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Karin Levinsen and Rikke Ørngreen
Research LAB: IT and Learning Design, Department of Philosophy and Learning, Aalborg University, Copenhagen, Denmark

Introduction
In this issue we present 6 papers. Anders Nordby, Kristine Øygardslia, Ulrik Sverdrup and Harald U. Sverdrup talk about gamification in a case of teaching the subject sustainability in elementary school. Their intention was to teach sustainability to 5th and 7th graders through system thinking, and the paper presents the research methodology used, the development of the game, and how the children played the game.

In the following paper by Jamie Costley and Christopher Lange the research question of whether instructors can have an impact upon satisfaction and perceived learning through various instructional design decisions is raised. The study investigates this by looking at three different online environments and the degree of instructor control made possible in these environments. It then analyzes whether the level of instructor control has an impact upon satisfaction and perceived learning. Though no significant difference was found in regard to level of satisfaction, the results showed that increased instructor control lead to an increase in perceived learning.

On the same point, the effectiveness of instructor-personalized and formative feedback is investigated in the paper by Dolors Planar and Soledad Moya. The paper is a review of formative feedback in higher education in the period from 2000 to 2014, in order to find answers as to which aspects are relevant, when wanting efficiently to implement personalized feedback prepared by the teacher in classes with a high student-staff ratio in virtual higher education.

Mugenyi Justice Kintu and Chang Zhu provide a contextual case study from the Ugandan University, investigating student characteristics and learning outcomes in a blended learning environment. They examine if learner characteristics and background are significant factors for learning outcome. Students from three schools and one directorate form part of the case study, who were involved in a face-to-face set up in the first part of a seventeen-week semester and in an online set up in the second part. The data consist of a background questionnaire survey (270 respondents), the examination results and an online self-regulated learning questionnaire for data on students’ self-regulation, the intrinsic motivation inventory for data on motivation and other self-developed instruments to measure the other constructs.

The next paper explores the relationship between an online synchronous learning environment and knowledge acquisition skills and traits, and suggest viable ways forward in order to enhance this relation. The case is the Blackboard platform, and the authors, John D. Politis and Denis J. Politis, collected data from 84 learners who studied online courses in a Higher Education Institution in the United Arab Emirates. The method applied the Analysis of Moment Structures (AMOS) and the statistical software to determine the factor structure of the examined variables.

Finally, in a case study from an Asian university, Choosri Banditvilai discusses enhancing students’ language skills through blended learning. The context is a course in “English for Specific Purposes” in Thailand in which e-learning strategies are used in parallel with traditional classroom language teaching methods. The achievements and attitudes of students were compared between the control group and the experimental group to measure the potential of available technology to develop language skills and learner autonomy. The findings from this study show that online practice is directly beneficial to enhance the four language learning skills as well as autonomous learning and learner motivation.

We hope you’ll enjoy reading these six papers.

Karin Levinsen & Rikke Ørngreen
The art of Gamification; Teaching Sustainability and System Thinking by Pervasive Game Development

Anders Nordby¹, Kristine Øygardslia², Ulrik Sverdrup³ and Harald Sverdrup⁴
¹Department of Fine Arts and Computer Science, Hedmark University College, Norway
²Institute for digital media and computer science, Norges Tekniske og Naturvitenskapelige Universitet, På Toppen av Haugen, Trondheim, Norge
³Lund University, Sweden
⁴Industrial Engineering, University of Iceland, Iceland

Abstract: In 2013 Hedmark University College conducted a research project where students from a game development project/study program developed and tested a Pervasive Game for learning as part of a class in System Thinking. The overall game goal was to teach Sustainability through System Thinking, and to give the students a real world experience with their game. It was tested on 5th and 7th graders in elementary school, spending one school day in each of the classes. This article focuses on the design of the project: how the game was developed, how the children played it and how research was designed and data collected.

Keywords: Gamification, game development, pervasive games, games and learning, pedagogy, system thinking, sustainability

1 Introduction

Making and modifying games have been a large part of children’s and young people’s lives in recent years due to the many game engines made available to the public for free. During the process of modifying games, and even making totally new games, the children learn about making graphics, animations, programming, game design, system thinking, collaboration, creativity and even pedagogy and psychology when they strive to make their games fun.

Tapscott (2011), the writer of the book on The Net Generation, has some thoughts on what this generation wants. He claims they want to have fun and that 58% of them say that having fun with a product or service is just as important as what that thing actually does. He further claims that if you employ any of these people, you must realize that they also want to have fun at work. They want to collaborate and have relationships. They want innovation and creativity. They want speed. They want to customize everything. Whether it’s designing their own t-shirts on Threadless.com, or selecting which widgets to put on their desktop, this group wants to do things their own way.

Of course, these claims and facts have not been unnoticed by researchers and learning designers. Researchers like Gee (2004, 2007, 2010) and Schaffer (2008) argue that games can be a powerful learning environment. They point out that when young kids are playing or modifying games while having fun, learning comes naturally, while in traditional schools the children have to study theoretically and accumulate knowledge for a long time before they can practice. Gee describes how he experienced learning in games with his son, and how he tried to read the game manual first and found he didn’t understand the game at all. Then he tried the other way around, playing the game first, and then reading the manual. And then everything was very clear. That’s what kids do - play first and then read the manual to understand what is necessary to know to solve the game. This is “learning by doing” (Dewey, 1916) and “learning just in time” (Gee, 2007).

Using games for learning is basically about gamification: applying game design and game technology to “serious” learning to bring back the motivation and fun (Deterding et al. 2011). However, although the word “gamification” is quite new, games have always been seen as a useful tool to increase fun and motivation in

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learning. During the last 10 years we have seen rapid advances in digital technology that allow children to interactively “experience” and solve “real world problems” virtually in simulations that contains advanced 3D environments, animations, pictures, film, and sound simultaneously. Furthermore, these environments work in real-time over the Internet and let the children share their experience with other children from all over the world in a way that has never before been possible. By gamifying school topics in these virtual environments we can not only bring back the fun factor and create motivation, but also drill skills, do assessment automatically and create virtual social societies where the children can practice their theory in a fun way (Gee, 2010). Examples of such environments that “accidentally” also work as virtual learning environments are many; for example Minecraft, which teaches young people to design and build 3D environments, Moviestar Planet, which teaches the children how to make movies, how to create new identities or how to handle fame and fortune, or virtual worlds like Club Penquin, Habbo or Stardoll, which teach young children responsibility for their pets, or how to earn and save money. In all these environments the players learn collaboration, teamwork and how to handle peer comments/reviewing from kids all over the world. Today these games and virtual environments have hundreds of millions of users who are from 5-15 years old (KZero, 2011), and they serve as an informal learning environment for children of all ages. Gamification is also about formalizing these informal “learning environments”, and using them beneficially in traditional learning and class environments.

System thinking goes hand in hand with game development; games are systems. Through games and system thinking the students and children can learn how events in the real world are connected and influence each other in a causal way. System thinking can also be used to construct games and teach the students how different parts of the game interact and perform. It can even let the students construct and simulate systems that would usually require a deep mathematical understanding of differential equations without knowing the mathematics. In the K12 education in the US system thinking is an important topic; recent research shows that children that are taught System thinking think more critically, express thoughts more clearly and understand more complex problems than children who don’t learn system thinking (Lyneis and Stuntz, 2007).

Sustainability is an increasingly important topic in schools, and its cross-disciplinary nature involves many of the important topics in school. Topics about sustainability are therefore usable as “environments” for teachers to embed stories that involve many important school topics at the same time. While it in itself is a competency aim and a goal in the curriculum, it naturally leads both game developers and players into problems that force them to learn mathematics or physics, which for many children are seen as “serious” and “boring” topics.

While developing digital games that incorporate all the above is very time consuming and requires special skills teachers usually don’t have, pervasive games is about creating simple games in real-world environments that use common digital tools, internet, pre-made simple games and virtual environments that schools and teachers already have access to in schools. In our project the development of the pervasive game was done by students studying game development, but this type of game is so simple to make that ordinary schoolteachers could equally well have made it. So the project then also served as a learning project for the teachers involved.

2 Scope and Objectives

There are clearly two groups of learners in this project: the students who make the game and the children who play the game. The main goal for the children was to learn sustainability and to understand how system thinking could be used to see how things in the world were connected. The main goal of the game then was to motivate the children to learn the sustainability and system thinking content in the game as well as trigger their interest to learn more about the topics the game presented to them.

The main goal for the students was to learn system thinking, and the game development task and the game playing done with the children was implemented to motivate them in this.

This article mainly focuses on the design of the project: the theory foundation, the game design and the research design and data collected. The article does not contain a thorough data analysis of the learning outcome or the motivation, but has a discussion in the end where we loosely discuss observations and thoughts during the implementation of the project.

2.1 Theoretical points of departure

A working hypothesis for the project was that the combination of game development, in this case pervasive
game development, and teaching and facilitating based on the principles of problem-based learning (PBL), would create a working environment which would enhance the students’ motivation to learn system thinking and enhance their operative and innovation skills in this particular area. Furthermore, their learning was expected to proceed more efficiently in such an environment than in traditional teaching environments, such as lectures. In addition to the game development tasks, another prerequisite of the course was that the students should experience the children playing their game to get a feel for how emergent their game was compared to commercial games for entertainment, and how the children understood the sustainability issues presented in the game and their links through system thinking. This approach would hopefully maintain a sense of ‘fun’ as well as linking students’ outside-of-school experiences to their educational reality.

