of condition of learning, effective learning can be achieved when the knowledge is communicated efficiently, and the instruction is broken down into simple building blocks with potential values. As such, Gagne stressed that designing the learning environments and developing the learning materials require identifying appropriate learners' mental conditions in order to promote a specific type of learning. For instance, by giving the right problem, appropriate rules and guidance, and intermediate feedback, it trains students' problem solving capabilities (Wager, n.d). These processes also require exposing students to the social interaction and conditions that use their cognitive processes (internal events) for interpreting the environmental stimuli (external events). Gagne's theory of instruction includes the nine events of instruction (1-gaining attention, 2-informing objectives, 3-stimulating recall of prior knowledge, 4- presenting stimulus material, 5-providing learner guidance, 6-eliciting performance, 7-providing feedback, 8-assessing performance, 9-enhancing retention) as a framework for developing educational modules. These events of instruction are described as the external events that can be used by the instructors to address the conditions of learning and structure the learning process for promoting effective learning and enhancing student capabilities (Gagne, 1985; Gagne, Wager, Golas & Keller, 2005). In this study, these events are incorporated in redesigning the learning environment, to support student learning and enhance their capabilities in the group project context.

2 Research methodology

2.1 Design of the 21st Century Class Environment

One of the main objectives of this study is to redesign the conventional class environment into the 21st century class environment where students are tasked to complete a multimedia group project that focus on problem-solving and peer interaction. This design approach was inspired as the literatures show that with the increase of digital literacy among the students, they become more capable to build learner-generated contents and construct new knowledge, especially through exploration, articulation and reflection, it has enriched students' learning experience (Duffy & Jonassen, 1992; Jonassen, 1999; McLoughlin & Lee, 2010).

The design of 21st century class environment mapped Jonassen's model and Gagne's events. Jonassen (1999) model employs the constructivist learning approach to encourage students to construct new knowledge and meaning through the personal experiences and peer interaction. Gagne's events are used to organize the information processing and design the instructions to develop learners' problem-solving skills (Dempsey, 2002). The multimedia group project is the main emphasis of the 21st century class environment. This is also supported by Gagne's condition of learning (1985) as he explained that the problem solving capability is best trained when the right problem and appropriate guidance are given. Hence, this project includes a problem situation and the development process includes considering restrictions, defining the meaning, showing the relevance, creating new ideas, as well as making sense to the context. One of the samples of the project title is that *"[assuming that] Milo Malaysia needs to rebrand their products with new appearance and presents through an interactive e-book named as 'Your Day with Milo'. This e-book will be added in the official website and the touch-screen kiosks at supermarkets. The e-book includes a new design of product logo and tagline*

with a trendier appearance; proposes new packaging design with Malaysia context but the core design should be maintained; and showcases all categories of Milo products in friendly and informative way"

2.2 Data Collection Process

The data collection process employs multiple research instruments, including questionnaire, open-ended questions, and interview. The questionnaire consists of 40 survey items. The survey items were adopted from several research projects with similar research scope. Each item is to be responded based on 5-point Likert scale, ranging from 1 as a result of strongly disagree to 5 as a result of strongly agree. The open-ended questions and interview are to obtain students' experience on group collaboration and their opinions on developing a multimedia group project. It aims to collect fuller details and more aspects of expression to complement and extend the limit of survey questions. In the process of data analysis, the collected data are triangulated in the mixed-method approach to study the impact of this 21st century class environment on student learning, particularly to identify the key attributes to enhance students' learning experience.

2.3 Research Sample

The research sample consists of 300 undergraduate students. The selection was based on the simple random sampling technique in which it represented the entire student population who enrolled in IT courses at INTI International University, Malaysia and studied the module of "Graphic Design and Animations" during the period of data collection, from year 2012 to year 2015. The student demography recorded that 74.2% of Malaysian students, and 25.8% of international students, and among all, majority are male students, consisted of 79.7%, and 23.3% of female students. The class environment was set at the lecture classes at INTI International University, with the emphasis on developing the multimedia group project that involved every student in the development process throughout the whole semester. This learning process focused on developing students' problem-solving skills, communication skills, and critical thinking skills, as well as the software skills in using the multimedia development software for content creation.

3 Data analysis and results

The data analysis was done to generate the results for discussions.

3.1 Exploratory factor analysis

Exploratory Factor analysis (EFA) was used to analyse the item response in the questionnaire for exploring the students' perceptions and learning experiences. Overall, this research study has executed four rounds of the EFA process to present a clean factor structure which consists of only loadings of .5 and above. The 5-step Exploratory Factor Analysis Protocol was employed to ensure the accuracy (Field, 2009; Williams & Brown, 2010; Taherdoost, Sahibuddin & Jalaliyoon, 2014).

1. **In determining the sample size,** the sample size of 300 is acceptable to perform EFA. This is considered a larger sample size which is more adequate and accurate in defining the number of factors.

2. **In selecting the factor extraction method**, the PCA with orthogonal varimax rotation is employed as it is the most commonly used multivariate technique for identifying the linear components and to maximizing the dispersion of factor loadings and making the factors more interpretable and meaningful (Field, 2009; Tabachnick & Fidell, 2012). The correlation matrix indicates that the correlation is between 0.3 to 0.9, which shows that the survey items correlate well as the loading of 0.30 is the minimal and 0.50 is considered significant to display the inter-correlations (Hair, Black, Babin & Anderson, 2009; Tabachnick & Fidell, 2012). The record of .928 in Kaiser-Meyer-Olkin (KMO) Measure shows high confidence on the sampling adequacy. The result of Bartlett's test of Sphericity, X^2 (300) = 3453.604, p <.001, also shows that the correlations between items is also proved sufficiently large for PCA (Field, 2009; Hair et al., 2009; Tabachnick & Fidell, 2012).

3. **In determining number of factors to retain,** Kaiser's criteria is selected as it is more accurate when the sample size exceeds 250 and the average communality is very close to 0.6 (14.18/25 = 0.5672) (Field, 2009; Williams & Brown, 2010). The result of factor extraction shows a cumulative percentage of variance of 56.723% with a total of 4 factors which have an eigenvalue of greater one (see Table 1).

Table 1: Total Variance Explained

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	8.899	35.597	35.597	6.708	26.831	26.831
2	2.769	11.076	46.674	2.992	11.967	38.798
3	1.400	5.601	52.275	2.583	10.332	49.129
4	1.112	4.448	56.723	1.898	7.594	56.723

Extraction Method: Principal Component Analysis.

4. Based on the scree plots of eigenvalues, the curve begins to flatten out after 4 factors, which representing the point of inflexion. Hence, in lining with Kaiser's rule, four factors are to be retained for interpretation (see Figure 1).

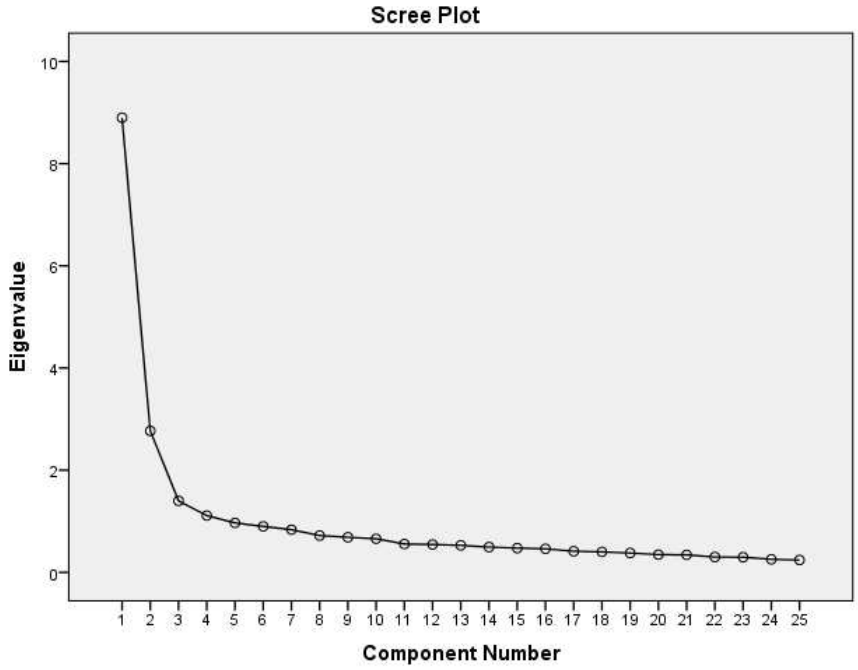

Figure 1: Scree plots of eigenvalues

5. **In selecting the rotating methods,** the orthogonal varimax rotation which capable of maximizing high item loadings is used to produce factor structures. The factor loading is set at 0.5 as the cut-off point as it is considered as strong factor loading coefficient (Tabachnick & Fidell, 2012; Yong & Pearce, 2013). A total of 25 variables were remained in the rotated component matrix after executing four rounds of EFA process to suppress the loadings below .5. Table 2 shows the rotated component matrix with four factors. As each factor is considered meaningful with at least two highly loaded variables, it is acceptable that 14 items are loaded onto factor one, 4 items are loaded onto factor two, 4 items are loaded onto factor three, 3 items are loaded onto factor four.

6. **In summarizing and labelling data,** the factor structure is developed from 25 survey items with the sample size of 300 by using the principle component analysis (PCA) and orthogonal varimax rotation. The Kaiser-Meyer-Olkin (KMO) measure shows adequate sampling with the result of .928. The Bartlett's test of sphericity indicates sufficiently large correlations between items with the result of X^2 (300) = 3453.604, p <.001. There are four factors found to have eigenvalues over Kaiser's criterion of 1, and capable of explaining 56.723% of the variances. The attributes of the survey items are considered in setting the themes for each identified factors for the interpretations (see Descriptive Analysis section). The theme for each factor are: Group learning (FAC1), Motivation (FAC2), Skills Development (FAC3), and Knowledge Transfer (FAC4).

Table 2: Rotated Component Matrix with 4 components

	Factors			
	1	2	3	4
My group communicated well with each other	.795			
My group was supportive of member's problems and helped resolved them	.744			
My group helped me do my best in the project	.733			
There was a lot of unity in my group	.722			
My group leader was very effective	.711			
My group taught me some things I would not have learnt on my own	.694			
My group's interactions were smooth	.681			
Our group encouraged positive contributions from each member	.667			
I enjoy working in a team	.659			
My group was able to solve our problems and conflicts in a positive manner	.657			
Our meetings were well attended.	.642			
I got to know my group members well	.623			
I learn more from the collaboration than on my own	.569			
We were able to organise our work effectively	.504			
I was very motivated to do this project		.755		
I enjoyed working on a project like this		.719		
The project made me want to do my best		.695		
I am very satisfied with my contribution to the project		.633		
I enjoyed using the web to acquire information for my project			.754	
I was able to maintain contact with my lecturer			.750	
I found using the Web to communicate my progress very useful in my learning			.663	
The project allowed me to develop and improve my presentation skills			.561	
I am now able to apply my skills in a more effective manner on future projects				.599
We were able to complete all our tasks on time				.538
The project increased my understanding on how to manage and develop an interactive application				.505

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.[a]
a. Rotation converged in 8 iterations.

3.2 Cronbach's Alpha Test for Reliability

In assessing the internal consistency in each of the identified factors, Cronbach's Alpha test for reliability was conducted. Overall, it shows the result of 0.921 for all 25 retained items. Particularly, factor 1 (with 14 items) shows the Cronbach's Alpha test result of 0.927, factor 2 (with 4 items) shows the result of 0.764, factor 3 (with 4 items) shows the result of 0.722, factor 4 (with 3 items) shows the result of 0.580. According to George & Mallery's (2003) rules of thumb, all 25 retained items as well as factor 1, factor 2, and factor 3 can be accepted as a reliable survey as the Cronbach's Alpha test result is above 0.7. On the other hand, with a larger sample size and considering the number of items in one factor, factor 4 which has the result below the average cut-off point of 0.7 can still be accepted as a reliable survey (Gliem & Gliem, 2003).

3.3 Descriptive Analysis

Descriptive analysis is used to present the mean scores and standard deviation of each identified factor. It also studies the mean, the cumulative percentage of agreed response (combining both strongly agree and agree) of each of the survey item. As for the factor of Group Learning (FAC1), due to the large number of items, another round of factor analysis was done to sub-divide into two sub-factors, themed as peer interaction and teamwork. The Peer Interaction sub-factor (FAC1-sub1) consists of nine items with the mean of 3.9252 and the standard deviation of .63520 (see Table 3).

Table 3: Descriptive Statistics for peer interaction *(FAC1-sub1)*

	N	Minimum	Maximum	Mean	Std.	Variance	Skewness	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error
Fac1_1	300	1.56	5.00	3.9252	.63520	.403	-.591	.141
Valid N (listwise)	300							

The responses of survey items for peer interaction (*FAC1-sub1)* can be seen in Table 4.

Table 4: Responses to survey items for peer interaction *(FAC1-sub1)*

Survey Items	Mean (M)	STD	Cum.Agree (%)	SA (%)	A (%)	U (%)	D (%)	SD (%)
I got to know my group members well.	4.17	0.744	80.67	37.67	43.00	17.67	1.67	0.00
My group helped me do my best in the project.	4.07	0.836	77.67	33.00	44.67	19.33	2.33	0.67
Our group encouraged positive contributions from each member.	3.99	0.863	75.00	28.33	46.67	22.00	1.67	1.33
My group was supportive of member's problems and helped resolved them.	3.98	0.840	73.67	29.33	44.33	22.67	2.67	1.00
My group was able to solve our problems and conflicts in a positive manner.	3.95	0.766	76.67	22.67	54.00	19.33	3.33	0.67
Our meetings were well attended.	3.86	0.945	66.67	28.67	38.00	26.00	5.00	2.33
My group's interactions were smooth.	3.85	0.908	69.00	24.33	44.67	24.67	4.67	1.67
There was a lot of unity in my group.	3.79	0.891	68.00	20.33	47.67	24.33	6.00	1.67
We were able to organize our work effectively.	3.67	0.860	61.67	13.67	48.00	31.67	5.00	1.67

By selecting the items with the mean score of above 4.0, it shows that:

- 80.67% of students agreed that they know their group members well.
- 77.67% of students agreed that the group helped to do his/her best in the project.

By selecting the items with the mean score of above 3.9, it shows:

- 75% of students agreed that their group encouraged positive contributions.
- 73.67% of students agreed that their group supported in problem solving.
- 76.67% of students agreed that their group was able to solve problems and conflicts.

By selecting the items with the mean score of above 3.8, it shows that:

- 66.67% of students agreed that members attended the group meeting.
- 69% of students agreed that their group interactions were smooth.

By selecting the items with the mean score of above 3.7, it shows that:

- 68% of students agreed that the members are united.
- 61.67% of students agreed that they were able to organize the work efficiently.

The results reflected that the students' peer interaction has great influence from the good relationship among the group members which was built prior to the group project. The students commented that "*we knew each other for quite a long time*", "*…team members have their own strengths and weaknesses which can compliments to the development*", *"…and we have work with each other before and are familiar with each other's capabilities*". This explains that the familiarity and past experiences in strengths, capabilities, and personal preferences determine the process of building the work relationship in the group project. With good work relationship, students become more comfortable and active in contributing efforts and providing their supports. These include staying proactive in uniting the group members, sharing the capabilities and resources, and dealing with conflicts in a more positive way. These can be seen from the students' responses, such as *"…we propose our own ideas to each other and choose the best one…"*, *"…he suggested an idea, then all of us seconded his idea and add more, whatever happened, we just work together, we don't blame each other*", *"…we all stay nearby, so we can call them to meet at 1 house then discuss and do works*".

The sub-factor Teamwork (FAC1-sub2) consists of five items with the mean of 3.9573 and the standard deviation of .70168 (see Table 5).

Table 5: Descriptive Statistics for teamwork *(FAC1-sub2)*

	N	Minimum	Maximum	Mean	Std.	Variance	Skewness	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error
Fac1_2	300	1.00	5.00	3.9573	.70168	.492	-.952	.141
Valid N (listwise)	300							

The responses to the survey items for teamwork (*Fac-sub2)* can be seen in Table 6.

Table 6: Responses to survey items for teamwork *(FAC1-sub2)*

Survey Items	**Mean (M)**	**STD**	**Cum.Agree (%)**	**SA (%)**	**A (%)**	**U (%)**	**D (%)**	**SD (%)**
My group leader was very effective.	4.04	0.922	75.33	34.67	40.67	21.00	1.33	2.33
My group communicated well with each other.	3.97	0.893	72.33	31.33	41.00	22.00	4.67	1.00
My group taught me some things I would not have learnt on my own.	3.96	0.894	77.33	27.00	50.33	17.33	2.33	3.00
I learn more from the collaboration than on my own.	3.92	0.810	74.00	24.00	50.00	21.67	2.67	1.67
I enjoy working in a team.	3.90	0.879	71.33	26.33	45.00	22.00	5.33	1.33

By selecting the items with the mean score of above 4.0, it shows that:

- 75.33% of students agreed that their group leader was effective.

By selecting the items with the mean score of above 3.9, it shows that:

- 72.33% of students agreed that their group has good communication.
- 75.33% of students agreed that their group taught them lessons that they would not have learnt on their own.
- 74.00% of students agreed that they learnt more from the collaboration.
- 71.33% of students agreed that they enjoy team-working.

The results reflected that the students emphasized more on the leadership, followed by valuing the quality of communication and the new lessons gained through the teamwork, even though some students felt dissatisfied and less enjoying in the teamwork. The students' responses include *"…my leader find information needed for the project, correcting mistakes of other members' works, she has a sense of responsibility…"*, *"…this project allowed me to realise than I will meet different people and require different levels of understanding of communication that I have to adapt to..."*, *"…however, we accept any suggestion from each other…I feel that communication with each other is very important"*, *"…but only few of the members are not that putting effort on it sometimes"*, *"…maybe it is my mistake because I should know how to lead better and handle all people…"*.

The factor of motivation (FAC2) consists of four items with the mean of 3.9358 and the standard deviation of .60017. These are shown in Table 7.