The course design was then theoretically inspired by the ideas found in the sociocultural theories of situated learning (Lave and Wenger, 1991; Wenger, 1998; Wenger, 2006), but also by cognitive theories such as experiential learning (Kolb, 1983) and the more modern approach of situated cognition studies suggested by James Paul Gee (Gee, 2010). Situated cognition theories bring in theory from other disciplines such as physics, psychology, brain research etc., and emphasize the conviction that thinking is connected and that it changes across actual situations, where thinking is not a process of applying abstract generalizations, definitions and rules, but rather dynamic images tied to our perception of the world and our bodies, feelings and internal states (Churchland, 1986; Damasio, 1994). Cognitive activities are tied to experiences of goal-oriented action in the material and social world and we think at our best abilities when we use previous experiences to prepare ourselves for future action. Gee (Gee, 2010) uses so-called connectionist or networked computers that search for and store patterns from the outside world as an analogy; humans look for patterns in their experience, and as they grow and their experience accumulates, they will discover deeper and more subtle patterns, which will help them predict what might happen in the future when they act to accomplish their goals.

Situated learning builds on the idea that participation in a community of practice with a common content, goal and mutual engagement stimulates and facilitates learning. In our project the game development class or the game playing community constitutes such a community of practice. While the students or children are busy designing or playing a game they learn system thinking or sustainability, almost without noticing. The main impact of the situated learning theories to the system thinking course-design came through acknowledging the situatedness of knowledge and the need to create learning situations in which theoretical ways of knowing were deeply connected to complex practices in which the students were expected and wished to participate.

Problem-based learning originates from the medical school in the 1960s and was first implemented by Howard Barrows and colleagues (Barrows 1980). The students were organized in small groups, usually 6-10 persons led by a tutor. The focus of the groups was to solve problems from the real world they were about to enter, and to study the theory they needed to solve these task themselves. The tutors’ roles were more supervisors and facilitators than a traditional teacher. Problem-based learning has since then become an independent pedagogical concept often used in all levels of education. The principles of problem-based learning can be described as follows (Pettersen, 2005, p. 127):

- The study builds on practice-related case descriptions, reports and studies
- The students – both individually and in groups – receive support, assistance and monitoring from a tutor
- Students should develop practical ways of working and develop learning strategies for studying along with practical problem solving and logical reasoning
- Students have the responsibility for their own learning in collaboration with their tutor, with the emphasis on self-regulation and student autonomy
- The teaching, the curriculum and the actual courses are organized in ways that maintain cross- and interdisciplinary approaches
- The study program should facilitate authentic tasks and challenges, which qualify for the students’ future professional lives.

The PBL model will in addition usually follow the steps below (based on the 7-step Maastricht model (Maastricht University, 2013) where the first 5 steps are put into one):

- Brainstorm and analyze the problem and define goals and learning objectives.
- Self-study period
Anders Nordby et al

- Debriefing and post discussion.

Step 1 is the initial phase where the students clarify the problem, define the learning goals and identify the theory they will study to solve the problem. Step 2 is the phase where they work alone, while step 3 is the presentation and the debriefing session.

2.2 System thinking and system analysis, a short primer

System Thinking is a common concept for understanding how causal relationships and feedback work in an everyday problem. It has two parts: System Analyses and System Dynamics. System analyses are an easy-to-understand language that describes the connection and causalities in the system, while System Dynamics is the numerical simulation of the system. System Analyses includes group modeling, where we ask the initial questions of the problem and create a mental model structure, using Causal Loop Diagrams. While System Dynamics goes beyond the scope of this paper, we have included a simple primer to understand the basics of System Analyses below.

The basic method in this study is system analysis using causal loop diagrams as defined by Senge (1990), Sterman (2000), Haraldsson and Sverdrup (2004) and Sverdrup and Svensson (2002a,b). Because of the unsustainable path of world society outlined in the introduction, the scope of this study is to investigate a commercial activity that is recognized as unsustainable at present, and explore how to transform it to a sustainable activity. We will further investigate how that activity connects to society and policy planning. It is outside the scope of this study to create numerical simulations models; the discussion remains at the qualitative causal level. Our working hypothesis is that a free market needs both freedom to operate but also distinct and clear rules of engagement, as well as the provision of a market arena. We postulate that the state, business and customer each have necessary roles to play to make a sustainable system out of these essential components. The problem is analyzed using system analysis methods, and clarified using causal loop diagrams. The main tool is called the causal loop diagram:

What this says is that the CAUSE is the causality creating the effect. And the plus on the arrow says that the more cause we have, the more effect we get. It is not sufficient that CAUSE and EFFECT are correlated; there must be a real casualization. The next key issue is, does EFFECT have any feedback on CAUSE? If it does, we need to draw an arrow, and add a + if more of the EFFECT gives more CAUSE or a – if more EFFECT gives less CAUSE.

When this is done, we ask again, is there something else that is affected? Normally there is. And then we draw an arrow from CAUSE to SOMETHING ELSE. And we ask more or less and put the – or the +. And if SOMETHING ELSE has any effect on the EFFECT parameter we draw a signed arrow there too. It could be as shown in the figure above. In the Causal Loop Diagram (CLD) we have two closed loops, one called B and one called R. If we walk a round the loop called R, starting at CAUSE, then because of an even number of -, an increase in CAUSE will come back and cause more increase in CAUSE. We call this a Reinforcing loop (R). Another way to see this reinforcing loop is as a positive feedback loop where the increase of “Something Else” leads to an indirect...
increase to “Cause” through the mediation of “Effect”, and only because a decrease in “Effect” leads to an increase in “Cause”. In the other loop, there is an increase in CAUSE which will cause an increase in EFFECT, but an increase in EFFECT will cause a decrease in CAUSE. And increase comes back as a decrease; it is a Balancing loop (B) (Sterman 2000, Senge 1990, Haraldsson and Sverdrup 2004, Haraldsson 2004, Sverdrup et al., 2014).

2.3 A short definition of sustainability

There are different ways to define sustainability, and some even make a point of saying it is not definable. We think there are basically two ways: the difficult one with all the details, and the simple one. The simple definition is quite old; it was given by the emperor Augustus of the Roman Empire in relationship to the engineering of the future Imperial Roman road network. He defined a sustainable plan to be “a plan that could be followed forever, without ruining the functions of the Empire”. He thus recommended the road construction to be done according to principles that would allow them to be used and kept up “forever”. In a vision of a sustainable society, we would like to have a similar vision. There are several names for sustainability out there, and we need to consider which of those are adequate, inadequate, sufficient or necessary. We should discuss the following central concepts:

- Sustainable society
- Sustainable growth
- Sustainable development

In the items below, each one of these will be assessed and commented on. **Sustainable society.** This is a society that can go on for as long as we can reasonably foresee. It is not dependent on growth, but may persist and prevail on a steady level. It is achievable under certain conditions. In a sustainable society there will be growth within the sustainability limits, but also de-growth of what is in excess of the sustainability limits. Growth and de-growth will be in a long-term balance with each other, like waves that rise and sink, as at sea. Overall, the resource use stays within the sustainability limits. There are sustainability limits for the biophysical system, the social system and their interface - the economic system. Sustainability in all aspects will be required for a sustainable system, as defined in the Tripple Bottom Line (John Elkington, 1997), which is emblematic to the importance of system thinking in problem areas of Sustainability. **Sustainable growth** is more problematic. There is no real consensus on how this concept is to be uniquely understood. Sustainable growth was the focus of the Bruntland commission, and very useful in getting the discussion started and focusing on the fact that the present civilization is not sustainable. The Bruntland Commission defined sustainable growth as “the growth that sustains the needs of the present without compromising the welfare of future generations”. It allows for perpetual growth in a finite world, and does not deal with several goal conflicts built into the definition. The present generation should have everything they want and the future generations will have that too. The Bruntland definition was important because it made the necessity of sustainability research evident and pointed towards the need to come up with solutions. But the definition itself is no more than a starting point. It is not sufficiently stringent, it is flavored by political correctness, it allows unlimited growth. However, sustained mass growth forever is a thermodynamic impossibility, and thus a dangerously unsustainable approach. **Sustainable development** is about developing within the sustainability frames that exist for society. It implies that there are quantifiable limits to physical consumption and to material use losses, limits to natural system acceptable damage, and that development must be understood under such conditions. Sustainable development implies development within the sustainability boundaries. It may mean material and energy consumption contraction and convergence, and for societies in resource overshoot, contraction for all. It means that for some situations, we may be wise to consider supplying sufficiency for the many before affluence for the few. Sustainable development concerns not only physical aspects, but also involves development of the social sphere and of society’s structures (Costanza and Daly 1992, Costanza et al., 1992, Sverdrup and Svensson 2002, 2004, EU 2008, 2014).

3 Project Design

The methodology should bring together the 4 major fields into one unity - System thinking, Sustainability, Game development and Adaptive learning - and describe how this was designed and con瑟pted.

The frame for the project was a 6-weeks full-time course in system thinking for second year undergraduate students in a bachelor course in Game Technology and Simulation in the game technology studies at Hedmark University College. In the first 3 semesters of their education these students had studied game design, 3D
modeling, game programming, animation and project-based game development, and had the basic knowledge in game production. System thinking and Sustainability were new to them and were taught through projects in this class. So was the basic theory for making the pervasive game.