Table 7: Descriptive Statistics for motivation *(FAC2)*

	N	Minimum	Maximum	Mean	Std.	Variance	Skewness	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error
Fac2	300	1.75	5.00	3.9358	.60017	.360	-.563	.141
Valid N (listwise)	300							

By selecting the items with the mean score of above 4.0, it shows that:

- 85.67% of students agreed that the project made them do their best.

By selecting the items with the mean score of above 3.8, it shows that:

- 70% of students agreed that they are satisfied with their own contributions
- 71% of students agreed that they enjoyed working on group project.
- 75.67% of students agreed that they were very motivated to do the project.

The results reflected that the multimedia group project plays an important role in motivating the students and stimulating them to put forth efforts to achieve a higher goal. Students said that *"I finally have chances able to apply the shooting technique…", "… struggle using this software had taught me not to give up easily & creative to find solution…".* As students were stimulated by recognise their new capabilities in the project development, they become more positive towards accepting challenges with less objection and resistance, as well as becoming more resourceful and self-reliable in the learning process. This can be seen from the students' responses that *"…I have the thought that if I can do it once I can do it again…"*, "*…spent most of the time to do the animation part, felt accomplishment…", "…teach my member how to trace a photo to his poster*", "*I feel so excited because I can know how far my idea and how good I am…*". The feedback reflects that the students can see their own significance and the positive changes as they become motivated in the learning process and then gain more determination to adjust their actions self-purposefully.

Table 8: Responses of survey items for motivation *(FAC2)*

Survey Items	**Mean (M)**	**STD**	**Cum.Agree (%)**	**SA (%)**	**A (%)**	**U (%)**	**D (%)**	**SD (%)**
The project made me want to do my best	4.15	0.690	85.67	31.00	54.67	12.67	1.67	0.00
I am very satisfied with my contribution to the project.	3.88	0.763	70.00	22.33	47.67	25.67	4.33	0.00
I enjoyed working on a project like this.	3.86	0.865	71.00	22.67	48.33	22.00	6.33	0.67
I was very motivated to do this project.	3.85	0.808	75.67	15.67	60.00	20.00	2.67	1.67

The factor of skills development (FAC3) consists of four items with the mean of 3.9117 and the standard deviation of .58667. This is shown in Table 9.

Table 9: Descriptive Statistics for skills development *(FAC3)*

	N	Minimum	Maximum	Mean	Std.	Variance	Skewness	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error
Fac3	300	2.25	5.00	3.9117	.58667	.344	-.123	.141
Valid N (listwise)	300							

Table 10 shows the responses to survey items for skills development *(FAC3)*

Table 10 Responses to survey items for skills development *(FAC3)*

Survey Items	**Mean (M)**	**STD**	**Cum.Agree (%)**	**SA (%)**	**A (%)**	**U (%)**	**D (%)**	**SD (%)**
I enjoyed using the web to acquire information for my project.	4.03	0.758	78.00	27.33	50.67	20.00	1.67	0.33
I found using the Web to communicate my progress very useful in my learning	3.90	0.825	73.00	21.33	51.67	23.00	3.33	0.67
The project allowed me to develop and improve my presentation skills.	3.87	0.823	72.33	19.33	53.00	24.00	2.67	1.00
I was able to maintain contact with my lecturer.	3.85	0.882	69.00	22.00	47.00	26.00	4.00	1.00

By selecting the items with the mean score of above 4.0, it shows that:

- 78% of students agreed that they enjoyed using web to seek for the resources in project development.

By selecting the items with the mean score of above 3.9, it shows that:

- 73% of students agreed that it is useful for using web to communicate and update the work progress.

By selecting the items with the mean score of above 3.8, it shows that:

- 72.33% of students agreed that their presentation skills can be improved through the project development.

- 69% of students agreed that they were able to maintain contact with their lecturers.

The results reflected that the students feel confident and comfortable with the use of web resources in searching for necessary information and sharing the updates with each other. Students commented that "*…we used the websites, we can check the information online, more interesting…", "…I like to browsing for the design on the website…then I learned from there…*", *"…we refer to website…make it as reference and then we set the topic…*". Hence they become more flexible in complementing each other. The students responded that *"…member skilled in different field can deal with different challenges & complement one another…*", *"I felt grateful for whatever experience that I had gone through…"*. As the project development is well-supported with the web technologies and students become more experienced in managing the web resources, it therefore enhances students' presentation skills and communication skills in the class environment. The students' responses include *"…we collaborate online & using social media to ensure group is constantly connected…", "…this type of learning made me realize how important it is to have good collaboration with others…", "…I observed classmates who have much more fascinating ideas…"*

The factor of the knowledge transfer (FAC4) consists of three items with the mean of 3.9167 and the standard deviation of .59798 which can be seen in Table 11.

Table 11: Descriptive Statistics for knowledge transfer *(FAC4)*

	N	Minimum	Maximum	Mean	Deviation	Variance	Skewness	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error
Fac4	300	1.33	5.00	3.9167	.59798	.358	-.470	.141
Valid N (listwise)	300							

Table 12 shows the responses to survey items for knowledge transfer *(FAC4)*

Table 12 Responses to survey items for knowledge transfer *(FAC4)*

Survey Items	**Mean (M)**	**STD**	**Cum.Agree (%)**	**SA (%)**	**A (%)**	**U (%)**	**D (%)**	**SD (%)**
The project increased my understanding on how to manage and develop an interactive application.	4.14	0.736	83.00	32.00	51.00	16.00	0.67	0.33
I am now able to apply my skills in a more effective manner on future projects.	4.01	0.766	80.00	24.33	55.67	17.67	1.33	1.00
We were able to complete all our tasks on time.	3.60	0.987	57.33	16.33	41.00	32.00	8.00	2.67

By selecting the items with the mean score of above 4.0, it shows that:

- 83% of students agreed that the project has increased their understandings on managing and developing the multimedia application.
- 80% of students agreed that the newly learned skills can be applied on future projects.

By selecting the items with the mean score of above 3.6, it shows that:

- 57.33% of students agreed that their tasks were completed on time.

The results reflected that even though many groups were unable to complete the tasks in the development process, however the project has stimulated and increased students' learning interests in various aspects and diversified their experiences with the real-world perspectives. The students responded that "*…faced a lot of obstacles, but after I manage to complete a part, I feel very proud and more motivated to continue…", "…was frustrated because we can't do what we plan, but as we learn more…we can do the design…", "…I feel it is hard but still inspire me to do it…*". On the other hand, as students gained new skills and knowledge in this learning environment, they showed confidence and readiness to transfer the new skills and generalize their new knowledge for further studies and advancing to the higher level of achievements.
Students' responses with good anticipations include "*…it is the basic that I need to learn to go advance level of my course…*", "*I can do better graphic design on further project…", "I look forward to working on more projects like this in the future and to apply the knowledge…*".

4 Discussion

In this section, the factors and students responses are analysed and elaborated to study the key attributes of each factor, along with the contributors and the impact on student learning experience in the 21st century class environments. This is summarised in Table 13.

Table 13: Key attributes of each factor and the contributors the impact on student learning

Key attributes	Contributors to the attributes:	Impacts on student learning
Factor 1 – Group Learning **Sub-factor 1 – Peer Interaction**		
Improved work relationship	When the students were allowed to select the peers who are known with past experiences/ activities.	Students tend to be more active and keen to provide helps and suggestions to those who they are familiar with.
Positive attitude in contributing ideas	When the students were encouraged to share thoughts which come from their own experiences, expertise, or personal preferences.	Students started to realise the differences and open for considering others' opinions in solving problems.
Active participation	When the students were invited to attend events/meeting where their presence serves an important purpose.	Students attempted different approaches to organize tasks and unite the members to suit the situations.
Factor 1 – Group Learning **Sub-factor 2 – Teamwork**		
Improved leadership	When the students were assigned with leadership roles to unite the team, supervise the process, deal with conflicts.	Students found the changes to practice the sense of responsibility for different stages of works.
Refined collaborative learning	When the students were convinced that the team make them to learn more effectively and enjoyably than individual learning or being isolated.	Students started to anticipate changes and felt more pleasure in sharing of thoughts and resources with others.
Factor 2 – Motivation		
Make best effort	When the students were trusted with their performance and given an important role to achieve the goal.	Students look forward to perform better and achieve higher goal.
Feel satisfied in learning	When the students were given chance to explore and innovate by knowing the differences, seeing the changes or observing the results.	Students have clearer mind in determining the purposes and outcomes for more personal gain.
Factor 3 – Skills Development		
Use of web resources	When the students were required to source to materials and resources to develop a complicated project.	Students practiced various skills and methods in searching and managing the online resources.
Engaged online communication	When the students were guided to build community in web 2.0 tools and social network sites.	Students interacted more extensively in social media with more discussion topics, more disputes, and more updates.
Meaningful presentation	When the students were encouraged to generate creative contents with multimedia elements.	Students became more confident and capable in using media-rich content to present and deliver the messages.
Factor 4 – Knowledge Transfer		
Enhanced knowledge on project management	When the students were challenged to handle a complex multimedia project.	Students were more impressed and proud on their successful achievements which inspired them to advance to higher level of performance.
Readiness for future developments	When the students were exposed to project with real-world contexts for problem-solving.	Students started to seek for more opportunities to diversify and apply their new knowledge in different situations for more experiments.

1. The factor of group learning can be stimulated by emphasizing on the key attributes of improved work relationship, positive attitude in contributing ideas, active participation, improved leadership, and refined collaborative learning. Student learning experience is then enhanced as they are keen to provide helps, accept different opinion, attempt different approach, and anticipate changes. This study has revealed that student learning experience can be a unique and valuable process when they are provided with the flexibility in self-constructing the knowledge. Particularly, when the learning environment is designed with real-world approach, students get to apply critical thinking to make sense of their knowledge and resources for generating the solutions towards different situations (Duffy & Jonassen, 1992; Neumann & Hood, 2009; Laurillard, 2009).

2. The factor of motivation can be stimulated by emphasizing on the key attributes of making best effort, and feeling satisfied in learning. These bring the impact of students looking forward to perform better, more determined to set purpose and achieve higher goal. The result is consistent with the literatures that as students' competence increases, their motivation increases. It can be seen that gaining new capabilities, skills and knowledge in the project development process has motivated students to handle the tasks with more confidence and satisfaction. According to Gagne (1985), when an appropriate condition is met, a specific type of learning can be best promoted. Therefore, it can be understood that as the students recognize their new capabilities and new achievements in the process of self-discovery, it urges the student to anticipate new goals and purposes, and become less fear towards new learning opportunities.

3. The factor of skills development can be stimulated by emphasizing on the key attributes of use of web resources, enhanced online communication, and meaningful presentation. Student learning experience is then enhanced as they mastered the skills in managing the resources, involved in online community, gain confidence in delivering the messages. This supports the fact that the advancement in skills lead students to believe in own potential as well as becoming more independent in exploring new possibilities or evaluating the risks. The sense of ownership that developed in the 21st century learning environment can then cultivate active learning which brings more pleasurable experience when students play a role in the learners' community and get connected in the social processes by complementing each other in the content creation process (Vygotsky, 1998; *Laurillard, 2009;* Neumann & Hood, 2009; Chiong & Jovanovic, 2012*).*

4. The factor of knowledge transfer can be stimulated by emphasizing on enhanced knowledge on project management and readiness for future developments. The impact on student learning can be considered from the aspects of students advancing to higher level of performance and seeking for more opportunities to diversify new knowledge. *This study* is consistent with the fact that the social contextual support in Jonassen's CLE model is an important component where it emphasizes on the significance and the value on self-respecting especially to those who have low self-esteem and weaker performance. With the inclusion of social contextual and processes, the 21st century class environment is more practical to illustrate the actual processes in tasks organisation, project management, and problem solving which develop and enhance students' transferable skills.

5 Conclusion

Strengthening students' capabilities has been a focus in research into education reform for the aims of building the 21st century learning environment with modern tools, media-rich content, and innovative pedagogical approaches. This study has identified and elaborated four factors that have impacted student learning in the 21st century learning environment, to promote effective learning and enhance students' learning experience. In summary, group learning can be stimulated by having improved working relationships and improved leadership to transform students into active learners and gain a sense of responsibility. The motivation comes from students making an effort and feeling satisfied in the learning process, which then leads them to perform better and set a higher achievement goals. The students' skills development requires the support of web resources, engaged online communication and meaningful presentations to enable them to be capable in managing the resources, utilising the social tools and media for delivering messages. The knowledge transfer can be stimulated by having enhanced knowledge on project management and a readiness for future developments which inspire students to advance and diversify their knowledge and skills into different

situations. This study concludes that the students' learning experience can be enhanced as the learning environment is designed to support and promote effective learning, particularly when technology and media-rich content are used to co-construct new meaning and knowledge. Overall, this study contributes the factors and key attributes which support the strategies to transform the university class environment to enhance students' learning experiences and promote effective learning.

References

Cecez-Kecmanovic, D. & Webb, C. (2000). A critical inquiry into web-mediated collaborative learning. In A. Aggarwal (Ed.), *Web-Based Learning and Teaching Technologies: Opportunities and Challenges* (pp. 307 – 326). Hershey, PA: Idea Group Publishing

Chiong, R. & Jovanovic, J. (2012). Collaborative Learning in Online Study Groups: An Evolutionary Game Theory Perspective. *Journal of Information Technology Education, 11,* 81-101.

Chitanana, L. (2012). A Constructivist Approach to the Design and Delivery of an Online Professional Development Course: A Case of the iEARN Online Course. *International Journal of Instruction*, *5*(1), 23–48.

Dempsey, J. V. (2002). Robert M Gagné. *British Journal of Educational Technology*, *33*(4), 365–366.

Downey, S., Mohler, J., Morris, J., & Sanchez, R. (2012). Learner perceptions and recall of small group discussions within 2D and 3D collaborative environments. *Australasian Journal of Educational Technology*, *28*(8), 1405–1419.

Duffy, T.M. & Jonassen, D.H. (1992). Constructivism and the Technology of Instruction: A Conversation. Hillsdale, NJ: Erlbaum.

Espasa, A., Guasch, T., & Alvarez, I. M. (2013). Analysis of Feedback Processes in Online Group Interaction: a Methodological Model. *Digital Education Review*, *23*, 59–73.

Field, A. (2009). *Discovering statistics using SPSS* (3rd ed.). London: Sage.

Gagne, R.M. (1985). *The conditions of learning and theory of instruction* (4th ed.). New York: Holt, Rienhart & Winston.

Gagne, R. M., Wager, W., Golas, K., and Keller, J., (2005). *Principles of Instructional Design*. Toronto, ON: Thomson Wadsworth.

George, D. & Mallery, P. (2011). *IBM SPSS Statistics 19 Step by Step: A Simple Guide and Reference* (12th ed.). New Jersey: Pearson Prentice Hall.

Gliem, J. A. & Gliem, R. R. (2003). Calculating, interpreting, and reporting Cronbach's alpha reliability coefficient for Likert-type scales. In *Midwest Research to Practice Conference in Adult, Continuing, and Community Education* (pp. 82–88).

Hair, J.F., Black, W.C., Babin, B.J. & Anderson, R.E. (2009) *Multivariate data analysis*. (7th Ed.) Prentice Hall: London.

Harris, A., Jones, M. & Baba, S. (2013). Distributed leadership and digital collaborative learning: A synergistic relationship? *British Journal of Educational Technology*, *44*(6), 926–939.

Johnson, D.W., & Johnson, R.T. (2008). Cooperation and the Use of Technology. In D. Jonassen, M. J. Spector, M. Driscoll, D. Merrill, & J. van Merrienboer (Eds.), *Handbook of Research on Educational Communications and Technology: A Project of the Association for Educational Communications and Technology* (p. 404). New York: Taylor & Francis.

Jonassen, D. (1999). Designing Constructivist Learning Environments. In C.M. Reigeluth (Ed.), *Instructional Design Theories and Models: A new Paradigm of Instructional Technology* (2nd ed.), 215–240. Mahwah, NJ: Lawrence Erlbaum Associates.

Laurillard, D. 2009. The pedagogical challenges to collaborative technologies. Computer Supportive Collaborative Learning 4: 5-20.

Laurillard, D., Charlton, P., Craft, B., Dimakopoulos, D., Ljubojevic, D., Magoulas, G., Masterman, E., Pujadas, R., Whitley, E. & Whittlestone, K. (2011). A constructionist learning environment for teachers to model learning designs. *Journal of Computer Assisted Learning*.

McLaughlin, J. E., Roth, M. T., Glatt, D. M., Gharkholonarehe, N., Davidson, C. A., Griffin, L. M., … Mumper, R. J. (2014). The Flipped Classroom: A Course Redesign to Foster Learning and Engagement in a Health Professions School. *Academic Medicine*, *89*(2).

Mcloughlin C. & Lee, M.J.W. (2010). Personalised and self-regulated learning in the Web 2.0 era : International exemplars of innovative pedagogy using social software. *Australasian Journal of Educational Technology*, *26*(1), 28–43.

Neumann, D. L., & Hood, M. (2009). The effects of using a wiki on student engagement and learning of report writing skills in a university statistics course. *Australasian Journal of Educational Technology*, *25*(3), 382–398.

Odunlami, I. B. (2013). Effects of Factor Analysis on the Questionnaire of Strategic Marketing Mix on Organisational Objectives of Food and Beverage Industry. *European Journal of Business and Management*, *5*(18), 47–58.

Stohlmann, M., Moore, T. & Roehrig, G. (2012). Considerations for Teaching Integrated STEM Education. *Journal of Pre-College Engineering Education Research*, *2*(1), 28–34.

Tabachnick, B.G. & Fidell, L.S. (2012). *Using multivariate statistics*. 6th Ed. Pearson Education Inc.

Taherdoost, H., Sahibuddin, S., & Jalaliyoon, N. (2014). Exploratory Factor Analysis: Concepts and Theory. *Advances in Applied and Pure Mathematics*, 375–382.

Usher, A. (2012). What is motivation and why does it matter? Center on Education Policy, Graduate School of Education and Human Development, The George Washington University.

Vygotsky, L.S. (1978). *Mind in Society: The Development of Higher Psychological Processes.* Harvard University Press.