The first half of the course was used to teach them system thinking, system analyses and system dynamics in a traditional way through lectures and sustainability assignments (Meadows et al., 1972; Forrester, 1971; Senge, 1990; Sterman, 2000; Schlyter et al. 2012; Sverdrup et al. 2014; Haraldsson and Sverdrup, 2004). The last part of the course (3 weeks) was used to teach and develop the various aspects of the pervasive game.

During a brainstorming process with the whole class, it was decided that the game should be based on core curriculum goals from elementary school, and that the pervasive game should include three digital mini-games also developed on themes from the core curriculum. It should be possible to play the game in one school day, which essentially means 5.5 hours.

The students were divided into four groups with three to six students in each group. The largest group was responsible for the overarching pervasive game, while the three smaller groups made the digital mini-games. Every day in the development period, the class had a meeting to discuss the overall game design, the development progression, and how to solve challenges that arose during the design- and development process.

Due to the short development time for the game and the students’ relatively little practice in system thinking, we decided to provide the students with basic system CLDs (Causal Loop Diagrams) of the mini-games. These CLDs gave them a broad overview of the system for which they were to create the games. The students would have to pick a part of these large systems and modify the CLDs so they reflected their own game design. The CLD for the main pervasive game had to be developed from scratch. Several system thinking sessions were also held in this period, which ensured that the students really used system thinking in their game development, and the game became consistent in terms of the sustainability content. The system models were programmed in Stella and the three digital mini-games in the Unity game engine. To preserve the sustainable solutions simulated in Stella, equations and results from Stella were programmed directly into Unity.

The students had to perform two internal design reviews. These were basically playtests with the aim of revealing and mending flaws in the game design. The students should conduct the first playtest alone, while the second was more thorough and used SurveyMonkey to plan, define and store the results.

Project management was to be in focus every day too; each group was to continually maintain project plans and time estimates, and every student was required to write personal blogs from the development every day. These blogs served as notes for the mandatory research report each student had to file after the course and project were finished. This report should focus on their own learning, motivation, creativity and collaboration skills as well as their reflections on the system thinking used in the game. They were also to write about the implementation phase and the game play done by the children.

4 Methods and Research design

The Research design includes several research methods and could be described as Practitioner Inquiry as stance (Cochran-Smith & Lytle, 2009). According to Cochran-Smith and Lytle practitioner includes action research, teacher research, self-study, the scholarship of teaching and using practice as a site for research. Practitioner inquiry intentionally blurs boundaries between teaching, practice and inquiry and research data is systematically collected throughout the process. The design also draws on methods from system dynamics theory such as system analyses and causal loop wrapping and loop analyses in order to understand system dynamics (Senge, 1990; Sterman, 2000; Haraldsson and Sverdrup, 2004). System analysis is used to map causalities involved in the processes studied. These causal loop diagrams constitute knowledge-maps for the system, and these are iteratively tested against data, experiences and qualitative information in a “learning loop mode” as illustrated in Figure 1. The system analysis process becomes an iterative adapting learning process (Senge 1990). When non-researcher are present, such as stakeholders or students, then these are included in the process, the term for this is an adaptive social learning process, a powerful participatory pedagogical tool.
Research data were collected from all parts of the project. The researchers took notes and pictures during the game development process with the students as well as in the game playing with the children. They also made meeting resumes from the many meetings during the game development process.

The students supplied research data in the form of their report (see above). They also had a 4-hour system thinking exam after the course which hopefully would give us some data about their learning. Finally they filled in a thorough course evaluation where they could anonymously give their views on the course.

The children filled in a 17-page diary that summed up learning from game experience, and had an hour-long system thinking session in the end of the day that was documented thoroughly by the researchers. The children’s teacher, who knew the children well, also observed the game playing and gave the research team valuable background information about the children playing the game.

5 The game

As mentioned above it was decided that the theme of the game should be based on core curriculum goals from elementary school, and we selected “explain how production and consumption can destroy ecosystems and pollute earth, water and air, and discuss how this can be prevented and repaired” to be the main theme of the game.

Further, the game should be cross mediated, meaning that it should contain a well-written narrative that should be told through actors, webpages, videos, clues on different locations and the digital mini-games.

Taking the core curriculum as inspiration the students decided to implement the following digital mini-games:
a digital game showing the relationship between human consumption and the ecosystem, and how we can prevent and repair the pollution of earth, water, and air.

a digital game showing refugees what they can expect their lives will be like as refugees.

a game showing ecological principles from the perspective of an earthworm.

To create a coherent and logical structure, both the digital games and the overarching pervasive game should be designed and analyzed using system thinking. The picture below shows an overview of the project.

Figure 2: The overall pervasive game.

The picture shows how the overall pervasive game includes 3 digital games; the island game, the refugee game and the earthworm game. Below, the 3 digital games and the overall pervasive game are described in more detail.

6 The Island game

The Island game focus was to show the relationship between human consumption and the ecosystem, and how we can prevent and repair the pollution of earth, air and water. The goal was to build, balance and trade the resources of an island. It was designed to teach the children about the balance in nature; how we need factories and products, but also that we can make things in a more sustainable way than we currently do. We showed them that we need to think about where food comes from, that production and consumption create waste and CO₂, and that this waste can ruin nature and make living there in these conditions unpleasant or impossible. Hopefully the children will learn that an island can prosper if they have fugitives come to their place, but also that the fugitives will need the island to adjust to their new situation.
Figure 3: The Island game screen, the initial CLD and the students CLD.
The CLD shows how an increasing population leads to the production of more products and consumables, and to more pollution and waste. The amount and quality of water and food suffers and leads a race for resources and even war. Mining of materials and the production of fertilizers can increase the production of food but they require more mining of metals. Recycling can also increase the availability of minerals and metals, but increases the amount of waste.

6.1.1 Gameplay

When the game starts the players have many workers, but very little food to give them. The children will have to build factories and fishing boats and farms to feed the workers. They will quickly run out of workers, and to gain more of them they will have to play the Fugitive Game where, upon completion, they get a color code that will give them more workers. But, with more workers they need more food, and they have to go play the Earthworms game to be able to grow food more efficiently. They now have food and workers and can start building factories. However, factories and power plants pump out harmful chemicals and CO\textsubscript{2}, so they have to find a way to stop the CO\textsubscript{2} level from getting too high. The solution is finding some money in one of the other game storylines. They can also trade goods and services with the actors to earn more money. When they have collected enough money they get a code for solar panels and a code for trade. They will then be able to build factories that run on solar power and use half of the energy without exceeding the dangerous CO2 level. Finally, they can use the extra food they have to trade with other islands, making their island balanced and prospering.

6.2 The Earthworm game

While the previous game showed the larger picture, depicting how different components in the world were linked together, we also wanted to include a game focusing on the small details. This was to show that small things in nature also had an impact on the larger system. We therefore included an assignment to make a game showing soil ecology and fertility from the perspective of an earthworm. From that perspective we decided to include a digital game showing ecological principles from the perspective of an earthworm.

The core goal of the Earthworm game is to get the best possible harvest. The player can achieve that by moving earthworms to the different parts of the soil (see picture below) and use as little pesticide as possible.
The CLDs show how a greater population of Earthworms gives a less compact soil structure and lets air, water and nutrients flow into the soil and give the soil better fertility. The farm productivity may increase both with the use of heavy machinery and pesticides and lead to a larger food production, but the CLD also shows how the heavy machinery leads to a more compact soil and that fertilizer kills the earthworms. Lastly the CLD shows how soil with a healthy population of earthworms leads to a better soil structure, which is less exposed to erosion.

The gameplay is very simple— it’s all about making the corn grow as fast as possible. To do that the children will have to move the earthworms to the parts of the soil that need it the most, and keep the amount of pesticides as low as possible (to avoid killing the worms). The more worms you have in the soil, the better becomes the crop. If bugs come to eat your crop, you may have to use pesticide to not lose the crop, but the more you use of them, the more you kill the worms, which in turn impacts your crop. The game goes faster and faster which makes it harder and harder to place the worms in the right place.

6.3 The Refugee game

The Refugee game is a bit different from the other two games in that it doesn’t necessarily focus on the larger system, but more about identification and understanding how it feels to be a refugee.
Figure 5: The Refugee game screen, the original CLD and the student CLD.
The CLD shows how poor quality of living and war leads to more refugees and how more refugees leads to higher consumption, greed and a race for resources, possibly war, climate change, and lower quality of the soil system and livelihood subsidence.

The gameplay in this game is also very simple; the children have to avoid danger and collect enough food to survive during their escape from their war-torn land to another country to apply for asylum. When they survive and get to a new country their application for asylum is tried with regards to the probability of getting asylum in that country (based on the real numbers). The children very often felt it was unjustified that their applications for asylum in the new country were not accepted after all their struggles and hardships.

6.4 The Pervasive Game

The fourth and largest student group were to create the overarching pervasive game. The focus here was on making a good story that integrated the smaller digital games in a consistent way.

The game started with a video of a refugee who had to flee his country because of famine and war as a consequence of pollution and climate change. The children find his video blog, and a request to find out what has happened to the environment in his country and how pollution and climate change there can be prevented. The players will then be divided into teams, and each team will receive a backpack with a pair of walkie-talkies, riddles and clues, a treasure map, computer passwords and a notebook. They will then have to solve the clues at different locations around the school, and talk to actors about sustainability-related subjects to be able to proceed in the game.

![Figure 6: Blackboard sketch of the final game.](image)

6.4.1 Pervasive game actors

The game contains several characters, and the students took the roles of actors. These characters were:

- The gardener: The gardener talks to the children about ecology, biological diversity and pollution. The children will help him plant vegetables and in return he will give them new quests related to trading.
- The King of Earth Worms: According to the legends, this mythical creature is about the size of a man residing in the area around the school. This character talked to the children about the importance of the small creatures in the ecosystem.
- The locksmith: This character will help the children create a key for the treasure chest they had found, by using recycled metal. This character talked to the pupils about the importance of recycling.
- The merchant: The merchant will give the players trade-related quests, and teach them about fair-trade and resources.
- The guides: Each team was appointed one student guide that they could request help from if needed.
- The refugee: The refugee will first appear in the video that is shown to the children, and will return towards the end of the game to talk to the players and discuss their experiences.

Below are a flow chart and the CLD for the game. The CLD shows how the mini-games are integrated with each other and the pervasive game. For example, the Worm game has to be played and won to have food...
resources for the island game, and the Refugee game has to be resolved to have a workforce for the factories and the power plants, also in the Island game. The treasure in the Pervasive game has to be found to be able to buy things in the Island game. The CLD also shows how the pollution, war and food/resources are the bases for the refugee escape, and how earthworms are needed to make food grow.

Figure 7: The Pervasive game CLD is shown as developed by the students. This shows the overall system causal loop diagram with all the small games inside the large.

An action flow chart is shown in Figure 8.

Figure 8: Game flow chart. The different action is color coded in the following way: Yellow – Actors, Green – The codes needed to solve the game, Magneta – Hints and passwords, Purple– Mini-games, Dark blue – Locations and actions.

6.5 The aftermath

After the game was completed, the children were given the refugee’s diary. This 17-page diary has two functions. First, it was a way to summarize the main principles they had learned from the game in a way that was closely related to the narrative of the game. Secondly, the diary included several written assignments that the pupils have to solve, related to the game they have played.
After the children had filled in the diary they were gathered in the classroom to conduct a system thinking debriefing session. This session was led by one of the teachers who asked the children questions about the different parts of the game, and how they were connected. Another teacher drew a system CLD on the blackboard from the children’s answers and made connections and signs in the way the children wanted them.

7 Discussion
This section discusses briefly some of the thoughts after the game playing in the elementary school.

Firstly, the energy, enthusiasm and creativity the children put into playing the game was impressive. They exhausted the assigned student helpers in 30 minutes, and the children basically solved the game that was meant to last the whole day in 2.5 hours. It was very clear that they considered the game playing fun; one child later enthusiastically called the day the “best school day ever”. We could also see some of the same enthusiasm during the work with the diary and the system thinking session and some children went to the library to borrow books to read more about the things they had learned in the game.

The diary was designed in a way so that we should be able to check how much of the sustainability-related topics from the game they had learned, and also if they understood the related connections between them. All the children filled in this diary, and when we later studied them we found that the majority of the children summed up their sustainability knowledge in a thorough and good way, which indicates that there was a good learning outcome from the game.

The system thinking debriefing session enabled us to check further how much of the connectivity between the events they had understood. Within an hour the blackboard contained a fairly complex CLD, which impressed both the students and the research group. This leads us to believe that games are a good way to teach system thinking. We believe the system thinking sessions could be even longer and more thorough without boring the children.

The children’s elementary school teacher pointed out that the children who normally didn’t like the traditional school teaching excelled while playing the game. They paid attention, they progressed quickly, and they showed leadership skills. This shows that teaching through pervasive game playing in school also can help to activate those children who do not so easily fit into the traditional school system.

Observations indicated that the students also had fun both when they developed the game and when they observed how the children played it. They also wrote the same in their reports; below are some of their comments:

- “It has been very fun to participate in this project, with the best part being the playtest with the 5th graders. I am satisfied with the whole project, and although it was hard to see how everything would turn out when we started the project, we managed to finish, and we finished with bravura.”
- “I see the pervasive game part of this course as an interesting experience where we learned a lot, and comments like “The best school day ever”, indicate that the 5th- and 7th graders felt the same”.
- “This was an enjoyable and rewarding assignment to work with, and although we’re neither actors or have developed a game like this before, I felt it was a very successful project for us students, and I hope the teachers feel the same”.
- “To summarize, I’ll say this project has been a joy to work on. I’ve both learned from it, and gained many very nice memories. This has been nothing but fun!”

They also describe the project as stealth learning due to the short development frame, but with a big reward at the end - the implementation of the games for the children. Since both the fun factor and the learning outcome for the children seemed to be good, the game playing in itself indicated that the gamification of this project worked well. Regarding the learning outcome for the students – to learn system thinking, the CLDs made by the students’ during the game development, the reports and the exam indicated that that they had learned at least as much as previous classes in system thinking done with traditional teaching methods. However, we didn’t compare the students’ learning in this project in detail with traditional teaching, so we can not say the learning outcome in this setting were better than doing it the traditional way. We believe, and the students also say so in their reports, that learning through making games is more fun and more thorough than
traditional learning due to ‘learning by doing’, and ‘learning just in time’; the need to learn pops up when they need it for the game. And of course, the implementation with the children is an event they will remember for a long time and tie their learning to this event.

Although the overall project was successful, the game development part had some limitations.

We found the students didn’t have enough experience in system thinking and sustainability to make their own CLDs on the games. The overall CLDs we made for the mini-games helped, but ideally they should make all CLDs themselves. We believe more time should be used on teaching them system thinking and sustainability ‘just in time’ during the development process of the pervasive game.

The time to develop the games was probably too short. This caused some frustration and several of the students felt that they could have made the game better with some additional time. Several students also pointed out that using CLDs and simulations to check game logic and debug the code proved to be very beneficial; they found the bugs much faster than with traditional tests. Thus they found another use of system thinking in game development not explicitly pointed out to them.

While the students saw a clear need for system thinking in sustainability, they questioned the use of system thinking when developing the small mini-games. The systemic challenges were just too small to "waste" time on developing system CLDs or simulations. However, it was a clear understanding that if the games grew more complex, the system thinking would be a very useful tool both in the game design phase and as a debugging tool.

The game was also solved faster than we expected by the children. This was not a major problem because the time we could use on the diary and the session with System Thinking was increased. This turned out to be both interesting and effective and probably added to the children’s learning. However, when we do this next time, the games should be more difficult to solve. The diligence, creativity and energy the children put into solving these games were truly amazing, and we believe the playing time and level of difficulty could easily be increased without them being bored or exhausted.

8 Conclusions

Without more thorough analyses of the research data in the project, it is hard to draw any conclusions. However, we believe that the combination of system analysis, sustainability, game development or game playing and learning is a good one. Its quite clear that both the school children and the students found the project fun, and the submitted reports, exam and debriefing sessions all indicate that the learning outcome for both were at least as good as with traditional methods. As stated above, we also believe the learning process is more thorough than traditional learning due to the “learning by doing” aspect of the project.

The interest from the schools in trying out this concept was also exceptional; after sending out a one-page request to schools to implement the game only 4 weeks before we planned the actual test, we got answers from 15 schools and more than 1500 children wanting us to implement the game in their school. Bearing this in mind, we will most definitely implement the project again.

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The Effects of Instructor Control of Online Learning Environments on Satisfaction and Perceived Learning

Jamie Costley¹ and Christopher Lange²

¹Kongju National University, Gongju, South Korea
²Joongbu University, Geumsan, South Korea
costleyjamie@gmail.com

Abstract: Instructional design is important as it helps set the discourse, context, and content of learning in an online environment. Specific instructional design decisions do not only play a part in the discourse of the learners, but they can affect the learners' levels of satisfaction and perceived learning as well. Numerous studies have shown the value that both student satisfaction and learning have on learner achievement. For this reason, the question of whether instructors can impact satisfaction and perceived learning through various instructional design decisions is important. This study looked at broad-based instructor decisions to see if online environments with higher levels of instructor control lead to higher levels of student satisfaction and/or perceived learning. Three different online environments were used, with each one containing progressively more instructor control. The results show that there were no significant differences in regards to mean levels of satisfaction between the three environments. However, there were significant differences among mean levels of perceived learning based on the differing instructor-controlled environments. This study shows that increasing the levels of instructor control within online environments leads to an increase in perceived learning.

Keywords: computer mediated communication; instructor control; instructional design; online learning; perceived learning; satisfaction

1 Introduction

Within education, the importance of computer mediated communication (CMC) has become evident because of its use in facilitating the learning experience. This is done through interaction not only between students, but between students and instructors as well (Rourke, Anderson, Garrison and Archer 1999). CMC has helped to create a shift from a teacher-centered environment to a student-centered one. Although this shift has become apparent, students still need proper guidance to ensure effective interaction, regardless of the shift. This is because teachers need to be able to make appropriate learner-centered design decisions for use in instruction (Berge & Collins 1995).