Wager, W. (n.d.). Legacy of Robert M. Gagne. Retrieved from Florida State University, Department of Education, on 8th June, 2014.

Williams, B. & Brown, T. (2010). Exploratory factor analysis: A five-step guide for novices. *Australasian Journal of Paramedicine*, *8*(3).

Yong, A. G. & Pearce, S. (2013). A Beginner's Guide to Factor Analysis: Focusing on Exploratory Factor Analysis. *Tutorials in Quantitative Methods for Psychology*, *9*(2), 79–94.

The Forms and Functions of Teaching and Learning Innovations on Blackboard: Substantial or Superficial?

Vuyisile Nkonki and Siyanda Ntlabathi
Teaching and Learning Centre, University of Fort Hare, Alice, South Africa

vnkonki@ufh.ac.za
sntlabathi@ufh.ac.za

Abstract: This study is an Information and Computer Technology evaluation of the Blackboard Learning Management System into teaching and learning at an institution of higher education in South Africa. In view of the institution's objective of developing a context-driven, transformative, and innovative teaching and learning practices involving the integration of technology, the study sought to classify and evaluate the form and function of teaching and learning innovations on Blackboard. Using a case study research design and a purposive sampling strategy, lecturers making an extensive use of Blackboard in the delivery of their courses were sampled. Blackboard start-up documents as well as open-ended questionnaires for lecturers provided qualitative data. Content analysis and the extraction of themes were employed. The functional pedagogical framework and SAMR models were used as interpretive lenses for the findings. The study concludes that the nature of Blackboard innovations tended to be more superficial at the levels of substitution and augmentation. Limited transformation evidenced by modification and redefinition spelled lack of substantial changes in curriculum design and delivery. With respect to the functions served by Blackboard, the conclusion drawn is that the integration is to a large extent driven by management and efficiency concerns and less by interaction, collaboration and personalisation functions. The study signals non-realisation of the educational functions spelt in the Blackboard start-up documents. The study recommends a differentiated approach to Blackboard training by a multi-disciplinary team.

Keywords: ICT integration, innovation, transformation, Blackboard, Learning Management Systems, transformational learning, pedagogical innovations.

1 Introduction

The rationale for integrating technology into teaching and learning lies in the novelty offered by technology, a belief in its efficiency, and the economic benefits associated with its use (Salmon, 2005). Notwithstanding the above-mentioned positive spin-offs, the focus on technology tools and the affordances and possibilities they bring, often clouds teaching and learning assumptions and consideration of the pedagogies that underlie their use. In this regard, Patten et al (2006) warn against naive optimism in relation to their ability to enhance teaching, foster and drive learning.

This paper aims at emphasising the need for an educational purpose as an overarching aim for using Blackboard, a Learning Management System (LMS), introduced at a higher education institution in South Africa. The study, therefore, sought to examine the pedagogical innovations associated with the use of Blackboard, the forms they take, and the functions they serve. It argues that transformational learning can only be achieved if there are substantive modifications on the teaching, learning and assessment tasks and activities of a module or course to maximise the value of the LMS medium. This point is corroborated by Ho (2000) who asserts that e-learning is about pedagogic innovations rather than technical solutions. The paper typifies some of the changes that lecturers made in their courses as part of design and delivery when using Blackboard, and then looks at the functional value of such changes. It concludes by recommending ways of using Blackboard to achieve transformative learning.

The forms of innovations on a Learning Management System are necessitated by the different needs depending on whether courses are offered on-campus, through distance, and on the content offered (Christie and Garrote-Jurado, 2009). Familiarity of students with the LMS is seen as influencing the tools that are used in online and blended courses. The above cited authors argue against the simply transfer of files onto an LMS without considering the design of the platform or the pedagogical use of its capacity. In a similar vein, Steel and Levy (2009) argue that students' learning styles, lecturers' practices and visions for practice are diverse and complex, and that like students, diversity and complexity also needs to be acknowledged and accommodated in relation to lecturers' beliefs about teaching and learning and the use of LMS environments. Berggren et al (2005) paper on reviewing complexities of integrating learning design concepts, specifications and tools with an LMS concluded that it is important to promote intuitive design environments that are teacher and learner-friendly. These above cited papers substantiate the importance of involving the lecturers

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and students when designing online platforms. Govindasamy (2002) also puts forward the view that lecturers need to come forward to express their expectations of e-learning solutions, as their voices would collectively become loud enough to be heard by the e-learning solutions providers.

With respect to the functions served by innovations in an LMS, a substantial portion of the literature argues that mitigating substantive problems of teaching and learning practice, as well as the advancement and maximisation of learning, should be the overarching aims of e-Learning. Dempster et al (2012) distinguish between the management, personal and professional aims of pedagogic innovations. With respect to the management imperative, they list review of existing courses, creating new courses, and the promoting blended learning in large course contexts. For personal and professional aims, they mention learning new teaching skills and engaging students online, which requires re-examining one's own pedagogy, the sharing of practices, and interrogation of principles and practicalities involved (Dempster, et al 2012). In this regard, Vrasidas (2004) highlights issues of pedagogy and design in e-Learning systems as having some implications for design of LMS, which according to him need to be "intuitive and designed so that it supports learning principles and supports the tasks of the online teacher". In view of the above conceptualization of the forms and functions of teaching and learning innovations on Blackboard, e-Learning questions the dominance of the lecturer in favour of more active and meaningful learning activities and tasks.

Contrary to the above-stated purpose of LMS integration, it is argued that the Blackboard platform serves to enhance traditional teaching and learning practices (Malikowski et al, 2007). In line with this view, Blin and Munroe (2007) observed that there is a general tendency to use Moodle, an LMS, for administration, dispensation of resources, and replication of existing practices such as broadcasting feedback. The conclusion by Malikowski et al (2007) is apt when they opine that LMSs promote the enhancement of traditional teaching and learning practices. A similar observation by Nkonki et al (2013) noted congruence between Blackboard's functionalities used, and lecturers' beliefs and preferences, particularly those that relate to the transmission modes of teaching and learning.

McLoughlin and Lee (2010) hold the view that educators and students using Blackboard move towards a social and participatory pedagogy rather than one based on the acquisition of pre-packaged, static facts that are transmitted by the lecturer to the students (Fallery and Rodhain, 2011). McLoughlin and Lee (2010) posit that there is need for pedagogies that are personal, social and participatory. In line with the transactional models of learning, these authors also hold that learners as active participants and co-producers of learning resources. Thus, innovations on e-learning platforms should be used to foster conversational models of learning which accentuate the development of autonomous learners through guided discovery and scaffolding, whilst enabling feedback and exchange, and fostering interaction and self-regulation (Mayers and de Freitas, 2004). In this regard, the Blackboard platform affords online discussion groups, simulations, discovery tasks, multimedia lessons tutorials, assignments, research projects, quizzes, and digital content.

The transformative learning potential of Blackboard, which the institution from which this research is conducted seeks to achieve, depends on the fundamental reconceptualization and reorganisation of the teaching and learning dynamic, starting with various specific contextual needs and contingencies (Garrison and Kanuka, 2004). The design of teaching and learning activities that incorporate technology should foster interaction and engagement in a community of inquiry and learning. Engagement in transformative learning involves free and open dialogue; critical debate; negotiation and agreement; reflective element; multiple forms of communication in a community of learning inquiry (Garrison and Kanuka, 2004). The result is the development of learning relationships, identities, social practices of inquiry and learning, disciplinary practices, collaborative learning outcomes, and authentic practices (Mayers and de Freitas, 2004). In view of the transformative learning tenets, Ho (2000) argues that it is the achievement of higher levels of learning, that is, critical and reflective thinking, which should be the ultimate aim of LMS innovations.

Salmon (2005) identifies two stages through which the introduction of e-Learning has moved. The first stage is where e-learning technologies are seen as a new way of doing familiar and traditional things. Here, pedagogical approaches and the underlying assumptions about teaching and learning are unchanged but enhanced by the introduction of learning technologies. This could be seen as transference of existing pedagogy. The second stage, involves the use of learning technologies in new ways that involves paradigm shift in the conceptualisation of both the practice and the pedagogy of teaching and learning. This is said to constitute radical pedagogical change which the institution from which this research is conducted aspires to achieve.

Rather than first thinking about which technologies to introduce into teaching and learning, Dempster et al (2012) posit that teaching and learning innovations should be preceded by (1) self-awareness of one's own conceptions and practices, (2) confrontation with the inadequacies of one's own theories and practices, (3) exposure to better, alternative conceptions, and (4) commitment to building and consolidating changed practices. They therefore, suggest starting teaching and learning innovations with individual lecturers during course design at the programme level. Individual lecturers in the departments, therefore, become the locus of developing pedagogic innovations with e-Learning tools.

Teacher resistance to curriculum redesign and redevelopment that involves the integration of technology is, in part, explained by teachers' established conceptions of learning and teaching. Hence, Ho (2000) suggests the creation of a safe platform for challenging curriculum assumptions. This platform would also foster self-awareness, confront and expose lecturers to better and alternative conceptions of teaching and learning. In addition, an institutional culture that acknowledges, recognises and legitimises innovations should help break the cycle of established teaching conceptions and practices. Ho (2000) also argues that multiple teams and interdisciplinary teams that share practices, foster creativity and innovation in curriculum development.

The point on curriculum development being the focus in the integration of technology, and the need for an interdisciplinary team, is further emphasised by Kaczynski and Kelly (2004) who assert that *"curriculum development efforts must become increasingly attentive to the rapidly evolving relationship of software program integration with course content".* They argue that prior to course delivery, students as contributors, learning content and technology should be addressed so that a rich learning experience is realised.

In view of the above ideas on e-Learning innovations, this study was conducted in order to address the following research questions:

- What forms do pedagogical innovations in Blackboard take?
- What teaching and learning functions are served by pedagogical innovations in Blackboard?

The following section describes the theoretical frameworks that were used to analyse Blackboard start-up documents, that is, the Blackboard Planning and Course Request Forms, as a way of interrogating the lecturers' intentions around the nature and functions of teaching and learning innovations.

2 Theoretical framework

The Puentedura (2009) Substitution, Augmentation, Modification, and Redefinition (SAMR) model was used to analyse and categorise the nature and form of pedagogic innovations in Blackboard. Patten et al's (2006) functional pedagogical framework informed the study of the various functions served by the forms of teaching and learning innovations in Blackboard.

2.1 The SAMR model

Though the model has been used to assess the pedagogic functions served by handheld devices such as tablet (van Oostveen et al, 2011), the framework is yet to be used for the classification of the pedagogic functions of Blackboard.

The enhancement functions of the model include substitution and augmentation. With *substitution*, technology acts as a direct tool, a substitute, with no functional change in the teaching and learning practices. Technology in this instance is used to do the same things the lecturer did without it. With *augmentation,* technology acts as a direct tool, a substitute with functional improvements in the teaching and learning practices. Though the same things are done with technology but there are however, minor improvements (Fabian and MacLean, 2014).

The transformation functions of the model include modification and redefinition. *Modification* allows for significant task redesign which makes it possible for new products to be created, and improvement in efficiency achieved. With *redefinition,* technology allows for the creation of new tasks which were previously inconceivable, a remix and redesign process, a total transformation of one's practice (Fabian and MacLean, 2014). Van Oostveen et al (2011) found that there was a general tendency to substitute traditional learning tools such as pen and paper, with tablet personal computers. The authors argue that a great deal needs to change with respect to the understanding of the pedagogical and epistemological conceptions of lectures, if meaningful learning is to be achieved. A similar observation was made by Herrington et al (2009) who view the current use of e-Learning tools in higher education as pedagogically conservative and regressive.

2.2 The functional pedagogical framework

This framework categorises applications in terms of their pedagogical functions. Patten et al (2006) list these categories of functions as *administration, reference, interactive, micro world, data collection, location aware, and collaboration.* These authors argue that most applications tend to replicate or augment the existing learning practices. These applications enable access to content, but tend to replicate traditional applications in terms of the instructional philosophy. The administration and reference functions mentioned above serve convenience in communication. The interactive, micro world, data collection, location aware, and collaboration are associated with the educational philosophies of collaboration, contextualisation, and constructivism. Though the framework has been used to assess pedagogic functions served by handheld devices, but is yet to be used for the classification of the pedagogical functions of an LMS like Blackboard. This particular study chose to infer pedagogical functions from the intentions of lecturers in the Blackboard Planning and Course Request Forms.

3 Research methodology

3.1 Research design

The study made use of a descriptive case study design (Cohen et al, 2007). In this particular study, case studies provided narrative accounts which describe lecturers' intentions with the use of Blackboard. Cases studies allow for both qualitative and quantitative analysis of data. Case studies are strong in the portrayal of reality and evaluation of actions with a view to pointing action steps. Insights offered by case studies have a direct bearing on the formative development of staff and individuals. The choice of a case study design is particularly relevant in the context of the site where this research is conducted since the transformation of teaching and learning practices is envisaged with the use of Blackboard.

3.2 Sampling

Sampling was purposive which implies that cases were hand-picked on the basis of their typicality and richness of information, with the intention that they would help fulfil a particular need. Thirty-one (31) out of sixty (60) Blackboard Planning and Course Request Forms constituted the cases of this particular research. These documents were easy to access because of their central location with the administrator of Blackboard. This saved the researchers both costs and time. In addition, lecturers who use Blackboard extensively, as reflected in the reports, were asked to respond to an open-ended questionnaire. Five (5) of the lecturers acceded to the request to participate in the study.

3.3 Data collection

Data were obtained from documents and records, as described above. In particular, the study made use of lecturers' responses on the current teaching context, the rationale for the use of Blackboard. The section on the *context* asks lecturers to furnish information on the teaching and learning challenges identified in their contexts. The *rationale* section solicits information on the purpose for which lecturers specifically want to use Blackboard, for example, resource deployment, communication, assessment, interactive student engagement, course management, et cetera. The form also asks what lecturers think would be the value of using technology to assuage the teaching and learning challenges described in the context section. In addition, the researchers used open-ended questions to gather data on (1) the changes/adjustments in the curriculum (both design and delivery) that have been necessitated by the introduction of Blackboard in their courses/modules, (2) the educational functions/outcomes (in terms of knowledge, skills, and competencies) that are served by the introduction of Blackboard in their courses/modules, (3) the intentions/purposes (as articulated in the Blackboard Planning and Course request forms) that were realized with the integration of Blackboard; (4) the constraints/impediments to the intentions/purposes that were not realized.

3.4 Data analysis

Content Analysis was employed for the purposes of making sense of the data. Cohen et al (2007:197) describes content analysis as involving a process whereby the "content of communication serves as a basis of inference, from word counts to categorisation", and is used in the analysis of educational documents. Data from the documents were first analysed qualitatively and then later further analysed quantitatively. Textual data analysis involved the extraction of words with similar meanings from verbatim responses, and the coding of these into concept types or themes (OLRAC SPS, 2015). Codes were summarised into categories suggested by the SAMR theoretical model. Category frequency was then computed to decipher the forms of innovations, as

well the functions served by pedagogic innovations on Blackboard. Data from open-ended questionnaires generated a transcript which was analysed thematically. The questions formed themes with the many meaning units such as words and phrases forming codes. These codes were classified and aggregated into fewer content categories suggested by the theoretical frameworks used in this particular study (Struwig and Stead, 2013). The narratives presented show the variety of manifestations of the forms and functions of pedagogic innovations on Blackboard.

4 Findings

4.1 Forms of pedagogic innovations in Blackboard

With respect to the forms of innovations, the data collected revealed the following results which are discussed under the following categories of the SAMR model:

Substitution: It is evident from the data that the tool was just a substitute for the old way of doing things. For example, instead of printing materials, the lecturers indicated that they would put materials online for students to access. This practice does not seem to change the norm or depart from teaching practices that do not involve Blackboard. The following excerpts suggest no functional changes in the teaching and learning methods and tasks. For example, the intention expressed in the following phrases suggests that *"It would make it easy for students to access course content"*. This suggests that students can have access to their materials anytime, anywhere. If they had printed materials but then lose their copies, they can go and access them from Blackboard again. Two similar excerpts elaborate this finding regrading lecturers' views of the function of Blackboard: *"Ensure that students receive the learning material and information that they need"* and *"Students will download notes and slides from Blackboard"*.

These lecturers see the tool as enabling access to learning materials, and possibly curtailing office visits by students requesting materials. The lecturers also indicated that *"The Blackboard tool reduced costs of printing"* and that *"They [students] will print course outlines and other teaching materials directly from blackboard"*. This was a cost reduction exercise on the side of the lecturer, but the cost is now shifted to the students when asked to print materials on their own. Other lecturers indicated that the tool enabled them make announcements and post due dates for assessments. One of the participants remarked that "*They will also be able to read any announcements I place on Bb for their attention."* The other students commented that *"They will also see the due dates for formative and summative assessment of their portfolios."* All of the above excerpts indicate a change from a handout method of disseminating information to using an online tool. This indicates mere substitution.

Augmentation: With augmentation there is functional improvement in how the tool is used. The majority of the lecturers used the tool with little improvements effected. Several excerpts showcase a change in the use of the Blackboard tool: *"They will be able to engage interactively with the learning content through Blackboard."* Here there is an assumption that when student access the material, they will be able to interact with the content. Similarly, the view that *"It will give them an opportunity to have access to more reading materials and improve the level of communication"* is indicative of the assumption that Blackboard will translate into transformative educational practices. Although giving students reading material does improve their level of communication skills, putting more reading materials online does not necessarily translate to students' interaction and engagement with the materials. In addition, there should be measures in place to test that the students are reading these materials. For example, giving students the task of summarising the text and sending it to the lecturer is an example of testing that they are reading. There were no measures evident in the lecturers' responses that show that students were truly engaged with the materials.

Modification: Modification implies the redesign of materials and tasks to accommodate Blackboard and to improve efficiency. Two aspects from the data that call for the redesign of materials and tasks included *"…developing critical thought in students, assisting students to complete challenging tutorials, becoming aware of what plagiarism is..."* This is a broad response and encompasses quite a number of changes on how the lecturer approaches the course. If Blackboard enabled all of the above, then one assumes that there were changes in the tasks and methods of engaging students. Redesign of materials to accommodate the LMS might be evident in its being used to complete challenging tutorials and in submitting reports on time. The fact that the tool enabled students to understand plagiarism speaks to its enabling writing development. Other excerpts that speak to redesign are, *"They will be able to enter discussion platforms, exchange views and opinions and respond to peers too."* A departure from a face-to-face discussion to an online discussion needs a completely

different conceptualisation of teaching and learning, both in form and function. This therefore, entails a total redesign of the task, and of the way in which students respond to each other and the lecturer in the discussion forum. The discussion forum tasks are a good way of illustrating changes in the design process of an online discussion forum. The discussion forum tasks are a good way of illustrating modification, which is located at the transformational level of the SAMR model. In this instance, the lecturer attempted to move to a more advanced level of technology usage in the classroom.

Redefinition: Redefinition allows for the creation of new tasks and materials. It allows for reconceptualisation of the whole course. The data, however, did not provide evidence of changes that would be effected at this level of aligning teaching and learning practices with the potential of Blackboard. With the redefinition level, most, if not all the lecturers had not reached this transformation level in their design of tasks and methods of teaching and learning.

The results of the analysis of the open-ended questions suggest that no substantial changes/adjustments were made and effected by lecturers on their curricula, at both the levels of the design and delivery of the curriculum and lesson units. One of the lecturers remarked that *"none really. I use it for notes. I sometimes use it for tests*". Where changes/adjustments are claimed to have been made, these are superficial adjustments on the learning guides. These include updates on dates for submission, lecture and consultation times, venues and contact persons. The following sentiment expressed by one of the lecturers pointed out that *"The learning guides would be followed year after year for any changes or adjustments, as they would be available on Blackboard".*

4.2 Functions of pedagogic innovations

Table 1 below shows frequencies and the rank-order of emerging themes, and their sub-themes, regarding the pedagogic functions served by the integration of Blackboard into teaching and learning: engagement (22%), convenience (81%), efficiency (26%), collaboration (9.67%), management (16.12%), developmental (12.90%), and personalisation (3.2%).

Table 1: Quantitative analysis of themes

Themes	Sub-themes	f	%
Convenience	Access to materials; Communication: clarity and effectiveness	25	81
Efficiency	Assessment: Minimal time & labour; Economy in resource utilisation	8	26
Engagement	Interaction (tasks)	7	22
Management	Repository of materials and resources; Management of submissions; queries	5	16
Developmental	Critical thinking; academic literacy; writing development; avoidance of plagiarism; support with challenging materials	4	13
Collaboration	Interaction and exchange of ideas	3	10
Personalisation	Uniqueness and customisation	1	3

The *engagement* theme included excerpts that suggested the use of Blackboard to foster interaction with ideas, materials and learning resources. The sub-themes pertaining to *convenience* which emerged from the data included access to materials, and the need to achieve ease, clarity and effectiveness in the lecturers' communication with students. For the *efficiency* theme, the need to save on time and labour expended on assessment tasks was expressed. The *efficiency* theme also involved management of resources. *Collaboration* was characterised by lecturers' reference to the desire to get students to interact and exchange ideas. The *developmental* function was deduced from phrases and sentences that made reference to critical thinking, academic literacy, writing development, and the avoidance of plagiarism. Phrases that alluded to academic

support for challenging materials were also allotted onto this theme. The *personalisation* function was expressed by the lecturers' intentions to use features of Blackboard that allow for uniqueness, customisation of materials and resources, as well as a personal feel in the delivery of course.

The responses to the open-ended questions revealed that the following educational functions/outcomes were served by the introduction of Blackboard, namely: improved communication, follow-up on students' progress, diagnosis and identification of students at risk, support, confirmation of learning, revision, additional learning, application of theory, exposure to a wide range of learning experiences and opportunities, access to notes, reasoning skills, computer skills, and online practice on the assessment exercises.

Some of the participants report that the intentions/purposes in the Blackboard Planning and Course Request forms were not realized. In this regard one of the lecturers opined that *"realistically nothing…"* was realized. One of the explanations for this non-realisation of educational outcomes included "*students' reluctance to set aside time for Blackboard*". Another view expressed cited complaints on the part of the lecturers who fail to work on Blackboard. The nature and contents of these complaints were however not elaborated on by the research participant.

5 Discussion

With respect to curriculum changes, the findings suggest that the focus on technology serves to benefit the convenience, management, administration and efficiency in the transmission mode, with limited success in the transactional, and almost no success with transformational learning. Though literature suggests improvements in efficiency as a function of modification in teaching and learning tasks and methods (Fabian and McLean, 2014), the findings of this particular study revealed the achievement of efficiency with substitutions and augmentations. These findings confirm Herrington, et al's (2009) observation that the use of technology devices in higher education has tended to be conservative and regressive, characterised by mere substitution of pen and paper by computers, laptops and other gadgets, with limited usage of the affordances that most teaching and learning software provides. The results of this research suggest, as do van Oostveen et al (2011), that transformational learning is not achieved if the focus is on the technological changes than on pedagogical changes. The few superficial adjustments on the Learning Guides claimed by some lecturers and the almost non-existence of substantial changes in both the design and delivery of the curriculum amounts to non-existence of pedagogical innovations in the usage of Blackboard which Christie and Garrote-Jurado (2009) advance in their argument for more pedagogical uses of a Learning Management System.

The Blackboard functions that serve interactive, constructivist, contextualisation, constructionist and collaborative learning, seem not to be focus of the current cohort of lecturers using Blackboard. This is asserted because the findings suggest convenience, management, and efficiency as the drivers of lecturers' motivations to use Blackboard. These findings confirm Patten et al (2006) observations that administration, reference, convenience and communication tend to be the most served functions in the integration of technology into teaching and learning. It would seem that lecturers' intentions to achieve collaboration, engagement, interaction, and transformation of texts are not matched by adjustments in the curriculum activities. These activities cannot be achieved through Blackboard without substantially reconfiguring the entire curriculum. The findings on the challenges with students' reluctance to set aside time for Blackboard, superficial changes on the Learning Guides, and the non-realisation of the educational intents and purposes of Blackboard integration could be explained by the lack of alignment between the technology application, course contents, students and lecturers' expectation and experiences. In this regard, Kaczynski and Kelly (2004) argue that a rich learning experience is achieved when there is an integration and a symbiotic relationship between a software programme, course content, and the contributions of students and lecturers.

6 Conclusion

It is evident that lecturers are using Blackboard in different ways for different reasons. The tool is used for enhancement purposes, but not at an advanced level that requires transformation of teaching and learning methods and tasks. In this study, analysis showed that none of the lecturers had advanced to the redefinition level of transformation as described in the SAMR framework. The above findings suggest that lecturers did not think through the necessary changes in their teaching and learning methods and tasks when integrating Blackboard. It would seem that the adjustment forms taken by most courses which integrated Blackboard are substitution and augmentation. Little wonder that a non-transformative use of Blackboard and the non-existence of pedagogical innovations is observed. The interaction, collaboration and personalisation concerns

do not seem to have been given thorough thought. One therefore concludes that the connection between purpose (function) and form (nature) were not well processed when Blackboard Planning and Course Request forms were completed. Thus, the educational function of integrating Blackboard was shifted to the background by most lecturers with convenience, management and efficiency concerns taking the centre stage. Therefore, educative purposeful functions could not be achieved because the integration of Blackboard was left to individual lecturers with little or no regard for the confluence of students, lecturers, educational developers, curriculum advisors, and technicians' inputs.

7 Recommendations

In view of the above findings and conclusions, the study submits that a lot of development and support still needs to be given to lecturers in order that they reach advanced levels in the use of Learning Management Systems. There is, therefore, a need for differentiation in the manner in which Blackboard training for lecturers is organised and delivered. Thus, basic, intermediate and advanced training manuals need to be developed. These manuals should be a blend of pedagogic and technological innovations for achieving certain educational outcomes. Attempts should be made by Blackboard trainers and academic development practitioners to get the lecturers to align their teaching and learning methods and tasks so that they are appropriate for the educational purposes sought. A multi-disciplinary team that includes Blackboard trainers, technologists, curriculum specialists, students and education developers should be constituted so that the integration of Blackboard into teaching and learning is informed by curriculum principles of active, engaging, collaborative, meaningful and transformational learning.

References

Blin, F. and Munroe, M. (2007) "Why hasn't technology disrupted academics' teaching practices? Understanding resistance to change through the lens of activity theory", *Computers & Education*. Vol 50, pp. 475-490.

Berggren, A., Burgos, D., Fontana, J.M., Hinkelman, D., Hung, V., Hursh, A., and Tielemans, G. (2005) "Practical and Pedagogical Issues for Teacher Adoption of IMS Learning Design Standards in Moodle LMS". *Journal of Interactive Media in Education*, 2005(2) 1 – 24. Available from http://jime.open.ac.uk/2005/02/berggren-25-02.pdf.

Cohen, L., Manion, L., and Morrison, K. (2007) *Research Methods in Education*, Routledge Taylor and Francis, London and New York.

Christie, M. and Garrote-Jurado, R. (2009) Barriers to innovation in online pedagogy, *European Journal of Engineering Education*, Vol. 34, No. 3, pp. 273-279, DOI:10.1080/03043790903038841. Retrieved on 15 October 2016.

Dempster, J.A., Benfield, G., and Francis, R. (2012) "An academic development model for fostering innovation sharing in curriculum design", *Innovations in Education and Teaching International,* Vol 49, No. 2, pp. 135-147.

Fabian, K. and MacLean, D. (2014) "Keep taking tablets? Assessing the use of tablet devices in learning and teaching activities in the Further Education sector", *Research in Learning Technology*, Vol 22, No. 22648. http://dx.doi.org/10.3402/rlt.v22.22648

Fallery, B. and Rodhain, H. (2011) "Three Epistemological Foundations on e-Learning Models", *International Conference on e-Education, Entertainment and e-Management.* Jakarta: Indonesia. http://hal.archiveouvertes.

Garrison, D. R. and Kanuka, H. (2004) "Blended learning: Uncovering its transformative potential in higher education", *Internet and Higher Education*, Vol. 7, pp. 95-105.

Govindasamy, T. (2002) "Successful implementation of e-learning Pedagogical considerations", *Internet and Higher Education,* Vol 4, pp. 287-299.

Herrington, J., Herrington, A., Mantei, J., Olney, I. and Ferry, B. (2009) "New Technologies, new pedagogies: mobile learning in higher education", www.ro.uow.edu.au/edupapers/91.

Ho, A.S.P. (2000) "A conceptual change approach to staff development: A model for programme design", *International Journal for Academic Development*, Vol. 5, No. 1, pp. 30-41.

Kaczynski, D., and Kelly, M. (2004) "Curriculum Development for Teaching Qualitative Data analysis Online" Proceedings of QualIT2004: *International Conference on Qualitative Research in IT & IT in Qualitative Research*: 24-26 November 2004, Brisbane, Australia.

Mayers, T. and de Freitas, S. (2004) "JISC e-Learning Models Desk Study: Review of e-learning theories, frameworks and models Manchester", *Joint Information Systems Committee*. http://www.jisc.ac.uk/uploaded_document/stage

Malikowski, S.R., Thompson, M.E., and Theis, J.G. (2007) "A Model for Research into Course Management Systems: Bridging Technology and Learning Theory", Journal *of Educational Computing Research*, Vol. 36, No. 2, pp 149-173.

McLoughlin, C. and Lee, M.J.W. (2010) "Personalised and self-regulated learning in Web 2.0 era: International exemplars of innovative pedagogy using social software", *Australasian Journal of Educational Technology*, Vol 26, No. 1, pp. 28-43.

Nkonki, V., Ntlabathi, S., and Mkonqo, L. (2013) **"**Explaining influences in the adoption of Blackboard at an institution of higher learning", *Proceedings of the 8th International Conference on e-Learning, Cape Peninsula University of Technology*, Cape Town, South Africa, 27-28 June 2013.

OLRAC SPS (2015) *IBM SPSS TAFS (Text Analytics for Surveys) Training Manual: Introduction*, TOLRAC SPS, Tokai.

Patten, B., Sanchez, I.A., and Tangney, B. (2006) "Designing collaborative, constructionist and contextual application for handheld devices", *Computers & Education*, Vol 46,pp. 294-308.

Salmon, G. (2005) "Flying not flapping: a strategic framework for e-learning and pedagogical innovation in higher education institutions", *Research in* Lear*ning Technology, Vol* 13, No. 3, pp. 201-218.

Steel, C. & Levy, M. (2009) Creativity and constraint: Understanding teacher beliefs and the use of LMS technologies. In Same places, different spaces. *Proceedings ascilite Auckland* 2009. http://www.ascilite.org.au/conferences/auckland09/procs/steel.pdf (16 Retrieved on 17 October 2016.

Struwig, F.W. and Stead, G.B. (2013) *Research: Planning, Designing and Reporting*, Pearson, Cape Town.

Van Oostveen, R., Muirhead, W., Goodman, W.M. (2011) "Tablet PC and reconceptualising learning with technology: a case study in higher education", *Interactive Technology and Smart Education*, Vol 8, No. 2, pp.78-93.

Vrasidas C. (2004), Issues of Pedagogy and Design in e-learning systems. *ACM Symposium on Applied Computing*, pp. 911-915.http://dl.acm.org/citation.cfm?doid=967900.968086. Retrieved on 17 October 2016.

Learner-Centred Teaching Contributes in Promising Results in Improving Learner Understanding and Motivation: A Case Study at Malaysia Tertiary Education

Wei-Li Yap [1], Mai Neo [2] and Tse-Kian Neo [2]
[1]Faculty of IT, Mathematics and Sciences, INTI International University, Nilai, Malaysia
[2]Faculty of Creative Multimedia, Multimedia University, Cyberjaya, Malaysia
desiree.yap@newinti.edu.my
neo.mai@mmu.edu.my
tkneo@mmu.edu.my

Abstract: In Malaysia, traditional teaching is still a common approach among many lecturers. There have been many studies reported its limitations and many lecturers have started to adopt more learner-centred teaching approach to promote better learner understanding and learner motivation. Throughout this effort, it is noticed there are lecturers who could not be assured and felt uncertain about this transition because they went through traditional teaching environment during their studies. Due to this, the effort in shifting from traditional teaching to a more learner-centred teaching has been challenging and hard-hitting. Nevertheless, educational and multimedia technology has played an important role in creating a more interesting and engaging learning environments for our digital natives in this 21st century. In this research, a framework is to be proposed based on Weimer's Learner-Centred Teaching model and through the incorporation of educational technology and multimedia technology in the learning environments. This proposed framework describes how this learner-centred teaching environment could promote better learner experiences by increasing retention rate and improving learner motivation. This proposed framework is recommended through the triangulation results from pre-test/ post-test, learning environments surveys and students' written comments, which in turn serves as a guideline for lecturers to identify how they could progressively shift to learner-centred teaching environment.

Keywords: learner-centred teaching, interactive multimedia learning, learner motivation, learner understanding

1 Background Study

1.1 Changing Education Landscape

Educational institutions are facing a greater challenge from today's students who have grown up with technologies (Prensky, 2001). The rapid growth of Information Technology and Communication (ICT) (Vallance, 2008), has resulted in a bigger push for educators to use these technologies in the classrooms (Sivapalan & Wan Fatimah, 2010). As such, the education landscape is rapidly evolving to accommodate the increasing use of these technological tools (McLoughlin & Lee, 2010), and to take advantage of their benefits to teaching and learning on a global scale (Gobbo & Girardi, 2001). Research has also shown that technological advancements have a direct impact on the nature of education, as they bring about changes in the roles of learners and educators alike, as well as on the learning process (Mahajan, 2012).

These changes thus results in enormous pressure for educational institutions to incorporate technology into the classrooms in order to produce skilled 21st century workers (McLaren, 2007; Mahajan, 2012). In more developed countries, such changes have long been incorporated into the educational system. However, in the Asian region, particularly in Malaysia, and where the countries are still developing, these changes are still slow and are still being tested for its effectiveness and readiness (Mitka & Gates, 2010; Hong & Songan, 2011). In addition to this, there is still a lack of confidence amongst educators about the effectiveness of online education (Chung, 2008; Chiang, Chapman & Elder 2010), as research has shown that technology is often used for the wrong reasons, usually due to pressure from school administrators, convenience, and results in the technology being the focus of the learning process, and not the content or learning materials (Herrington & Kervin, 2007). As such there is a definite need to embed sound pedagogies into the creation of learning materials and let these pedagogies be the driver of educational innovation (Koehler, Mishra, Hershey & Peruski, 2004; Raja Maznah, 2004; McCarthy, 2010), in order to engage students in the course content (Tuparov, Tuparova & Peneva, 2004; Chiang, Chapman & Elder, 2010), which consequently formed an integral part of this research's objective and issue.

Reference this paper: Yap W, Neo M and Neo T "Learner-Centred Teaching Contributes in Promising Results in Improving Learner Understanding and Motivation: A Case Study at Malaysia Tertiary Education" *The Electronic Journal of e-Learning Volume 14 Issue 4 2016, (pp266-281)* available online at www.ejel.org

1.2 Educational challenges in INTI International University

INTI International University (INTI IU) is one such example facing these challenges. Currently INTI IU is making a change to incorporate learner-centred teaching into the curriculum. However, with the lack of confidence in online learning and an absence of a proper teaching framework which incorporates these changes, acceptance and adoption of such learning approaches may become misguided and ineffective. INTI IU followed this encouragement from the Ministry of Education. INTI IU, the management has been promoting e-learning in the campus. With the use of technology in education, it helps INTI IU to start implementing e-learning in course delivery. The first step was INTI IU launched its own learning management system called INTIONLINE. It is an online platform which allows lecturers to upload their lecture notes, coursework specifications, create quizzes, participate in forums for discussion, use dropbin to allow students to submit assignments online and send message or notification to students and classes.