Previous research has indicated that aspects of instructional design used to facilitate interaction within an online community have had a significant impact on both student satisfaction and perceived learning (Garrison 2007; Swan & Shih 2005; Wu & Hiltz 2004). The pedagogical significance of this is student satisfaction and perceived learning have been linked to successful implementation of E-learning and student achievement respectively (Sun, Tsai, Finger and Yeh 2008). An overarching theme within previous studies that look at the effect that instructional design has on satisfaction and perceived learning have focused on a form of instructor-control that dictates the amount of interaction that is to take place within a specific online environment. In addition to its influence on interaction levels, instructional design can be used to control other aspects such as the content of the class, the feedback given to learners, task structure, and the organization of the online learning environment.(Puzziferro & Shelton 2008; Siragussa, Dixon and Dixon 2007; Ertmer, Richardson, Belland, Camin, Connolly, Coulthard & Mong 2007; Lim, Morris & Kupritz 2014). These aspects of design should be addressed so that effective methods for promoting satisfaction and learning can be fully implemented.

Research which has measured the effect that instructor-control has on student satisfaction and learning has done so through surveying students to see how much instructor control they perceived (Sher 2009; Swan 2001; Sun et al. 2008). The perceived levels of instructor-control were then compared to students' perceived levels of learning and satisfaction to determine the level of effects (Sher 2009; Swan 2001; Sun et al. 2008). The current study manipulates various online learning environments, in which the participants experience varying levels of instructor control. The differing levels of instructor control are based on a modification of Siragussa, Dixon and Dixon's (2007) IDOL model of instructional design. More specifically, this paper examines
the effects of broad-based design decisions that manipulate the amount of instructor control and how that control affects levels of learning and satisfaction. This research looks at two main questions:

- How do the differing levels of instructor control affect student satisfaction?
- How do the differing levels of instructor control affect student learning?

2 Theoretical Background

2.1 CMC in Education

The popularity of CMC within education has brought forward ideas of interaction within online learning communities. Swan, Garrison, and Richardson (2009) claim that the biggest question within these communities has been whether they can actually be sustained in the form of text-based, asynchronous environments. The answer to this question can be found within online learning environments that use asynchronous forums as a means of communication between instructors and learners. Asynchronous online forums have proven sustainable as a form of CMC because of their success in removing barriers to participation and allowing learners to communicate with each other “anytime” and “anywhere” (Wu & Hiltz 2004). Another benefit of asynchronous online forums is that students have been shown to favor this form of online learning over face-to-face communication because it allows users to communicate at their own pace and in their own way (Callan 2006; O’Neill, Duplock and Willis. 2006; Wang and Woo 2007). Furthermore, claims have been made that asynchronous forums are more effective in terms of producing a greater quality of work, as responses are well thought out, longer, and more detailed when compared to face-to-face learning environments (Hara, Bonk and Angeli 2002).

3 Instructional Design Online

When designing instruction online, teachers need to take into account the various aspects that will support learners. Chen (2007) explains that the four components needed for effective support-based instructional design online are 1) technology, 2) course content, 3) participants, and 4) goals/activities. Goals and activities form the heart of the online learning process. Chen (2007) argues that these four components need to be used in the following ways in order to provide the best support for students in the learning process: Technology should be user-friendly and used to support the facilitation of learning tasks. Course content should be presented through the use of scaffolding to support engagement and achievement. Effective interaction and collaboration should be promoted by the instructor through the design of a social support system. Properly structured learning tasks should be implemented to achieve pre-determined learning goals. Like Chen (2007), Janicki and Liegle (2001) focus on effective instructional processes along with the use of technology in order to effectively design instruction online. In respect to technology, they propose that consistent layout, ease of navigation, and the availability of help screens are important components that support design in online learning. From an instructional process perspective, they promote the following: instructors acting as facilitators, use of a variety of presentation styles, use of multiple exercises, solving hands-on problems, allowing learner-control of pacing, testing learners frequently, and providing clear feedback.

Anderson, Rourke, Garrison and Archer (2001) look at instructional design as part of teaching presence, which they define as the design, facilitation and direction of social and cognitive processes used to create meaningful student outcomes. Based on their work, teaching presence is divided into three categories: facilitating discourse, direct instruction, and design and organization. Facilitating discourse involves the guidance of the learner by the instructor in a meaningful way to make certain that students stay focused on the task (Anderson, et al. 2001). Direct instruction involves the direct intervention of the instructor in order to “correct misconceptions, provide relevant information, summarize the discussion and/ or provide some metacognitive awareness” (Swan and Garrison 2009, p. 13). Design and organization not only involves the design and implementation of individual and group learning activities (Akyol & Garrison 2011), but it also includes setting the curriculum, designing methods, establishing group norms (netiquette), and utilizing the medium effectively by keeping students focused and providing encouragement (Anderson, et al. 2001). The teacher in the role of instructional designer is also responsible for setting clear expectations with respect to the type of discourse that is desired within the online environment. This includes teacher actions such as stating the desired message length, structuring the discourse through instructor comments, and establishing time parameters for learners to post within the online environment (Anderson, et al. 2001).
Within the design and organizational aspects of online learning, instructors may need to control aspects of engagement to reduce the difficulty learners have interacting within the online community. Such control can come in the form of checking understanding at frequent intervals and providing immediate feedback to the learners when necessary (Lim, Morris & Kupritz 2014). It is important to note that the need for various levels of instructor control within a specific online environment may lead to different outcomes for the learners. Anderson et al. (2001) focus on these aspects to ensure that specific, desired student outcomes are obtained. They believe that instructional design should be used to provide students with guidelines, model appropriate posts, and assist the learners when communication breakdowns occur (Anderson, et al. 2001). Furthermore, they believe that design and organizational aspects implemented by the instructor should follow a narrative path through mediation and interaction in which the students have a clear idea of what is expected of them (Anderson, et al. 2001). Such interaction is obtained through making instructional design decisions in such a way that they create an overlap between content interaction and participant interaction to create a sense of community within an online learning environment (Swan 2002).

In an older model, Reeves and Reeves (1997) introduce ten dimensions that are used to explain instructional design within online environments. These dimensions are pedagogical philosophy, learning theory, goal orientation, task orientation, source of motivation, teacher role, metacognitive support, collaborative learning, cultural sensitivity, and structural flexibility. These dimensions vary along a continuum and learning environments can be described according to how differing aspects of those dimensions vary within those environments. Using a modified version of Reeves and Reeves’ (1997) model, Siragusa, Dixon and Dixon (2007) developed a method of understanding instructional design elements that consist of a set of instructor-initiated decisions that are separated into categories that include content, structure and organization, study flexibility, interaction, and feedback. These decisions can vary in the online environment based on the needs of the students. According to Siragusa, et al. (2007), the amount of content provided in the online environment by the instructor can vary from being “totally provided and linear” to being “completely student-constructed and non-linear”. For example, undergraduate students may benefit from content being totally provided to them so they can get a complete understanding of the underlying principles of a topic, while post-graduate students may benefit from student-constructed content to help them build on their own ideas of a specific topic (Glaser 1987). Varying levels of structure and organization may be useful as well, as providing more structure helps students gain a deeper understanding of the material presented to them (Chen 2007). Siragusa, et al. (2007) state that structure and organization ranges from teacher-proof to easily modifiable within the online learning environment. Teacher-proof means that the learning materials are represented in appropriate learning steps and additional learning materials are added when a deeper understanding is needed. Easily modifiable structure and organization gives more flexibility to what learning materials are given and how they are presented. In regards to study flexibility in online learning, teachers may control the amount of autonomy the students have when it comes to the pace at which they post. The pace at which students can post ranges from teacher-determined to student-controlled (Siragusa et al. 2007). In a fully online course, teachers may need to control the pace at which students post more than they would in a blended learning class. This is because the students in a blended learning course have a chance to participate in class, while students in a fully online course do not have this option. Interaction refers to the amount of control the teacher has on the interaction on the forum. Teacher decisions can range from “teacher-guided” interaction to “student-guided interaction” (Siragusa, et al. 2007). Teacher-guided interaction may be used if teachers are looking to guide students in a certain direction to achieve specific outcomes. Student-guided interaction may be used for more abstract outcomes, where students may be required to come to their own conclusions through knowledge construction. Siragusa, et al. (2007) claim that the feedback that students require will vary depending upon student needs and level of engagement with the learning materials. Feedback can range from teacher-controlled to student-controlled. This model shows that the amount of instructor control in online learning environments such as asynchronous online forums can and will vary based on student needs. It cannot only give insight, but it is also useful to investigate if these variations in instructor control have any effect on student satisfaction and/or learning.

3.1 Effects of Instructional Design on Satisfaction

Delon and Mclean (1992) make the claim that student satisfaction is one of the most important factors when it comes to implementing e-learning. An increase in student satisfaction is positively correlated with retention as well as its influence on student motivation (Astin 1993; Edwards & Waters 1982; Bailey, Bauman, & Lata 1998; Chute, Thompson, & Hancock 1999; Donohue & Wong 1997). Additionally, students’ satisfaction with their
teachers has been linked to increased levels of perceived learning (Richardson and Swan 2003). Among the various ways of influencing satisfaction, teaching design and organization of online environments appears to be a determining factor, as the role of instructors and their presence has been shown to be an indicator and determinant of student satisfaction (Garrison 2007; Sun, et al. 2008).

Research conducted by Sun, et al. (2008) address varying dimensions of instructional design online that can influence student satisfaction. Within the instructor dimension, instructor control such as the timeliness of instructor responses to student posts has been shown to have a significant influence on student satisfaction (Arbaugh 2002; Thurmond, Wambach and Connors 2002). Sun, et al. (2008) postulate that this is due to the students’ perception that they are afforded more opportunities to learn when teachers respond to their posts in a timely manner. Within the course dimension, flexibility in time and location have been shown to increase student satisfaction (Sun et al. 2008). Sun et al. (2008) suggest that this is due not only to the convenience the students feel, but also to the elimination of awkwardness that can occur in face-to-face interactions. Within the dimension of the learning environment, Thurmond, et al. (2002), claim that feedback from others positively affects satisfaction. This is because feedback through interaction with others leads to the improved progress and ability of learner groups to solve problems (Arbaugh 2000).

3.2 Effects of Instructional Design on Learning

Within online learning environments, it is the job of the teacher to facilitate the process in order to fulfill specific learning outcomes (Anderson et al. 2001). Based on decisions made by the teacher, learners within a community may have various perceptions of learning. Research has shown that the way learners perceive their learning environment is related to student achievement (Fraser, 1994). Therefore, the role of instructional design and its effect on the perception of learning deserves some attention. Within online communities, Akyol and Garrison (2014) note that perceived learning of the students is affected by how teachers facilitate the online experience, highlighting the importance of looking at ways in which the decisions of the instructor can positively affect perceived learning.

Research comparing instructor-control of online environments and perceived learning of students has generally focused on the instructor-controlled levels of interaction. This is the case with research conducted by Shea, Fredericksen, Pickett and Pelz (2003), which compared interaction with instructors to students’ levels of perceived learning. Survey analysis was conducted with both variables (students’ perception of interaction with the instructor, and students’ perception of learning) to show that students who perceived high levels of teacher interaction perceived higher levels of learning as well. The survey was based on how the teacher interacted with the students through the use of a variety of teaching behaviors, including instructional design and organization. In regards to design and organization, the students reported high levels of interaction when their teacher clearly communicated how to participate in the learning activities and what the course topics would be. The results showed that these design decisions were positively correlated with high levels of perceived learning. Additional research conducted by Arbaugh (2000) surveyed participants to find out how they perceived learning, ease of interaction, and instructor emphasis on interaction. The findings of this study were similar with that of Shea, et al. (2003) in that instructor interaction has a significant influence on the students’ perception of learning. Research conducted by Swan (2001) not only looked at levels of student to teacher interaction, but also looked at levels of student interaction. The results showed that student-to-student interaction as well as student-to-teacher interaction led to higher levels of perceived learning, though student interaction with the teacher was a more powerful predictor of perceived learning than students’ interaction with each other.

4 Methods

4.1 Subjects and Context

This study had 219 participants. The participants were students at a national university in Korea. The study was implemented in blended learning classes that focused on the improvement of writing skills and the development of understanding of key teaching issues such as classroom management and delivering instruction. The ultimate goal of the course was to provide the students adequate preparation for the Korean teachers’ entrance exam. The classes took place over the course of three semesters from 2013 to 2014. The in-class aspects of the classes were lectures, student presentations, and group activities. The online portion of the course involved the students using an asynchronous online forum in order to interact and exchange ideas.
as a community and enhance their understanding of the in-class material. Table 1 shows the gender and major breakdown for the three forums used in the study.

**Table 1**: The Gender and majors for the three forums

<table>
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<th>Semester two</th>
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</table>

All majors were part of the college of education except those marked with an *

### 4.2 Experimental Procedures

This study took place over three consecutive semesters. It was implemented in order to see if manipulating the levels of teacher control of three different online forums would produce varying levels of student satisfaction and perceived learning. For each semester that the experiment was run, there was variation in the type of online learning environment from which the students interacted. These differing learning environments were progressively more instructor dominated, and more specific directions were given in forum 2 than 1, and forum 3 than 2. The three forums received progressively higher levels of instructor control. The instructional design model used to vary the levels of teacher control was created using a modification of the Instructional Design for Online Learning model (IDOL) designed by Siragusa, Dixon and Dixon (2007).

### 4.3 Defining the three learning environments

The following is a modified version of the Instructional Design for Online Learning model designed by Siragusa, Dixon and Dixon (2007). There are seven instructional design decisions used in this study. Each one is explained, and detail is given in regards to how the decisions varied in each of the three forums. A visual representation can be seen in figure 1, which shows more instructor-controlled choices to the right, and more student-controlled choices to the left.
Content source refers to whether the content is generated by either the instructor or the students. The amount of content direction given by the instructor varied among the three forums, ranging from student-controlled to largely instructor controlled. The first forum completely consisted of student generated content, as they were told to post "whatever they wanted" that related to the class. The second and third forums were more instructor-controlled in the sense that they contained specific instructor generated content in the form of questions. More specifically for the second and third forums, learners were given weekly questions to answer, and learner-to-learner interaction occurred on threads generated from those weekly questions.

Linear content refers to whether or not the content followed a specific linear pattern, for example a linear path of narrative or levels of difficulty. The first two forums contained no linear pattern. The topics used in the first forum were student-generated and the topics from the second forum were presented weekly, but not based on any specific linear pattern. On the other hand, the third forum contained progressively more difficult questions as time went on. The pattern for the third forum was based around the complexity of questions, ranging from simple in the earlier weeks of the semester, to more complex in the later weeks.

Instructor posting refers to how much the instructor interacts with the learners through posting. The first and second forums contained few instructor posts (less than 100 instructor posts out of approximately 3000 total posts in forums 1 and 2). The third forum contained significantly more instructor posts that focused on giving contents and moderating the learner-to-learner discussion (approximately 500 instructor posts out of approximately 3000 total posts).

Structure and organization refers to how the discourse and interactions are controlled by the instructor. This can include providing examples and restricting the way students reply to other students’ posts. The first forum contained no such structure and students were told to write and interact anyway that they felt comfortable. For the second forum, students were given example posts that were focused and on-topic. Furthermore, students were instructed in netiquette and given instruction and encouragement in how to improve their interaction, for example, embedding media, the quote function, and how to find specific users. The third forum used the same set of instructions as in forum 2. Furthermore, it was made mandatory that contributions to a thread contribute directly to the topic and examples of effective knowledge building through threaded discussions were given.

Study flexibility refers to the freedom of students’ posting in regards to time. In the first forum, students were free to post whenever they wanted throughout the semester. If they chose to, they could make many posts at the beginning of the semester, then stop, or contribute consistently throughout the semester. The second and third forums required the students to submit their posts on a monthly basis. Additionally, students on the second and third forum were given explicit encouragement to make their posts on time.

Interaction refers to how much the instructor controls the amount of interaction taking place between the students in the forum. The students in the first forum were allowed to interact with anyone they wanted to within the forum, but interaction was not mandatory. They could, if they wished, use the forum as a personal blog or diary about class, and not contribute to other users’ threads. The students in the second forum were also free to interact with whomever they wanted, but interaction was mandatory, in that, on top of starting a thread answering their question of the week, they were also required to contribute three posts to other learners’ threads. The third forum contained more instructor control as it had all of the interaction requirements of the second forum, and students were put into groups of 14 to 17 students and told that they can only interact with their fellow group members.

Feedback refers to the amount of responses the instructor made to the students’ posts regarding quality of their posts and/or potential grading implications of their posts. The first forum contained little feedback, and was only given at the student’s request. For the second and third forums, instructor feedback was given biweekly.

Figure 1 is a visual representation of the levels of instructor control for each of the instructional design decisions and how they varied between environments. The placements of the forums are subjective representations of how those forums appear within the design. The left side of the scale can be considered student controlled, while the right side of the scale can be considered instructor controlled.
4.4 Measurement of Satisfaction and Perceived Learning

All of the participants from each of the three learning environments received a survey in which they rated their levels of satisfaction and perceived learning in regards to the learning environment. The survey consisted of Likert scale questions with 1 being the lowest and 5 being the highest. The data obtained from this survey were then put into SPSS version 20 and tested to find the mean values of satisfaction and learning within the three different learning environments. The means of each learning environment for both satisfaction and learning were compared using ANOVA and the results were used to determine whether the environments with more instructor control led to an increase in student satisfaction and perceived learning.

5 Results

5.1 How do the differing levels of instructor control affect student satisfaction?

The means for student satisfaction were calculated for each of the three conditions. As can be seen in Table 2, the low control environment (forum 1) had a mean satisfaction score of 4.84, the medium control environment (forum 2) had a mean satisfaction score of 4.82, and the high control environment (forum 3) had a mean satisfaction score of 4.82.

Table 2: Mean satisfaction for the three conditions

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low control</td>
<td>70</td>
<td>4.84</td>
<td>3.67</td>
</tr>
<tr>
<td>Medium control</td>
<td>72</td>
<td>4.82</td>
<td>3.87</td>
</tr>
<tr>
<td>High control</td>
<td>77</td>
<td>4.82</td>
<td>3.88</td>
</tr>
</tbody>
</table>

To compare the differences in mean satisfaction scores between the three environments, ANOVA testing was performed. As can be seen in Table 3, there is no statistically significant difference between the three conditions. This shows that regardless of experiment conditions, all forums had very similar student satisfaction.
### Table 3: ANOVA for comparing variance in satisfaction means

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>2</td>
<td>.028</td>
<td>.014</td>
<td>.095</td>
<td>.909</td>
</tr>
<tr>
<td>Within groups</td>
<td>216</td>
<td>31.38</td>
<td>.145</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>218</td>
<td>31.41</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 5.2 How do the differing levels of instructor control affect students learning?