It is not easy at the beginning to convince lecturers to move on to this e-learning because there were some challenges faced by the management, lecturers and students. The challenges are:

- Lecturers are not familiar with e-learning approach
- Lecturers do not have much experience in using Microsoft Office Suite
- There is inconsistency in the design of lecture notes
- Mistakenly thought the use of INTIONLINE achieves e-learning

1.3 Learner-centred Teaching

Learner-centred education entails providing and implementing learning in many forms so that students have the flexibility and option to learn, and it is through doing tailoring programs to meet these needs that learning and motivation are enhanced. When students are allowed to have their own control on the learning materials and learning pace at the same times, the students are experiencing a change in the learning process (Hunter, 2012). Bender (2003) noted that education has gone into new paradigm and more emphasis needs to be put on student engagement. It is very obvious that when technology was introduced for teaching, students can be actually involved on the teaching part, not just on the learning process, because they can discuss the works together with the peers and they can see their peers' works online. This gives them the opportunity to experience different learning environment.

When comparing learner-centred teaching with the conventional teaching, there is one main difference between them. One is allowing the students to have the control on self-directed learning while the latter is putting the responsibility on lecturers to plan the lesson and give instructions to students. A learner-centred teaching environment always carries the following characteristics which describes effective learners as recommended by de La Harpe, Kulski and Radloff (1999): "*they have specific learning objectives, have wide range of learning strategies and know when to use those, use accessible resources in the most effective way, take responsibility for their own learning, have the skills of adapting to learning processes, planning, observing and evaluating, express their feeling in an appropriate way, understand the learning process, and are aware of their strengths and weaknesses*." Weimer (2002) suggested that in order for education programs to effectively promote learning, and thus evolve into learner-centric environments, five key changes need to be incorporated into instructional practices.

1. The role of the teacher
2. The balance of power
3. The function of content
4. The responsibility for learning
5. The process and purpose of evaluation

1.4 Multimedia Learning

There were many discussions before by other researchers about the proper usage of multimedia elements brings great positive impact towards the learning outcomes for students. Why do people use multimedia in education? It is proven that the multimedia has the relation to the learning process of an individual. It encourages more participation and attracts higher attention from the students. Low, Low and Koo (2003) posited that using multimedia in education can help shifting the education environment to different paradigm and students can enjoy the major benefits of multimedia learning. If multimedia learning environment is

introduced with certain level of student control is incorporated, better student understanding can be achieved (Nicholson & Nicholson, 2010).

With the use of multimedia learning modules in the classroom teaching, students are motivated in learning process. The learners are allowed to control when they want to study using the multimedia learning module. The design of the multimedia in the learning module promotes the feeling of ownership because the learners are given full control using the learning module (Shank, 2005; Wang, 2010). The multimedia learning module includes the hyperlinks which allow the students to navigate to other additional sources available in the Internet besides the non-linear form of the learning module. From there, students are encouraged to explore more information and form deeper understanding on the content (Wang, 2010). Gibson, Herbert, Sebastian and Mayhew (1998) posited "*By combining different media we reach a wider variety of learners creating a rich blend of sensory perceptions*" (p. 472). This is again supported by Wang (2010) where multimedia is able to help both slow and fast learners without putting pressure onto the lecturers about which teaching method to be adopted.

1.5 Multimedia Design Principles

Mayer (2001) proposes seven design principles to be considered while designing a multimedia learning application to ensure the positive impact of multimedia is achieved and not to overload the students' brain processing while perceiving an application which is rich with media. With the principles implemented in learning material, it can help to provide a better learning environment and helps to improve learning (Clark & Mayer, 2008).

The following Table 1 summarizes the description for each design principle:

Table 1: Mayer's seven design principles (Mayer, 2001)

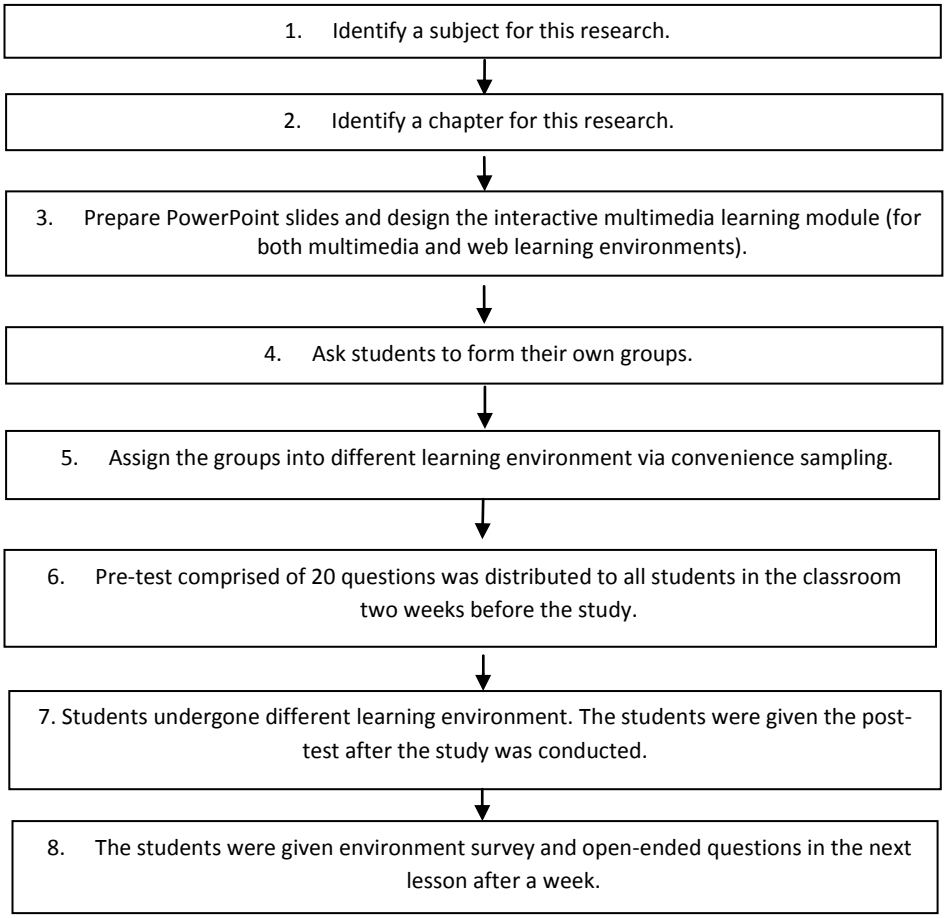
Design Principle	**Explanation**
Multimedia Principle	Students learn better from words and pictures than from words alone.
Spatial Contiguity Principle	Students learn better when corresponding words and pictures are presented near rather than far from each other on the page or screen.
Temporal Contiguity Principle	Students learn better when corresponding words and pictures are presented simultaneously rather than successively.
Coherence Principle	Students learn better when extraneous words, pictures and sounds are excluded rather than included.
Modality Principle	Students learn better from animation and narration than from animation and on-screen text.
Redundancy Principle	Students learn better from animation and narration than from animation, narration, and on-screen text.
Individual Differences Principle	Design effects are stronger for low-knowledge learners than for high-knowledge learners and for high-spatial learners rather than for low-spatial learners.

2 Methodology

This study followed the experimental research methodology where there was a need to study the "cause-and-effect" relationships among the learning environments and students' learning outcomes. Experimental research is described as "*a study which looks at the effect(s) of at least one independent variable on one or more dependent variables*" (Fraenkel, Wallen and Hyun, 2012, p. 265). The group design in the experimental research for this study was quasi-experimental design. The quasi-experimental design for this research consisted of one control group (C) and two treatment groups (X). The control group was where students were taught using face-to-face teaching approach and PowerPoint was used as the presentation slides (referred as F2F). One of the treatment groups was where lecturer conducted the lecture in face-to-face via the interactive multimedia learning module, and at the same time students were allowed to access the same copy of learning module from the computers (referred as MM). The other treatment group was to allow the students to have their own independent learning by accessing the web-based interactive multimedia learning module (referred as Web). Observation (O) through measurement was administered through pretest before and after the treatment or the conduct of the control group.

This research aims to investigate students' perceptions on each learning environments: face-to-face, multimedia and web. In this research, the author was assigned to teach this subject when it was offered. This research was conducted over two years in two studies due to the offer of this subject did not occur every semester. In both studies, the way students being sampled into different learning environments were consistent. After the enrolment was settled after week 3 in the semester, students were asked to form their own groups for the purpose of their group assignments. Once the groups were formed, the author then assigned a number to each group depending where the groups sat that time in the class starting from the front row. For example, in the case of a total of 15 groups being formed in the class, group 1 to group 5 would be in the control group, group 6 to 10 would be in treatment group 1 (multimedia) and group 11 to 15 would be in treatment group 2 (web). All of the students were independent samples in each learning environments. The conduct of both Study 1 and 2 involving different learning environments is illustrated in Figure 1:

Figure 1: Flow of Study 1 and Study 2



3 Analysis and Discussion

3.1 Student Learning Outcomes

The following Table 2 shows mean scores for the Pre-test and Post-test conducted in the three learning environments for both studies. Pre-test and Post-test consists of full marks of 20.

Table 2 Mean Scores for Pretest and Posttest

	N	Mean	STD	N	Mean	STD
	STUDY 1			STUDY 2		
F2F: Pre-test	14	7.64	2.061	13	6.46	1.984
F2F: Post-test	14	11.64	2.205	13	11.69	3.614
MM: Pre-test	24	8.46	2.813	17	9.82	4.377
MM: Post-test	24	11.92	3.006	17	14.29	3.331
Web: Pre-test	30	8.10	2.496	20	8.50	.919
Web: Post-test	30	12.80	3.253	20	14.40	.884

From Table 2 above, it indicated that in these two studies, the post-test mean score of the web learning was the highest among all and Study 2 has better mean scores compared to Study 1. The Shapiro-Wilk tests have the values of .606 and .485 for Study 1 and 2 which indicated the samples were normally distributed. Table 3 indicates that the results for the differences of pretest and posttest mean scores are significant where the p-value is less than .05 (Field 2009):

Table 3 Paired Sample T-Test

Paired Sample Test								
	Paired Differences					**t**	**df**	**Sig. (2-tailed)**
	Mean	**Std. Deviation**	**Std. Error Mean**	**95% Confidence Interval of the Difference**				
				Lower	**Upper**			
STUDY 1								
F2F: Pre-test – Post-test	**-4.000**	2.075	.555	-5.198	-2.802	-7.211	13	**.000**
MM: Pre-test – Post-test	**-3.458**	3.538	.722	-4.952	-1.964	-4.788	23	**.000**
Web: Pre-test – Post-test	**-4.700**	3.303	.603	-5.933	-3.467	-7.795	29	**.000**
STUDY 2								
F2F: Pre-test – Post-test	**-5.231**	3.586	.995	-7.398	-3.064	-5.259	12	**.000**
MM: Pre-test – Post-test	**-4.471**	3.448	.836	-6.243	-2.698	-5.346	16	**.000**
Web: Pre-test – Post-test	**-5.900**	1.944	.435	-6.810	-4.990	-13.573	19	**.000**

3.2 Learning Environment Survey Results

The survey was designed with 20 questions, 30 questions and 35 questions to get feedback from the students on the three different learning environments respectively. The survey was adapted from other similar research field, Ashkeboussi (2001), Liaw, Huang and Chen (2007), Kennedy, Petrovic & Keppell (1998), Masiello, Ramberg and Lonka (2005), and Pham (1998). The students responded on a five-point Likert type scale (1=strongly disagree, 2=disagree, 3=undecided, 4=agree, and 5=strongly agree). Each survey in each environment was different to accommodate the findings on each learning environment. There were few categories or constructs identified for the survey: motivation, understanding, content, role of teacher and web features (this category was only available for the survey used in web learning environment). The following Table 4 summarizes the mean scores for each contributing factor, Learner Understanding and Learner Motivation. (The complete set of surveys is in Appendix).

Table 4: Mean scores for Motivation and Understanding Survey Items

	STUDY 1			**STUDY 2**		
Understanding	M = 3.52	M = 3.53	M = 3.86	M = 3.50	M = 4.01	M = 4.16
Motivation	M = 3.29	M = 3.59	M = 3.85	M = 3.38	M = 4.09	M = 4.09

Table 5 shows the results of the ANOVA analysis for the factor on learner understanding. It is noted that the difference between the mean scores for understanding is significant among three learning environments where $p < 0.05$. For effect on achieving understanding among the three learning environments, it differed

significantly across all three, where Study 1 is F (2, 65) = 7.680, p = .001 and Study 2 is F (2, 47) = 3.661, p = .033.

Table 5 One-way ANOVA analysis on "Understanding"

	Sum of Squares	df	Mean Square	F	Sig.
STUDY 1					
Between Groups	3.079	2	1.539	7.680	.001
Within Groups	13.029	65	.200		
Total	16.108	67			
STUDY 2					
Between Groups	3.303	2	1.652	3.661	.033
Within Groups	21.202	47	.451		
Total	24.505	49			

In terms of the effect on understanding, web learning with multimedia module was significantly different from teaching with PowerPoint and teaching with multimedia module. Tukey post-hoc comparisons for effect on understanding of these three learning environments indicated that web learning with multimedia module (M = 3.87, 95% CI [3.71, 4.03]) again had higher ratings than teaching with PowerPoint (M = 3.52, 95% CI [3.24, 3.80]), p = .049, and also teaching with multimedia module (M = 3.41, 95% CI [3.22, 3.60]), p = .001 (see Table 6). Similarly, in Study 2, web learning with multimedia module (M = 4.12, 95% CI [3.80, 4.43]) also had higher ratings than teaching with PowerPoint (M = 3.50, 95% CI [3.02, 3.98]), p = .035. As for the comparisons between teaching with multimedia module (M = 4.04, 95% CI [3.75, 4.33]) and the other two learning environments were not statistically significant at p < .05.

Table 6 Multiple comparison for "Understanding"

Tukey HSD						
(I) Method	(J) Method	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
STUDY 1						
F2F	**MM**	.11409	.15056	.730	-.2470	.4752
	Web	-.34841*	.14491	.049	-.6960	-.0008
MM	**F2F**	-.11409	.15056	.730	-.4752	.2470
	Web	-.46250*	.12261	.001	-.7566	-.1684
Web	**F2F**	.34841*	.14491	.049	.0008	.6960
	MM	.46250*	.12261	.001	.1684	.7566
STUDY 2						
F2F	**MM**	-.53922	.24746	.085	-1.1381	.0597
	Web	-.61667*	.23928	.035	-1.1958	-.0376
MM	**F2F**	.53922	.24746	.085	-.0597	1.1381
	Web	-.07745	.22156	.935	-.6137	.4588
Web	**F2F**	.61667*	.23928	.035	.0376	1.1958
	MM	.07745	.22156	.935	-.4588	.6137

Table 7 above shows the results of the ANOVA analysis on learner motivation. It is noted that the difference between the mean scores for motivation is significant among three learning environments where p < 0.05. For effect on motivation among the three learning environments, it differed significantly across all three, where Study 1 is F (2, 65) = 5.079, p = .009 and Study 2 is F (2, 47) = 4.514, p = .016.

Table 7 ANOVA analysis on "Motivation"

	Sum of Squares	df	Mean Square	F	Sig.
STUDY 1					
Between Groups	3.288	2	1.644	5.079	.009
Within Groups	21.037	65	.324		
Total	24.325	67			
STUDY 2					
Between Groups	4.605	2	2.302	4.514	.016
Within Groups	23.974	47	.510		
Total	28.579	49			

For the effect of motivation, the difference between the mean scores of teaching with PowerPoint and web learning with multimedia module was .581 and this difference was statistically significant (p = .007) (see Table 8). From the earlier overall ANOVA analysis, the significance found was actually due to the difference of mean scores between only two groups: teaching with PowerPoint and web learning with multimedia module. In summary, Tukey post-hoc comparisons for effect on motivation of these three learning environments for Study 1 indicated that web learning with multimedia module (M = 3.87, 95% CI [3.65, 4.08]) had significantly higher ratings than teaching with PowerPoint (M = 3.29, 95% CI [2.95, 3.62]), p = .007. As for the comparisons between teaching with multimedia module (M = 3.62, 95% CI [3.38, 3.85]) and the other two learning environments were not statistically significant at $p < .05$. For Study 2, the results indicated that teaching with multimedia module (M = 4.09, 95% CI [3.75, 4.44]) had significantly higher ratings than web learning with multimedia module (M = 4.06, 95% CI [3.72, 4.40]), p = .029 and also teaching with PowerPoint (M = 3.38, 95% CI [2.93, 3.84]), p = .026.

Table 8 Multiple comparison for "Motivation"

Tukey HSD						
(I) Method	(J) Method	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
STUDY 1						
F2F	**MM**	-.33095	.19132	.202	-.7898	.1279
	Web	-.58095*	.18414	.007	-1.0226	-.1393
MM	**F2F**	.33095	.19132	.202	-.1279	.7898
	Web	-.25000	.15580	.251	-.6237	.1237
Web	**F2F**	.58095*	.18414	.007	.1393	1.0226
	MM	.25000	.15580	.251	-.1237	.6237
STUDY 2						
F2F	**MM**	-.70950*	.26314	.026	-1.3463	-.0727
	Web	-.67538*	.25445	.029	-1.2912	-.0596
MM	**F2F**	.70950*	.26314	.026	.0727	1.3463
	Web	.03412	.23561	.989	-.5361	.6043
Web	**F2F**	.67538*	.25445	.029	.0596	1.2912
	MM	-.03412	.23561	.989	-.6043	.5361

3.3 Students' Comments

After collecting surveys on learning environments, students' comments from Study 1 and Study 2 were also collected and analyzed to find out the triangulation among pre-test/ post-test, survey and comments (See Table 9, 10 and 11).