The means for perceived learning were calculated for each of the three conditions. As can be seen in Table 4, the low control environment (forum 1) had a mean perceived learning score of 4.60, the medium control environment (forum 2) had a mean perceived learning score of 4.92, and the high control environment (forum 3) had a mean perceived score of 4.94.

### Table 4: Mean learning scores for the three conditions

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low control</td>
<td>70</td>
<td>4.60</td>
<td>5.49</td>
</tr>
<tr>
<td>Medium control</td>
<td>72</td>
<td>4.92</td>
<td>2.78</td>
</tr>
<tr>
<td>High control</td>
<td>77</td>
<td>4.94</td>
<td>2.48</td>
</tr>
</tbody>
</table>

To compare the differences in mean perceived learning scores between the three environments, ANOVA testing and the Sheffe test were performed. As can be seen in Table 5, there was a statistically significant difference between the three conditions. As there were three different conditions, it was necessary to determine which forums varied from one another. Table 6 shows there is a statistically significant difference between the low controlled forum and the medium controlled forum. There is also a significant difference between the low controlled forum and the high controlled forum. However there is no significant difference between the medium controlled forum and the high controlled forum. These results show that instructor control does impact the perceived learning of students.

### Table 5: ANOVA for comparing perceived learning means.

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>2</td>
<td>5.08</td>
<td>2.54</td>
<td>17.7</td>
<td>.000</td>
</tr>
<tr>
<td>Within groups</td>
<td>216</td>
<td>30.98</td>
<td>.143</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>218</td>
<td>36.06</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 6: ANOVA (Scheffe test) for comparing learning means

<table>
<thead>
<tr>
<th></th>
<th>Low control</th>
<th>Medium control</th>
<th>High control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low control</td>
<td>0</td>
<td>-.317</td>
<td>-.335*</td>
</tr>
<tr>
<td>Medium control</td>
<td>.317*</td>
<td>0</td>
<td>-.018</td>
</tr>
<tr>
<td>High control</td>
<td>.335*</td>
<td>0.18</td>
<td>0</td>
</tr>
</tbody>
</table>

* The mean difference is significant at the 0.05 level.

Giving this study a richer analysis and providing more support for the findings that broad based instructor decisions of creating higher controlled learning environments contributed to higher levels of perceived learning by the students, analysis was done comparing other variables to the perceived learning of the students. This strengthens the study, showing that the results are due to instructor control of learning environments rather than other factors such as gender, major, or grade. These three variables were analyzed to see if they had any influence on perceived learning. As can be seen in tables 7, there was no relationship found between gender, major, or grade with perceived learning of the students, adding support to the claim of this study that perceived learning was indeed caused by instructor control.
Table 7: ANOVA for comparing mean levels of learning based on gender, major, and grades

<table>
<thead>
<tr>
<th></th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between Groups</td>
<td>1</td>
<td>.059</td>
<td>.059</td>
<td>.354</td>
<td>.552</td>
</tr>
<tr>
<td>Within Groups</td>
<td>217</td>
<td>35.996</td>
<td>.166</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>218</td>
<td>36.055</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between groups</td>
<td>18</td>
<td>2.80</td>
<td>.156</td>
<td>.936</td>
<td>.536</td>
</tr>
<tr>
<td>Within groups</td>
<td>200</td>
<td>33.25</td>
<td>.166</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>218</td>
<td>36.05</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between groups</td>
<td>3</td>
<td>.647</td>
<td>.216</td>
<td>1.31</td>
<td>.272</td>
</tr>
<tr>
<td>Within groups</td>
<td>215</td>
<td>35.41</td>
<td>.165</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>218</td>
<td>36.06</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6 Discussion

In light of research that shows that engagement and interaction can be promoted through instructor controls within online instructional design (Lim, Morris & Kupritz 2014; Swan 2002), the results of this study validate that design can have an important impact, as positive learner outcomes were achieved through increases in instructor control. The current study looked at varying control of online environments in a broad way to give a general sense of how various instructional design decisions can affect student satisfaction and perceived learning. Increasing the amount of control used by the instructor in this study did not affect student satisfaction, but did prove to influence student learning.

The fact that the lowest controlled environment in this study had the highest mean score in terms of satisfaction (although there was no significant difference compared to the other two environments) does go against what previous research has generally shown. Previous research has claimed that higher levels of instructional design controls lead to higher levels of student satisfaction (Arbaugh 2002; Thurmond et al. 2002; Sun, et al. 2008; Thurmond, Wambach and Connors 2002). These studies show that instructional design that allows more interaction and feedback should lead to higher satisfaction. Although not statistically significant in this study, the reason student satisfaction was highest in the low-control group may be found in the area of study flexibility. Using more instructor control and putting restrictions on when students can post may be detrimental to student satisfaction. Sun et al. (2008) mention that students are more satisfied when they are not constrained by time. In the second and third forums, the students were more constrained by time as they were given specific deadlines of when to submit their posts, while the students in the first forum could submit their posts anytime they wanted throughout the semester.

In terms of learning, the students’ mean rankings progressively went up as the level of control went up from forum one to forum three. There was a significant difference of perceived learning when comparing the first forum, which had the lowest levels of perceived learning with the other two forums, which had much higher levels of perceived learning. This shows that the higher controlled forums produced higher levels of learning when compared to the lowest controlled forum. Consistent with these findings, previous research has claimed that higher levels of instructor presence, specifically instructional design control, can significantly impact perceived learning levels of students (Arbaugh 2000; Shea, et al. 2003; Swan 2001).

Looking at the specific dimensions that were varied in terms of instructor control may explain the higher levels of learning in the more instructor-controlled learning environments. This study shows that learning increased with more instructor-controlled content. According to Glaser (1987), undergraduate students need the delivery of the content to be more complete so they can grasp the underlying concepts of the topic. This contrasts with postgraduate students who generally require less content because they are more involved in
Looking deeper into how the content was delivered by the instructor in this study provides additional insight for how instructor decisions influenced the learning levels of the students. The content in the third forum was presented by the instructor in a much more linear fashion than in the other two forums. In the third forum, the instructor provided a clear linear pattern to the students as the questions posed to them became increasingly more difficult over time. The fact that the third forum appeared to have higher levels of learning makes sense when looking at other research. Cochran (1991) claims that teachers need to know how to best deliver the content and represent the content in a way that is understandable to the students. This can affect the students’ perception of how difficult the content is. Through the delivery of content in a linear pattern (from less difficult to more difficult over time) forum three may have helped the students gain a better understanding of the content, further increasing their levels of learning. This helps to understand the results of the current study.

Instructor-control of interaction in this study may have also played a role in how the student levels of learning were higher in forums two and three. Previous research has shown that students who perceive high levels of interaction also perceive high levels of learning (Ozturk and Ozcinar 2013). The results of this study reflect this research, the levels of student learning increased as the control of interaction also increased. Forum one, which required no interaction, had the lowest level of student learning. Forum two, which included mandatory interaction by having the students reply to a specific number of other users’ posts had higher levels of interaction than forum one. Forum three, which had the most control over the interaction by requiring students to only reply to posts with fellow group members contained the highest levels of student learning. Therefore, it would be reasonable to conclude that more instructor control of interaction contributes to higher levels of student learning. In terms of how structure and organization was used to control interaction and discourse in this study, the instructor varied the levels of control within the online environments, which may have contributed to the differing levels of student learning. Forum one had no such structure, as students were told to interact in any way in which they felt comfortable. Forums two and three had more structure and organization, as specific examples were given about how posts should be done within the forums and examples of how the tasks should be done were given. Wilcox, Schram, Lappan and Lanier (1991) make the claim that when a teacher provides examples, it allows students to own their ideas. This helps the students shape their understanding of the content of whatever class they are taking (Wilcox, et al. 1991).

In this study, variation in instructor posting may have also contributed to varied levels of student learning. The level of instructor posting is by definition, the amount the instructor interacts with learners online. Previous research has shown that students who perceive high levels of interaction with their teachers, also perceive high levels of learning (Arbaugh, 2000; Shea, et al., 2003; Shea, et al., 2003). The current study varied the levels of teacher interaction through instructor posting. Forum one contained very few instructor postings, and the third forum contained significantly more instructor postings. Therefore, the increase of instructor-interaction with the students through more instructor postings in the third forum may have accounted for forum three having the highest level of student learning. Furthermore, the students in forum two and three were encouraged to post more, while the students in forum one were not. This could have led to more interaction, which can increase perceived learning (Swan 2001). Additionally, feedback in the second and third forum was given more regularly. Specifically, the students in the second and third forum received feedback every two weeks. Siragusa et al. (2007) explain that feedback enriches the students’ online learning experiences. Furthermore, they make the claim that instructor feedback given to students in an online setting is helpful in that it assists the students in their learning process (Siragusa, et al. 2007).