Table 9 Students' Comments (F2F)

No	Comments
STUDY 1	
1	*"Difficult to follow."*
2	*"Sometimes will feel boring if lecturer present by a boring way."*
3	*"Some lecturer might having less interaction with the students.* *Some lecturer might teaching too fast, the students might find hard to absord the knowledge. Students might not concentrated during the class."*
4	*"Lecturer was teaching too fast and cauldn't catch up.* *Lecturer was not really clearly explain futher more explaination."*
5	*"Sometimes it make me bored and tired, besides this, it is actually no problem at all."*
STUDY 2	
1	*"I can't remember what lecturer teach sometimes."*
2	*"Sometimes I can't say some idea in class."*
3	*"Too boring, hard to memoried."*
4	*"The complicated of the chapter and sometimes hard to understand."*
5	*"I think sometimes the class so fast sometime I can't understand and some information me expain every learn."*

Table 10 Students' Comments (MM)

No	Comments
STUDY 1	
1	*"What I like about the interactive multimedia learning module is, it is easy to understand."*
2	*"I still can remember what I see in the module."*
3	*"No problem for me, understanding the module easy bcos got pictures and animation."*
4	*"The interactive multimedia learning module was helping me by showing the examples such as the devices, video, and sound."*
5	*"Make learning fun and motivating."*
STUDY 2	
1	*"It's interesting and can understand with easily."*
2	*"It is very intresthing to learnig the multimedia module."*
3	*"I enjoy using this multimedia module."*
4	*"It's fun to learn using the multimedia module than the powerpoint."*
5	*"I learning in this course with many graphic and, very attract me and easily to learn."*

Table 11 Students' Comments (Web)

No	Comments
STUDY 1	
1	*"It was visually and interesting when learning."*
2	*"The using of web module helped in the learning in this course is that it can easily be concentrate."*
3	*"I don't have to worry if I am slow in learning."*
4	*"Can learn in our own place at any time."*
5	*"Can learn with fun and peace mind. So, I can understand very well."*
STUDY 2	
1	*"Can learn by own pace."*
2	*"Web module is very good everything is explainel accordingly."*
3	*"Can find more information and gave some game to play."*
4	*"It can be view many times at an hour."*
5	*"I have some preference in the topic so I can learn better because I search more information."*

4 Conclusion

In conclusion, Study 1 and 2 had obtained similar results from the pre-test/ post-test, survey and students' comments. These three instruments formed the triangulation method in explaining the constructs which were based upon Weimer's model of learner-centred teaching. The use of the multimedia learning module and web learning environment had received good feedback from the students which helped in improving their learning outcomes in terms of motivation, and understanding. This research results presented students could be more independent in their learning, students could train their thinking skills, and multimedia module would be effective in increasing retention rate. On top of all these good recommendations, lecturer's support is still essential throughout the learning process. Table 12 summarizes the findings from this research.

Table 12 Findings from research

	Teaching with PowerPoint	**Learning with multimedia module**	**Web learning with multimedia module**
Characteristics	Face-to-face teaching Uses PowerPoint Limited interaction	Face-to-face teaching (with lesser instructions and teaching) Uses interactive multimedia module designed based on Mayer's design principles (students access it during lecture) Some level of students' engagement in the learning process	Student-centred learning Web learning (uses search feature) Uses web-based interactive multimedia module Students are highly engaged in the learning process
Impact of each learning environment on students' understanding and motivation	Student accepted conventional teaching. Learner understanding is achieved but may not have high retention rate Learner motivation is low because feeling boring and sleepy in the class	Students liked seeing multimedia module. Students enjoyed having some time to think or revisit the topic. Learner understanding is improved when they have some level of engagement Learner motivation is increased due to the use of multimedia module	Students enjoyed the web learning. Students appreciated to learn at own pace. Students enjoyed searching for more information. Learner understanding is the highest because they are highly engaged in the independent learning Learner motivation is the highest due to the web features and use of multimedia module

References

Ashkeboussi, R., 2001. *A comparative analysis of learning experience in a traditional vs virtual classroom setting.* [online], Available at: <http://www.thefreelibrary.com/A+comparative+analysis+of+learning+experience+in+a+traditional+vs....-a083034564> [Accessed 28 August 2016].

Bender, B., 2003. Student-Centered Learning: A Personal Journal, *EDUCAUSE Center for Applied Research, Research Bulletin.* [online], 2003, (11). Available at: <http://net.educause.edu/ir/library/pdf/ERB0311.pdf> [Accessed 24 August 2016].

Chiang, C.K., Chapman, H. and Elder, R., 2010. Changing to learner-centred education: Challenges experienced by nurse educators in Taiwan. Nurse Education Today, 30, pp.816-820.

Chung, K.C., 2008. Antecedent of Brand Trust in Online Tertiary Education: A Malaysian and Singapore Perspective. International Journal of Business and Management, 3(4), pp.3-10.

Clark, R.C. and Mayer, R. E., 2008. Learning by Viewing versus Learning by Doing: Evidence-Based Guidelines for Principled Learning Environments. *Performance Improvement.* [online], 47(9). Available at: <http://www.interscience.wiley.com> [Accessed 15 September 2016].

de la Harpe, B., Kulski, M. and Radloff, A., 1999. How best to document the quality of our teaching and our students' learning? In K. Martin, N. Stanley and N. Davison (Eds), Teaching in the Disciplines/ Learning in Context, pp.108-113. *Proceedings of the 8th Annual Teaching Learning Forum, The University of Western Australia, February 1999.* Perth: UWA. [online] Available at: <http://lsn.curtin.edu.au/tlf/tlf1999/delaharpe.html> [Accessed 30 August 2016].

Field, A., 2009. Discovering statistics using SPSS. 3rd ed. Sage Publications.

Fraenkel, J., Wallen, N., and Hyun, H.H., 2012. *How to design and evaluate research in education*. 8th ed. Boston: McGraw Hill.

Gibson, G. M., Herbert, M. A., Sebastian, J. P. and Mayhew, J. C., 1998. Designing a Collaborative Multimedia Course: Culture and School Success. *SITE 98: Society for Information Technology and Teacher Education International Conference* [online] Available at: <http://www.eric.ed.gov/PDFS/ED421145.pdf> [Accessed 9 September 2016].

Gobbo, C. and Girardi, M., 2001. Teachers' beliefs and integration of information and communications technology in Italian schools. Technology, Pedagogy and Education, 10(1), pp.63-85.

Herrington, J., and Kervin, L., 2007. Authentic learning supported by technology: Ten suggestions and cases of integration in classrooms. Educational Media International, 44(3), pp.219-236.

Hong, K.S. and Songan, P., 2011. ICT in changing landscape of higher education in Southeast Asia. Australian Journal of Educational Technology, 27(8), pp.1276 -1290.

Hunter, M.S., 2012. Creating and Developing Learner-Centered Classrooms. *31st Annual National Conference on The First - Year Experience, National Resources Centre, San Antonio, Texas, USA*, pp.53-60.

Kennedy, G., Petrovic, T. and Keppell, M., 1998. The Development of Multimedia Evaluation Criteria and a Program of Evaluation for Computer Aided Learning. *Proceedings of Ascilite Conference,* pp.407-415.

Koehler, M.J., Mishra, P., Hershey, K. and Peruski, L., 2004. With a little help from your students: A new model for faculty development and online course design. Journal of Technology and Teacher Education, 12(1), pp.25-55.

Liaw, S.S., Huang, H.M. and Chen, G.D., 2007. Surveying instructor and learner attitudes toward e-learning. *Computers and Education*, 49, pp.1066-1080.

Low, L.Y., Low, L.T. and Koo V.C., 2003. Multimedia learning systems: a future interactive educational tool. *Internet and Higher Education,* 6, pp.25-40.

Mahajan, G., 2012. Multimedia in Teacher Education: Perceptions and Uses. Journal of Education and Practice, 3(1), pp.5-13.

Masiello, I., Ramberg, R. and Lonka, K., 2005. Attitudes to the application of a Web-based learning system in a microbiology course. *Computers and Education,* 45, pp.171-185.

Mayer, R.E. (2001). *Multimedia learning*. New York: Cambridge University Press.

McCarthy, J. P. and Anderson, L. , 2000. Active Learning Techniques versus Traditional Teaching Styles: Two Experiments from History and Political Science. Innovative Higher Education, 24 (4), pp.279-294.

McIntyre, D.R. and Wolff, F.G., 1998. An Experiment with WWW Interactive Learning in University Education. Computers and Education, 31, pp.255-264.

McLaren B.M., Lim, S.J., Yaron, D., and Koedinger, K.R., 2007. Can a polite intelligent tutoring system lead to improved learning outside of the lab? *Proceedings of the 13th International Conference on Artificial Intelligence in Education (AIED 2007)*, pp.433-440.

McLoughlin, C. and Lee, M. J. W., 2010. Australasian Journal of Educational Technology. *Personalised and self regulated learning in the Web 2.0 era: International exemplars of innovative pedagogy using social software,* [online] Available at: <http://www.ascilite.org.au/ajet/ajet26/mcloughlin.html> [Accessed 21 September 2016].

Mtika, P. and Gates, P., 2010. Developing learner-centred education among secondary trainee teachers in Malawi: The dilemma of appropriation and application. International Journal of Educational Development, 30, pp.396 – 404.

Nicholson, J. and Nicholson, D.B., 2010. A stream runs through IT: using streaming video to teach information technology. *Campus-Wide Information Systems*, 27(1), pp.17-24.

Pham, B., 1998. Quality evaluation of educational multimedia systems. *Australian Journal of Educational Technology* [online], 14(2), pp.107-121. Available at: <http://www.ascilite.org.au/ajet/ajet14/pham.html> [Accessed 9 September 2016].

Prensky, M., 2001. On The Horizon. *Digital natives, digital immigrants,* [e-journal] 9(5). Available through: Marc Prensky website <http://www.marcprensky.com/writing/Prensky%20-%20Digital%20Natives,%20Digital%20Immigrants%20-%20Part1.pdf> [Accessed 27 August 2016].

Raja Maznah, H., 2004. E-learning in higher education institutions in Malaysia. E-mento, 5(7), pp.72-75.

Shank, P. (2005). The Value of Multimedia in Learning, Adobe Systems Incorporated [online] Available at: <http://www.adobe.com/designcenter/thinktank/valuemedia/The_Value_of_Multimedia.pdf> [Accessed 5 September 2016].

Sivapalan, S. and Wan Fatimah, W.A., 2010. European Journal of Social Sciences. *A Web-Based Multimedia Approach to Literature in Malaysian Secondary Schools: Learners' Preferences,* [online] Available at: <http://www.eurojournals.com/ejss_12_3_01.pdf> [Accessed 15 September 2016].

Tuparov, G., Dureva-Tuparova, D., and Peneva, J., (2004). Didactical and technological issues during the development process of e-learning courses. *Proceedings of the 5th international conference on Computer systems and technologies, Rousse, Bulgarien*, pp.17-18.

Tutty, J., White B. and Pascoe R., 2005. Experiences from a wireless-enabled tablet classroom. *Proceedings Seventh Australasian Computing Education Conference (ACE2005),* p. 42.

Vallance, M., 2008. Australasian Journal of Educational Technology. *Beyond policy: Strategic actions to support ICT integration in Japanese schools,* [online] Available at: <http://www.ascilite.org.au/ajet/ajet24/vallance.html> [Accessed 30 August 2016].

Wang, T. J., 2010. Educational Benefits of Multimedia Skills Training. *Tech Trends January/February 2010,* 54(1). [online] Available at: <http://www.cc.ntut.edu.tw/~tjwang/tt-54-1.pdf> [Accessed 28 August 2016].

Weimer, M., 2002. Learner-centered teaching: Five key changes to practice. San Francisco, CA: Jossey-Bass.

Appendix

Table 1 to Table 6 show the mean scores, standard deviation, percentages and Cronbach's Alpha for the perception on the three learning environments for Study 1 and 2:

Table 1 Means and Percentages for the Perception on Face-to-face Teaching with PowerPoint (Study 1)

No	Survey Items	Mean (M)	STD	%
1	The presence of the lecturer during this lecture was helpful	4.21	.802	78.6
2	The design of the lecture was suitable for me to learn the content	4.00	.555	85.7
3	The lecturer helped me understand the concepts in the lecture better.	3.86	.663	71.4
4	I enjoyed having the lecturer present to answer any of my questions	3.86	.663	71.4
5	The content was clear and logically organized	3.79	.699	64.3
6	Important information or key concepts were easy to identify	3.71	.914	57.1
7	The content presented in the lecture was relevant to my learning	3.64	.497	64.3
8	I was able to maintain contact with the lecturer at all times	3.57	.852	50.0
9	Text and graphics made understanding the content better	3.57	.646	50.0
10	I was clear about the objectives of the lecture	3.57	.646	64.3
11	The content was easy to understand	3.50	.760	50.0
12	I found that there was just the right amount of information on each screen	3.50	.650	42.8
13	I was able to learn better with the conventional method of teaching	3.50	.760	35.7
14	I know better about the subject after the lecture	3.50	.760	50.0
15	I enjoyed learning with the conventional method of teaching	3.50	.855	42.9
16	I understood the course content after the lecture	3.43	.756	57.1
17	I found the lecture interesting and engaging	3.43	.852	50.0
18	I liked the conventional method of teaching.	3.29	.914	42.8
19	I was interested to learn more about the topic after the lecture	3.14	.663	28.6
20	I was motivated learning with the conventional method of teaching	3.07	1.072	28.6
Cronbach's Alpha		.833		

Table 2 Means and Percentages for the Perception on Learning with Multimedia (Study 1)

No	Survey Items	Mean (M)	STD	%
1	The presence of the lecturer during this module was helpful	3.96	.624	79.2
2	The lecturer helped me understand the concepts in the module better	3.83	.702	66.7
3	The content was clear and logically organized	3.83	.637	70.8
4	The design of the multimedia learning module was suitable for me to learn the content	3.83	.637	70.8
5	I liked the multimedia learning module	3.79	.779	66.7
6	Multimedia made understanding the content better	3.79	.658	66.7
7	I enjoyed learning with the multimedia learning module	3.79	.833	70.9
8	I liked learning with this method than in the traditional classroom	3.75	.676	62.5
9	I liked the use of multimedia to illustrate ideas and concepts	3.75	.794	75.0
10	The buttons and links were easy to understand	3.75	.794	62.5
11	Multimedia made learning fun and motivating	3.75	.676	70.8
12	I enjoyed having the lecturer present to answer any of my questions during the module presentation	3.71	.690	66.6
13	The content presented in the module was relevant to my learning	3.71	.550	66.7
14	Important information or key concepts were easy to identify	3.67	.761	66.6
15	I liked being able to learn with multimedia-oriented modules	3.54	.588	58.3
16	The content was easy to understand	3.50	.834	58.4
17	The interface of the multimedia learning module was clearly structured and appealing	3.50	.659	50.0

18	I liked the multimedia content in the module	3.50	.659	50.0
19	I was motivated learning with the module	3.50	.590	54.2
20	I found learning with the module interesting and engaging	3.50	.834	54.1
21	I was interested to learn more about the topic after going through the multimedia learning module	3.50	.722	54.2
22	The interactive features in the module made learning fun and engaging	3.46	.721	50.0
23	The interactive features in the module motivated me to learn the content	3.46	.721	41.6
24	I was able to follow the navigation easily in the module	3.46	.658	45.9
25	I was able to maintain contact with the lecturer at all times	3.42	.584	45.8
26	I found that there was just the right amount of information on each screen	3.38	.647	37.5
27	I was able to learn better with multimedia content	3.33	.761	41.7
28	I knew better about the subject with the multimedia learning module	3.33	.761	41.7
29	I was clear about the objectives of the multimedia learning module	3.33	.761	41.7
30	I understood the course content in the multimedia learning module	3.25	.737	41.7
Cronbach's Alpha		.878		

Table 3 Means and Percentages for the Perception on Web Learning with Multimedia (Study 1)

No	Survey Items	Mean (M)	STD	%
1	My learning process was better with lecturer's presence in the class.	4.33	.653	90.0
2	I understood the content easily.	4.07	.767	82.9
3	I could easily find out which points were important.	4.06	.832	77.1
4	I could understand the graphics in the web-based multimedia learning module.	4.06	.814	75.7
5	I could understand the instructions in the web-based multimedia learning module.	4.03	.589	87.1
6	I found the content was well organized.	4.01	.771	77.1
7	I enjoyed being able to control the time spent and speed in learning.	4.01	.893	75.7
8	The navigation links and buttons were all correct.	4.00	.851	78.6
9	I liked being able to search information on the web.	4.00	.816	80.0
10	I found this learning environment motivating.	4.00	.868	78.6
11	I liked to learn in this learning environment.	3.99	.732	78.6
12	I liked being able to communicate with my lecturer and classmates via email or other tools.	3.97	.798	75.7
13	I was engaged in this learning environment.	3.96	.770	78.6
14	The information in the module was based on the syllabus.	3.96	.711	78.6
15	I could find answers in the learning module.	3.96	.711	75.7
16	I enjoyed learning through the multimedia contents.	3.96	.924	77.1
17	I could achieve all the objectives for this chapter.	3.96	.788	77.1
18	I understood better through the use of multimedia.	3.94	.866	72.9
19	I was engaged with the help of interactivity in the module.	3.93	.822	71.4
20	I agreed that multimedia could explain the concept easily.	3.93	.840	75.7
21	Multimedia content helped me to learn better.	3.91	.913	67.1
22	I found the overall design of the web-based module to be attractive.	3.91	.697	74.3
23	Web-based module helped me understood the chapter.	3.89	.733	72.9
24	I found the overall design being suitable for learning.	3.89	.772	72.9
25	I had no problem in navigating the web-based module.	3.87	.741	78.6
26	The amount of information on the screen was just right.	3.83	.816	65.7
27	I would want to find out more information about the contents after the lesson.	3.80	.878	68.6

28	The interactivity level was enough.	3.80	.827	64.3
29	This learning environment motivated me.	3.79	.866	72.9
30	I was motivated through the interactivity provided.	3.77	.802	64.3
31	After this web-based learning, I gained much knowledge.	3.77	.820	67.1
32	The objectives were made clearly to me.	3.77	.820	67.1
33	The loading speed was satisfactorily.	3.76	.908	58.6
34	I would want this learning method in future.	3.70	.906	62.9
35	I prefer this learning method than the conventional approach.	3.67	1.003	58.6
	Cronbach's Alpha	.945		

Table 4 Means and Percentages for the Perception on Face-to-face Teaching with PowerPoint (Study 2)

No.	Survey Items	Mean (M)	STD	%
1	Important information or key concepts were easy to identify	3.85	1.144	84.6
2	I was interested to learn more about the topic after the lecture	3.77	.832	69.2
3	I understood the course content after the lecture	3.69	.947	76.9
4	The presence of the lecturer during this lecture was helpful	3.69	1.377	69.2
5	The lecturer helped me understand the concepts in the lecture better.	3.62	1.261	76.9
6	I was clear about the objectives of the lecture	3.62	.961	69.2
7	I was able to learn better with the conventional method of teaching	3.54	.967	61.5
8	I know better about the subject after the lecture	3.54	1.127	61.5
9	I enjoyed learning with the conventional method of teaching	3.54	.877	69.2
10	Text and graphics made understanding the content better	3.54	1.050	69.2
11	I found that there was just the right amount of information on each screen	3.46	.776	46.2
12	The content presented in the lecture was relevant to my learning	3.38	1.044	46.2
13	I was able to maintain contact with the lecturer at all times	3.31	1.182	53.8
14	The design of the lecture was suitable for me to learn the content	3.31	1.032	46.2
15	The content was easy to understand	3.23	1.092	46.2
16	I liked the conventional method of teaching	3.23	1.301	61.5
17	I was motivated learning with the conventional method of teaching	3.23	.832	38.5
18	The content was clear and logically organized	3.23	1.363	61.5
19	I found the lecture interesting and engaging	3.15	1.068	38.5
20	I enjoyed having the lecturer present to answer any of my questions	3.00	1.291	30.8
	Cronbach's Alpha	.956		

Table 5 Means and Percentages for the Perception on Learning with Multimedia (Study 2)

No.	Survey Items	Mean (M)	STD	%
1	I was able to maintain contact with the lecturer at all times	4.24	.831	88.2
2	The content was easy to understand	4.24	.831	76.5
3	The interactive features in the module made learning fun and engaging	4.24	.664	88.2
4	I was interested to learn more about the topic after going through the multimedia learning module	4.24	.752	82.4
5	I liked being able to learn with multimedia-oriented modules	4.18	.809	76.5
6	I was able to learn better with multimedia content	4.18	.636	88.2
7	I enjoyed learning with the multimedia learning module	4.18	.728	82.4
8	I liked the multimedia learning module	4.18	.809	88.2
9	The presence of the lecturer during this module was helpful	4.12	.697	82.4

10	The design of the multimedia learning module was suitable for me to learn the content	4.12	.600	88.2
11	The buttons and links were easy to understand	4.12	.781	88.2
12	The interface of the multimedia learning module was clearly structured and appealing	4.12	.857	82.4
13	Multimedia made learning fun and motivating	4.12	.697	82.4
14	I liked the multimedia content in the module	4.12	.697	82.4
15	I enjoyed having the lecturer present to answer any of my questions during the module presentation	4.06	.659	82.4
16	I found that there was just the right amount of information on each screen	4.06	.827	70.6
17	I understood the course content in the multimedia learning module	4.06	.827	70.6
18	The lecturer helped me understand the concepts in the module better	4.06	.899	76.5
19	I was clear about the objectives of the multimedia learning module	4.00	.707	76.5
20	I was motivated learning with the module	4.00	.707	76.5
21	Important information or key concepts were easy to identify	3.94	.827	64.7
22	The content presented in the module was relevant to my learning	3.94	.899	70.6
23	The content was clear and logically organized	3.94	.748	70.6
24	I liked learning with this method than in the traditional classroom	3.94	.966	64.7
25	The interactive features in the module motivated me to learn the content	3.94	.748	70.6
26	I liked the use of multimedia to illustrate ideas and concepts	3.94	.659	76.5
27	I found learning with the module interesting and engaging	3.88	1.054	64.7
28	I was able to follow the navigation easily in the module	3.82	.883	64.7
29	Multimedia made understanding the content better	3.82	.883	64.7
30	I knew better about the subject with the multimedia learning module	3.82	.809	70.6
	Cronbach's Alpha	.957		

Table 6 Means and Percentages for the Perception on Web Learning with Multimedia (Study 2)

No.	Survey Items	Mean (M)	STD	%
1	Multimedia made learning fun and motivating	4.40	.598	95.0
2	The presence of the lecturer helped me in the learning process	4.35	.671	90.0
3	I was able to search for more information on the topics from the web	4.35	.587	95.0
4	The instructions in the application was easy to understand	4.35	.489	100.0
5	I liked being able to learn at my own pace and time	4.35	.587	95.0
6	The content in the application relevant to the chapter objectives	4.30	.657	90.0
7	Important information or key concepts were easy to identify	4.30	.733	85.0
8	I was able to use chat, email and other web features to help support my learning	4.30	.571	95.0
9	The content was clear and logically organized	4.20	.768	80.0
10	The content presented in the module was relevant to my learning	4.20	.696	85.0
11	I was able to learn better with multimedia content	4.20	.894	70.0
12	I liked the multimedia content in the web module	4.20	.834	85.0
13	The graphics in the multimedia application were clear enough for me to understand	4.20	.768	80.0
14	I find learning with the web interesting and engaging	4.15	.813	75.0
15	I know better about the subject after using the web module	4.15	.875	80.0
16	I was interested to learn more about the topics in the web module	4.15	.745	80.0

17	The content was easy to understand	4.15	.875	80.0
18	I found that there was just the right amount of information on each screen	4.15	.875	80.0
19	I liked the use of multimedia to illustrate ideas and concepts	4.15	.745	80.0
20	I enjoyed learning in the web environment	4.15	.745	80.0
21	The interactive features in the module made learning was fun and engaging	4.15	.933	75.0
22	The buttons and links were easy to understand and brought me to the correct pages	4.10	.788	85.0
23	Multimedia made understanding the content better	4.10	.912	75.0
24	The multimedia application provided sufficient interactivity for me	4.05	.759	75.0
25	The application loads the page in a satisfactory speed	4.05	.945	70.0
26	Interacting with the module motivated me to learn the content	4.05	.759	75.0
27	I was clear about the objectives of the multimedia learning module	4.05	.826	80.0
28	The interface of the web module was clearly structured and appealing	3.95	.826	65.0
29	I was able to search for the answers on the web to questions I have on the content	3.95	.605	80.0
30	I understood the course content in the web-based module	3.95	.826	65.0
31	I was motivated learning on the web	3.95	.887	70.0
32	The design of the web module was suitable for me to learn the content	3.90	.788	75.0
33	I prefer this teaching / learning method in my learning process	3.90	1.119	70.0
34	I was able to navigate easily in the web module	3.90	.852	85.0
35	I liked learning on with this application rather than the traditional classroom	3.80	1.105	65.0
	Cronbach's Alpha	.968		

Table 7 presents survey items for measuring learner understanding and learner motivation for each learning environment:

Table 7 Survey items for learner understanding

F2F	MM	Web
The content presented in the lecture was relevant to my learning	Multimedia made understanding the content better	The content was easy to understand
I was clear about the objectives of the lecture	The content presented in the module was relevant to my learning	I understood the course content in the web-based module
The content was easy to understand	I understood the course content in the multimedia learning module	I was able to learn better with multimedia content
I know better about the subject after the lecture	The content was easy to understand	The content presented in the module was relevant to my learning
I was able to learn better with the conventional method of teaching	I was able to learn better with multimedia content	The content in the application relevant to the chapter objectives
I understood the course content after the lecture	I was clear about the objectives of the multimedia learning module	Multimedia made understanding the content better
	I knew better about the subject with the multimedia learning module	The instructions in the application was easy to understand
		I was clear about the objectives of the multimedia learning module
		I know better about the subject after using the web module

Table 8 Survey items for learner motivation

F2F	MM	Web
I enjoyed learning with the conventional method of teaching	I liked the multimedia learning module	I find learning with the web interesting and engaging
I found the lecture interesting and engaging	I enjoyed learning with the multimedia learning module	I enjoyed learning in the web environment
I liked the conventional method of teaching.	I liked learning with this method than in the traditional classroom	Multimedia made learning fun and motivating
I was interested to learn more about the topic after the lecture	Multimedia made learning fun and motivating	I liked being able to learn at my own pace and time
I was motivated learning with the conventional method of teaching	I liked being able to learn with multimedia-oriented modules	The interactive features in the module made learning was fun and engaging
	I liked the multimedia content in the module	I liked the multimedia content in the web module
	I was motivated learning with the module	I was motivated learning on the web
	I found learning with the module interesting and engaging	I was interested to learn more about the topics in the web module
	I was interested to learn more about the topic after going through the multimedia learning module	I prefer this teaching / learning method in my learning process
	The interactive features in the module made learning fun and engaging	Interacting with the module motivated me to learn the content
	The interactive features in the module motivated me to learn the content	I liked learning on with this application rather than the traditional classroom

Moodle as an ODL teaching tool: A Perspective of Students and Academics

Nurkhamimi Zainuddin, Rozhan Idrus and Ahmad Farid Mohd Jamal
Universiti Sains Islam Malaysia, Bandar Baru Nilai, Malaysia
khamimi@usim.edu.my
rozhan@usim.edu.my
ahmadfarid@usim.edu.my

Abstract: This article describes the use of Moodle as a suitable platform to support the postgraduate open and distance learning (ODL) courses offered by Universiti Sains Islam Malaysia (USIM). Many USIM postgraduate students who take obligatory courses (e.g., research methodology and data analysis) are taught at different venues to facilitate students' access to higher education and enhance quality of lifelong learning. Managing this complex teaching network has called for the adaptation of Moodle platform. This approach meets two relevant requirements, (a) to ensure consistency, compliance, and quality of teaching, (b) to reduce educational costs, which largely depend on the number of peripheral venues for teaching activities. This article analyses the functionalities of the Moodle platform and its use among USIM postgraduate students and academics. The data was collected based on content analysis via questionnaire applied to 18 USIM ODL postgraduate students and 4 lecturers. The results show that despite having great potential, Moodle is mainly used as a repository for materials. Moreover, lecturers recognize the importance of the use of other functionalities of this platform in order to promote the success of the teaching and learning process.

Keywords: open and distance learning, learning management systems, pedagogical tools, postgraduate courses, higher education

1 Introduction

Nowadays it is not possible to discuss about the teaching and learning process without associating it with the the Information and Communication Technologies (ICT). Eventually, ICT will be present in all processes that involve collection of data, processing of information and knowledge creation. On the other hand, teaching and learning is considered as one of the most typical processes that have these characteristics (Nurkhamimi, 2011).

ICT play an important role in education, having a special relevance in the instructional component, and is supported by Learning Management Systems (LMS), such as Moodle, Edmodo, ConnectEDU and Schoology. These platforms have many capabilities provided that they are fully utilized. For example, interaction, feedback, conversation and networking are some of the possible actions in using learning platforms. Furthermore, they provide a lot of opportunities to explore new methods of teaching and learning. Particularly, the Moodle platform adopted by Universiti Sains Islam Malaysia (USIM) integrates several modules which allow creation, organization, delivery, communication, collaboration and assessment activities.

The present paper analyses the main functionalities and tools available on the Moodle platform and their use by USIM. Additionally, it discusses the results of a study carried out at the Global Open Access Learning Centre (GOAL Centre) through the application of a questionnaire to students with the objective of characterizing their uses for Moodle and its main tools. Through this method, the study intends to contribute to the systematization of the activities and the respective modules provided by Moodle, as well as their importance in the students' perspective, revealed in an exploratory study.

2 Postgraduate ODL courses at Universiti Sains Islam Malaysia

Universiti Sains Islam Malaysia (USIM) is the 12th public higher education institution in Malaysia. USIM aims to uphold and enhance Islamic studies through the integration of *Naqli* (revealed) and *Aqli* (human) with emphasis on the use of information technology in education and research system, as well as the mastery of Arabic and English.

USIM's Centre for Graduate Studies (CGS) is responsible for administering and monitoring academic programmes as well as students' academic progress. The centre encourages academic research to generate knowledgeable, competent, and professional graduates in various fields. The main objective is to create opportunities for researchers and students to share knowledge relating to Islam and the Muslim community.

Reference this paper: Zainuddin N, Idrus R.M and Jamal A. F. M. "Moodle as an ODL teaching tool: A Perspective of Students and Academics" *The Electronic Journal of e-Learning Volume 14 Issue 4 2016, (pp282-290)* available online at www.ejel.org

As of 2014, the new intake of postgraduate students can choose whether to complete the two mandatory courses (Research Methodology and Data Analysis) by normal mode or by ODL mode. These new students must complete these courses within their first semester in order to prevent a hold from being placed on their records. Relatively, as compiled by Mohamed Amin Embi (2013), USIM is equipped with its own e-learning system known as GOALS (Global Open Access Learning System) based on Moodle.

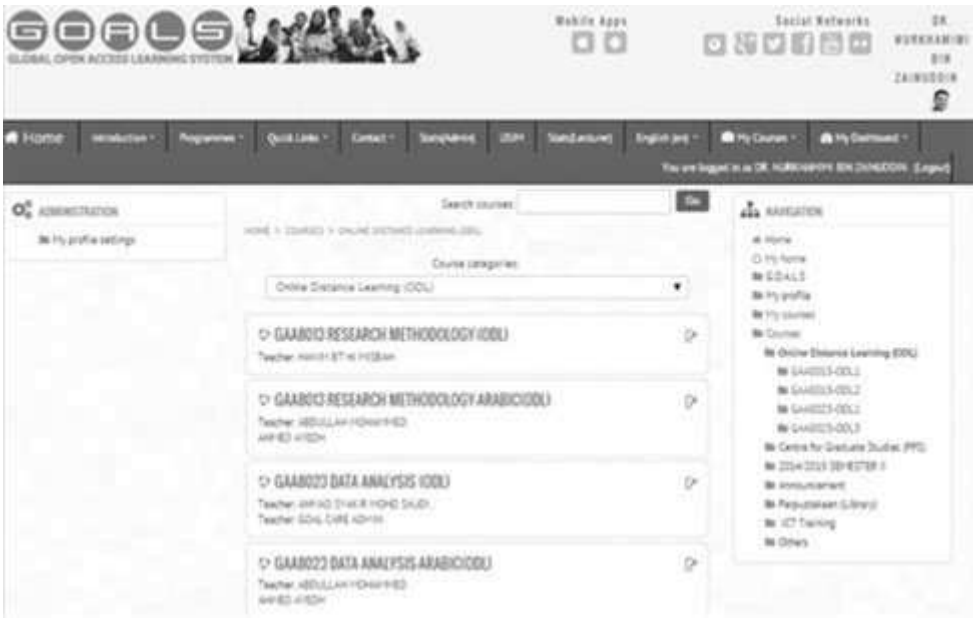


Figure 1: GOALS USIM interface

With its inception in 2011, USIM GOALS has since undergone periodic upgrading process (Alwi et al., 2014). From uploading course outlines, posting notices, setting up online quizzes to initiating online forum, USIM lecturers have utilized GOALS in their teaching and learning (TnL) activities. Looking at the advantageous functions of this system, there is a need to utilize Moodle as an innovative platform to support the smooth running of the postgraduate ODL courses in USIM.

The assessment requirement of the postgraduate ODL courses in USIM is much dependent on the optimization of GOALS. The assessment method of USIM's two mandatory courses (Research Methodology and Data Analysis) was set by The Centre of Graduate Studies (CGS) and it has been realigned with the approval of the subject matter expert of these two courses in a meeting dated 23 October 2014. This meeting approved the alignment of the assessment requirement for both courses (Research Methodology and Data Analysis) as shown in the Table 1 and 2.

Table 1: Activity weight of ODL assessment for Research Methodology Course

Research Methodology – GAA / GAW 8013				
No.	Category	%	Minimum activities per semester	Assessment method
i.	Assignment	30	3	Online assignment via GOALS
ii.	Individual proposal presentation	20	2	Face-to-face online presentation via BBB (GOALS) / Self-recorded video
iii.	Written research proposal submission	30	1	Online assignment via GOALS
iv.	Participation	20	2	GOALS online quizzes / GOALS forum participation / notes completion / communication

Table 2: Activity weight of ODL assessment for Data Analysis Course

Data Analysis – GAA / GAW 8023				
No.	Category	%	Minimum activities per semester	Assessment method
i.	Written Assignment / project	20	4	Online assignment via GOALS
ii.	Individual presentation	10	2	Face-to-face online presentation via BBB (GOALS) / Self-recorded video
iii.	Participation	20	2	Online quizzes / forum participation / notes completion / communication
iv.	Final Exam (take home)	50	1	GOALS online quizzes / test via GOALS

3 Moodle: An e-learning platform for ODL courses

Ketterl et al. (2009) observed that the use of systems for distance education, student blogs, wiki groups, chats and instant messages has grown into universities and outside of them. This trend isdue mostly to the fact that they are easy, fast and convenient. Additionally, Paiva (2010) observed that many applications were developed for e-learning platforms that brought features that contribute to the increase of shared knowledge and communication between students.

Most e-learning platforms offer tools such as forum, email, blog, wall (asynchronous communication), chat (synchronous communication), wikis, glossaries, texts, and surveys (collective construction and interactive tools). They also include educational activities, books, videos (educational tools); profile, registration, groups, databases, frequency control and daily classes (administrative tools). In this context, the Moodle (Modular Object Oriented Dynamic Learning Environment) tool is defined as a platform built from a constructivist perspective that emphasizes research and collaboration through its structure and available features developed for training (Martins and Giraffa, 2008). The training features include both communication (chats, forums, wikis, blogs, glossaries, quizzes) and information (textual data, audio and video links, and search) tools.

Considering the aforementioned characteristics, Moodle is an open-source, totally free and customizable e-learning platform (Ribeiro and Medina, 2009). The platform can be adapted using WML, PHP and MySQL. Choosing Moodle as an e-learning platform is usually motivated based on its simplicity, adaptability and open source configuration.

Regarding the activities of the e-learning platforms, a classification table based on six classes: Creation, Organization, Delivery, Communication, Collaboration and Assessment has been formed. Table 3 presents these activities, their correspondence to the modules, and a brief description based on the instantiation of some features that are possible to perform with them.

Table 3: Activities and modules which can be conducted via Moodle

Activity	**Module**	**Description**
Creation	Database	Allow to build, display and search a bank of record entries about any topic Allow to share a collection of data
Organization	Lessons	Represent a set of ordered topics summarizing the instructional materials and allow access to them through respective links
Delivery	Assignments	Allow teachers to collect work from students Allow teachers to evaluate the students' work and provide feedback including grades, in private mode Allow students to upload assignment files
	Workshops	Represent a peer assessment activity with many options Allow students to submit their work via an online text tool and attachments
Communication	Big Blue Button	Allow synchronous conversation
	Forums	Represent a communication tool where students and teachers can exchange ideas by posting comments
	News	Represent a special forum for general announcements Allow teachers to add posts and to send emails

Activity	Module	Description
Collaboration	Glossary	Allow creating and maintaining of a list of definitions Represent a mechanism for collaborative activities that can be restricted to entries made by the teacher
	Wikis	Allow users to edit collaborative Web pages Provide space for collaborative work
Assessment	Choice	Allow teachers to ask questions and specify multiple choice answers Represent a useful mechanism to stimulate thinking about a topic
	Quiz	Allow teachers to design and build quizzes with a variety of questions, with different types of answers, such as multiple choice, true/false, short answer
	Survey	Allow teachers to gather feedback from students using prepackaged questionnaires
	Feedback	Allow teachers to create surveys to collect feedback
Reusability	SCORM	Represent specifications that enable interoperability, accessibility and reusability of the learning content Represent tools that enable SCORM packages to be included in the course
	External Tools	Enable interaction with compliant learning resources (eg. Learning Tools Interoperability) and activities on other Web sites Provide access to new activity types or materials

USIM chose Moodle as an e-learning platform for postgraduate ODL courses over several Learning Management System (LMS) with similar features about a year ago. Since then, Moodle has been seen more as an interactive service than a research project. For this reason, the USIM staff has focused on its improvements instead of constantly comparing with other LMS. As a service to the entire campus, stability is crucial, at least until it fits the teaching requirements. Blackboard, Moodle, and more recently Sakai, are among the many other LMS that have plenty of features that allow the achievements of the same kind of goals.

4 Methodology

In this study the Moodle system used in USIM (GOALS) was examined through content analysis, complemented with a non-structured interview carried out with the administrator for the platform at USIM. Then, the use of the Moodle platform among students from Universiti Sains Islam Malaysia was analysed. The data was collected through a paper-based questionnaire developed on the basis of the literature review and validated through the referred interview, and applied to postgraduate students who were attending subjects under the responsibility and supervision of the Centre for Graduate Studies (CGS) of USIM. The questionnaire consisted of the following sections:

Section A

A1 - Characterization of the postgraduate students in terms of: age, course and degree attended, type of device and network used to access the Internet, purpose of the access on the learning context and average time of use of the Internet per day for learning purposes.

A2 - Characterization of the general use of the Moodle platform in terms of: number of accesses per month and format of information accessed/posted.

A3 - Characterization of Moodle tools used by the participants.

A4 - Suggestions and comments from postgraduate students to improve the Moodle platform for the betterment of the ODL courses.

Section B

B1 – Lecturers' responses to questions related to their adoption of Moodle

B2 – Lecturers' responses to questions relating to interactions

B3 - Suggestions and comments from lecturers to improve the Moodle platform for the betterment of the ODL courses.

The collected data was analysed using the IBM SPSS Statistics 19 software. A descriptive analysis was performed in order to characterize the behavior of each variable measured.

5 Results

18 postgraduate students (for section A) and 4 lecturers (for section B) were selected to undergo the evaluation process. The determining of the sample size in the evaluation of a small group and the field user testing sessions were done based on Tessmer (1993) who stated that the usability of less than 20 participants in small group evaluations and between 20 and 30 participants for field test evaluations. The results are analysed as follows.

5.1 Characterization of the participants

The participants were 3 females and 15 males. The ages of the respondents were between 31 years old and 42 years old. Table 4 presents the distribution of the number of students per course and degree.

Table 4: Number of respondents attending the courses

Course	Masters	PhD
Research Methodology	2 Students	16 Students
Data Analysis		

It can be observed that most of the participants were PhD students (89%) and that most of them were from the Faculty of Science and Technology. Regarding the devices used to access the Internet, all the respondents referred to laptops and about 32% mentioned that they additionally use mobile phones. It was verified that 93% of the participants referred the use of a private network, while the remaining 7% mentioned that they do not have access to the Internet at home. The network from USIM was referred by 87% of respondents and 35% of the students referred the use of networks from broadband and Wifi.

5.2 Characterization of the general use of the Moodle platform.

The use of Moodle was analysed through the frequency of access, the purpose of the accesses and the formats of the information accessed or posted. Figure 2 presents the histogram of participants' answers about the frequency of weekly usage of Moodle.

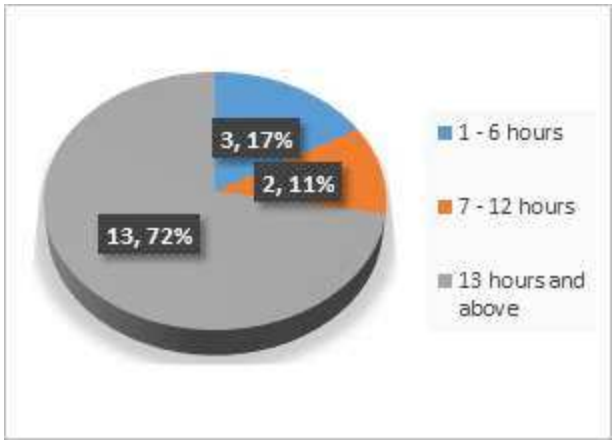


Figure 2: Average time of use per week

On average, students access the Moodle (GOALS) platform about 8 - 20 hours per week. It is interesting to note that there are three distinguished groups of users from Figure 1, namely: (1) those that have low frequency of access (17%, 1 – 6 hours), (2) those that have intermediate frequency of access (11%, 7 – 12 hours) and (3) those with high frequency of access (72%, 13 hours and above). Regarding Moodle's purpose of use, it can be seen in Figure 3 that: (a) the main purpose is 'Download materials', mentioned by about 98% the respondents and 'See news and course updates', mentioned by about 84% of them. 'Deliver assignments', 'Communicate with lecturers' and 'Ask questions', in this order, are much less mentioned.

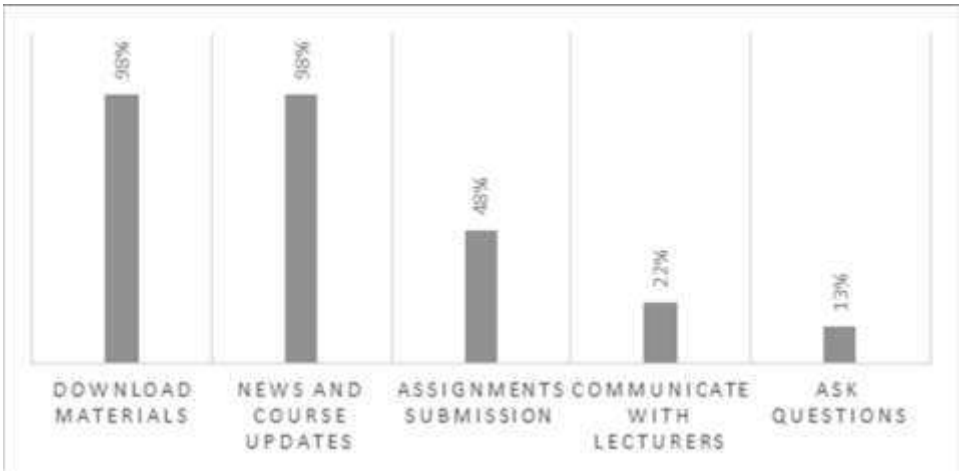


Figure 3: Purpose of using Moodle (GOALS)

These results can be interpreted as Moodle being used mainly as a repository of materials and information. This hypothesis is reinforced by the analysis of the results presented in Figure 4, where it can be observed that the most used materials' formats that respondents access/post are 'Texts", 'Videos' and 'Images'. 'Audio' is also referred, but used much less than the former three formats. Three of the students identified 'Animations' as another format used in Moodle.

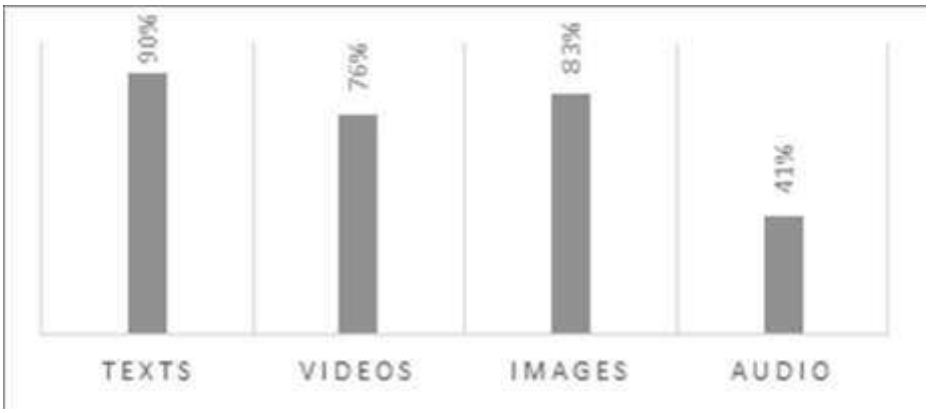


Figure 4: Most used materials

5.3 Characterization of Moodle tools used by the participants

'News', 'Forum' and 'Assignments' are the most used Moodle tools and also those that respondents consider the most important. The other tools which they have been using at the same time on their ODL platform were 'Quiz/Survey', 'Questionnaires', 'Chats' and 'Web-conference'. Again the possibility of the main utilization of Moodle is that of a repository of materials and information must be considered.

5.4 Suggestions and comments from postgraduate students to improve the Moodle platform for the betterment of the ODL courses

Some of the significant suggestions and comments from the participants in order to improve GOALS as an ODL platform were put in table 5.

Table 5: Suggestions and comments

I found your GOALS system very up-to date. Still I think quick response from the tutors either in e-mail or in post will encourage the students in learning through this GOALS system. Thanks for your inquiry.
Overall, I am happy with the support given by the lecturer Dr. Ahmad Syakir (e-tutor), who has given good guidance for this subject.
I think in order for this system to run well it is important to have a dedicated lecturer who is able to guide students regardless of distance.
My suggestion is to increase the working hours (for goals service center at least one officer until midnight.

5.5 Lecturers responses to questions relating to their adoption of Moodle

Results revealed that almost all 4 lecturers had basic knowledge of Moodle and most of them had made an effort to fully integrate it into their teaching or papers. In doing so, the majority expressed confidence in their ability to use Moodle. In terms of long-term adoption, the majority of lecturers intended to make further use of Moodle, perhaps unsurprising, given that the USIM management had clearly stated its commitment to widespread adoption of an online component in all papers and programmes. In hindsight, the survey did not measure the motivation behind respondents' sustained utilization of Moodle, although several comments alluded to a perception of mandatory adoption.

Table 6: Lecturers' responses to questions relating to their adoption of Moodle

Lecturer 1	I have a basic knowledge of tools and features available on Moodle.
Lecturer 2	I have made an effort to fully integrate some of the different tools and features available in Moodle in my teaching/paper.
Lecturer 3	I am confident in my ability to use Moodle.
Lecturer 4	I have the intention of using Moodle again next semester.

5.6 Lecturers' responses to questions relating to interactions

When asked about connectedness with students (which could be seen as a sign of quality interaction), almost all 4 lecturers agreed that Moodle had helped feelings of connectedness with their ODL students.

Table 7: Lecturers' responses to questions relating to their adoption of Moodle

Lecturer 1	I believe the use of Moodle has enhanced the level of staff-student and student interaction in my course and it promotes more active learning
Lecturer 2	I believe the use of Moodle has enhanced the quality of student-student interaction in my course and I feel reasonably neutral about the pedagogical benefits of Moodle.
Lecturer 3	Moodle has helped me to feel more connected with my students. It also increases staff-student interaction
Lecturer 4	Moodle has helped me to feel more connected with my ODL students

5.7 Suggestions and comments from lecturers to improve the Moodle platform for the betterment of the ODL courses.

Some of the significant suggestions and comments from the participants in order to improve GOALS as an ODL platform were put in table 8.

Table 8: Suggestions and comments

Lecturer 1	Redesign the user interface and reduce duplicate icons
Lecturer 2	Restructure the navigation layout to have consistent colours and layouts
Lecturer 3	Reduce overload of information by grouping related information, and removing world news and guidelines
Lecturer 4	Provide descriptions for icons, symbols or features

6 Conclusion and Discussion

This paper analysed the main functionalities and tools available on the Moodle platform and their use at Universiti Sains Islam Malaysia. It was found that GOALS USIM contains some of the main tools found on the standard Moodle platform, like Assignments, Chats, Forums, News and Quiz/Survey. Furthermore, it incorporates some external tools like Blogs, Wikis, Questionnaires and Web-conference. This might be the strong reason for utilizing Moodle in postgraduate ODL courses at USIM as these features in Moodle facilitated the pedagogy requirements needed such as collaborative and blended learning.

The analysis of the students' answers to the survey revealed that the most mentioned purpose of the use of GOALS were 'Download materials', 'News' and 'Submit assignments' and that the most used information materials are 'Texts' and 'Images'. Additionally, students gave more importance to 'News' and 'Assignments'. These results are compatible with the hypothesis that Moodle (GOALS) is being used mainly as a repository of materials and information. It can also be noted that these tools enable interaction, collaboration and real time communication as described by Nurkhamimi (2014).

From the brainstorming solutions and results described, several ideas generated from both users show interest in personalizing the user interface. Users are expected to have more interaction using the learning management system, in order to carry out tasks easily and effectively. It is obvious that user interface changes the layout and elements, based on user control or context and are required to ease communication between software and users. Novice users will also have less confusion accessing the entire system. Therefore, an adaptive user interface is suitable in designing the upcoming Moodle prototype. An adaptive user interface has emerged in personalized user interfaces to improve the ability of an application to serve the user's needs. Previous research indicates that redesigning an application's user interface from the feedback of interaction measurement between users and applications can substantially improve usability (Granić, A., Glavinić, V., & Stankov, S., 2004).

However, the current survey revealed greater scope for Moodle to influence ODL teaching and curriculum design at a deep level. This would involve a shift in attitude away from seeing Moodle as a "pump and dump repository", towards becoming the frontier of innovation in teaching.

To overcome the constraints and challenges faced by the postgraduate ODL courses, it should be taken into account that the successful use of e-learning platforms in the teaching and learning context critically depends on the teachers having knowledge about the tools, being aware of how they should be used and being capable of organizing all the communication process. There is unlikely to be a one-size fits all model to digitalization, as Laurillard writes:

> *Blended learning is now a steady constant in education. A combination of 90 percent conventional methods and 10 percent digital influences may not be ideal for some courses but may be the perfect formula for others. Therefore, instructors will need to determine the best while choosing their materials is and be aware that the best way to do this is to embrace blended learning (Joint Information Systems Committee, 2009).*

As future work, it is considered important to perform a careful analysis of the underlying reasons for the use of the e-learning tools by the academic community, as well as to investigate on how these tools can help in promoting the success of the teaching and learning process.

References

Alwi, N. H. M., Mahir, N. A., & Ismail, S. (2014). Infusing Social Media in Teaching and Learning (TnL) at Tertiary Institutions: A Case of Effective Communication in Universiti Sains Islam Malaysia (USIM). *Procedia-Social and Behavioral Sciences*, *155*, 265-270.

Granić, A., Glavinić, V., & Stankov, S. (2004). Usability evaluation methodology for web-based educational systems. In Proceedings of the 8th ERCIM Workshop on User Interfaces for All (pp. 28-29). Joint Information Systems Committee. (2009). Effective practice in a digital age: A guide to technology enhanced learning and teaching. United Kingdom. Available from http://www.jisc.ac.uk/media/documents/publications/effectivepracticedigitalage.pdf

Joint Information Systems Committee. (2009). Effective practice in a digital age: A guide to technology enhanced learning and teaching. United Kingdom. Available from Proceedings ascilite 2011 Hobart: Concise Paper 1280 http://www.jisc.ac.uk/media/documents/publications/effectivepracticedigitalage.pdf

Ketterl, Markus; Mertens, Robert; Vornberger, Oliver. (2009). *Bringing Web 2.0 to web lectures*. (pp. 82-96). Emerald - Interactive Technology and Smart Education, Vol. 6 No. 2.

Martins, C.A.; Giraffa, L.M. M. (2008). Capacitando: uma proposta de formação docente utilizando o Moodle. (pp.1-9). Renote: Novas Tecnologias na Educação, Rio Grande do Sul, v. 6, n. 2, 1.

Moodle, 2012; Available from: http://moodle.org/(2 Mar 2015)

Mohd Amin, E. (2013). Open Educational resources in Malaysian higher learning institutions, Centre for Academic Advancement, UKM & Department of Higher Education, Ministry of Higher Education.

Nurkhamimi, Z., Mohd Feham, M. G., & Sahrir, M. S. (2011). Steps and procedures of teaching writing skill via Wiki among learners of Arabic as second language as a model. Journal of Linguistic and Literary Studies, 9, 325-341.

Nurkhamimi, Z. (2014). The Development of Multimedia Programme for Teaching and Learning Arabic Vocabularies: Moodle as an Example. (Unpublished PhD dissertation, International Islamic University Malaysia) (In Arabic).

Paiva, V.M. (2010). Ambientes virtuais de aprendizagem: implicações epistemol gicas. (pp. 353-370). Educação em Revista. Belo Horizonte, v.26, n.3.

Ribeiro, P., & Medina, R. D. (2009). Mobile Learning Engine Moodle (MLE–Moodle): das funcionalidades a validação em curso a distância utilizando dispositivos móveis. Revista RENOTE–XIII Ciclo de Palestras Novas Tecnologias na Educação. Porto Alegre, 7(1).

Tessmer, M. (1993). Planning and Conducting Formative Evaluations, Improving the Quality of Education and Training. © Martin Tessmer, 1993, London : Kogan Page Limited.