Through this study, it is apparent that instructor control of learning environments, specifically though means of controlling content and interaction, can have positive effects of perceived learning of the students. Instructors need to be aware that introducing more complete content, not only can give them a clearer understanding of underlying concepts, but can also have a positive effect on how they perceive the learning process as a whole. Additionally, promoting interaction through efficient structure and organization can be beneficial to how students perceive learning as well. Although it appears that an online environment that is more instructor-
controlled can increase levels of learning, it is important to be aware that online communities should still be student-centered. Instructor-control should be designed to facilitate a student-centered environment, not make a teacher-centered one. Teachers who deliver instruction online need to be aware that certain levels of control within the environment can affect student outcomes positively. Perceived learning has been shown to be a beneficial outcome and if instructors want to increase this, they might want to look into instructional design decisions that emphasize a more instructor–controlled environment.

This paper uses a quasi-experimental design to look at the effects of instructor-control on student learning and satisfaction. It is a limitation of this paper that in the formulation of the concept of “instructor-control” multiple variables were manipulated. This makes it difficult to precisely ascertain which variables generated the positive effect on learning. Also, there may be other instructional design variables not covered in this experiment that can influence learning. Future research should seek to break down the constituent parts of this experiment into more precise and varied experimental conditions to see which parts of instructional control have a positive impact on learning. Furthermore, though there was no statistically significant difference between the differing learning environments and satisfaction, there must surely be ways that instructional design can positively or negatively impact satisfaction. More varied design features need to be investigated to find out how we can positively influence student satisfaction through instructor control.

References


Ozturk, HT, and Ozcinar H (2013) “Learning in multiple communities from the perspective of knowledge capital” The International Review of Research in Open and Distributed Learning Vol 14, No 1, 204 - 221.


Student Characteristics and Learning Outcomes in a Blended Learning Environment Intervention in a Ugandan University

Mugenyi Justice Kintu¹ and Chang Zhu²
¹Mountains of the Moon University and Vrije Universiteit Brussel
²Vrije Universiteit, Brussel
Kmugenyi2@gmail.com
chang.zhu@vub.ac.be

Abstract: This paper explores the design of a blended learning environment in a transition from face-to-face and seeks to determine whether learner characteristics and background together with blended learning design elements are significant factors for learning outcomes such as intrinsic motivation, satisfaction, knowledge construction and learning performance in blended learning. It is aimed at examining the learner characteristics and backgrounds such as age, gender, self-regulation, attitudes, family and social support as well as the management of workload in blended learning. It is again to find out the levels of use and satisfaction with blended learning design features such as interactions, learning management system tools and resources, face-to-face support and technology quality by learners. Students from three schools and one directorate were involved in a face-to-face set up in the first part of a seventeen week semester and in an online set up in the second part. They finally had a face-to-face at the end to review their work after which they took end of semester examinations. A questionnaire survey was administered to 270 respondents in this group to gather data on student characteristics and background, design features and three of the outcomes. The examination results were used as a measure of the performance variable in the learning outcomes. We applied the online self-regulated learning questionnaire for data on students’ self-regulation, the intrinsic motivation inventory for data on motivation and other self-developed instruments to measure the other constructs. Descriptive statistics showed that the identified learner characteristics manifest strength for blended learning design and the learners’ involvement with design features was found to be high and satisfactory. ANOVA results showed no significant differences between age groups in performance and t-test results showed no significant differences between male and female students. Regression analysis results showed learner attitudes as predictors of learner satisfaction and motivation while workload management is a significant predictor for learner satisfaction and knowledge construction. Among the design elements, regression results showed only learner interactions as significant predictors of knowledge construction and satisfaction. As a consequence, a number of learner characteristics and design features are seen to be important for blended learning design and the non-significant ones remain a focus for future research.

Keywords: Student characteristics, blended learning design, learning outcomes and learning management system

1 Introduction

The design of a blended learning environment in this study is an aspect of instructional design and has a lot to do with innovative pedagogy for improved teaching and learning using technology in Uganda. It is noted especially by Schellens (2004) that the design of a learning environment is very important for stimulating and supporting student learning. The design in this study involves a transition from traditional face-to-face teaching-learning to blended learning with technology. The focus of this study is mainly on how to design a motivating and supportive blended learning environment as an attempt to transit from traditional face-to-face, paper based course delivery methods to more advanced methods involving technology. We incorporate an instructional design component in this study in order to study this transitional undertaking. The transition is geared towards exploring various alternatives that can foster exploration in learning by applying the use of modern information communication technologies. This means a re-invention of teaching and learning in university relevant for the 21st Century (Laurillard 2002). We note that individual differences play a big part in student learning and so this study considers student characteristics and background in terms of their demographics and social aspects. It also highlights what learning in blended environment can lead to in terms of outcomes when technology is applied in education through an intervention.

2 Literature review

This literature review explores individual student characteristics that play a part in student learning particularly in a blended learning environment. It further shows how students make use of a designed blended learning environment to their satisfaction and to achieve learning outcomes. The variables under review have been

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singled out due to the study setting. The learner characteristics, out of the researcher’s experience at Mountains of the Moon University in Uganda, have been issues of concern in student learning. Levels of support by supervisors and peers at work and the degree to which their jobs allow an opportunity for learning can affect blended learning success. Emotional family support has been found to predict effects of online learning as noted by Chu and Ju (2010). Managing study activities in any learning environment is important and needs self-regulatory skills by both young and old. Issues of technology quality, on-line and face-to-face interactions as well as use of a learning management system with its tools and resources are design features that form the medium for student learning. These have been grounded in the literature to show how they are used by learners to achieve satisfaction, learning performance, motivation and knowledge construction as learning outcomes in the design of blended learning.

2.1 Students’ characteristics and background in a blended learning intervention

2.1.1 Self-regulation

Self regulation is a significant and critical aspect in learning (Barnard et al 2009). Students need to control the various resources available to them in learning such as learning time, the study environment as well as help available from peers and instructors (Pintrich 2000). The adoption of self regulated learning strategies (Boekaerts and Corno 2005) leads learners in learning environments to efficiently manage learning activities. The key to such learning outcomes as knowledge construction and intrinsic motivation lies so much in the ability of learners to regulate their own learning processes (Cleary and Zimmerman 2004).

2.1.2 Attitudes towards blended learning

There can be effective application of learning strategies where positive attitudes towards learning exist (Haddock and Maio 2009). Zhu, Au and Yates (2013) identified attitudes towards ICT usage, subject area, intrinsic and extrinsic motivation and on-line learning as factors that influence students’ attitudes towards online courses. Studies show that there has been satisfaction with blended learning thereby showing a positive attitude to such a learning environment (Yilmaz and Orhan 2010).

2.1.3 Family and social support

Parental support for learner success in blended learning is vital (Black 2009; Russel 2004) and emotional family support predicts effects of e-learning (Chu 2010). The existence of family support especially in regard to IT applications is known to decrease anxiety related to IT usage (Bimber 2000), and in our situation, involving technology in learning is a challenge for many learners, which calls for tangible family support (Chu 2010).

Social support as a theory discusses sources of positive or protective influences associated with individuals’ social relationship and network (Berkman et al 2000). Online collaborative learners need to have feelings of connectedness and belonging promoted because they are considered as critical factors in online learning (Hara, Bonk and Angeli 2000). Jacobson (1986) named informational, instructional and emotional supports as other types of social support necessary for success in learning environments. In the context of this study, some learners at the age of 24 are still supported by parents in university. We therefore examine the need for support emotionally, financially or otherwise for blended learning success in this intervention.

2.1.4 Management of Workload

YukselTurk (2010) found out that various responsibilities and occupations accounted for the low levels of interaction with peers. Holley and Oliver (2010) noted that assessment pressures at work and expectations for them to acquire independent study skills in a short time will always give a low chance of accessing academic time. Learner management of workload needs examination as a vital aspect for blended learning interventions.

2.1.5 Computer competences

Students’ knowledge and skill in computer applications can be a drive in the use of technology in learning while deficiency makes it difficult for them to learn (Lofstram and Nevgi 2007). Students’ comfort with IT tools makes them interface better with given tools used in blended learning (Kvavik and Caruso 2005).
2.1.6 Gender and age

Research shows that female learners do not comparatively do well in science and technology (Crombie and Abarbanel 2000) and in male dominated environments (Phan 2001). Boys’ heavy use of computers and their positive attitudes resulted into outperforming girls in ICT literacy (Volman and Eck 2001). In some cases there are no significant differences in the academic achievement grades of male and female students though in the pre- and final test of traditional and blended learning environments respectively showed female students’ performance was higher (Yasar and Demirkol 2014). Hoskins and Hooff (2005) noted age as a predictor of achievement and older students do better than younger ones in online learning. There were however no differences in performance between the old and young learners in online environments (Colorado and Eberle 2010).

2.2 Blended learning design features

2.2.1 Interactions in blended learning

Student-student interaction for learners helps them to meet online in order to get a feeling of community belonging (Sorden 2011). Garrison (2009) indicated that social presence occurs as learners identify and communicate with a community and develop relationships. Meaningful and academically rich interactions between students are helpful for learning as well as being enablers of learning (Tu and Corry 2003).

Student-faculty interaction ensures successful learner outcomes in blended learning (Smulsky2012) and frequent contact brings student motivation as well as involvement (Chickering and Gamson 1987). The value of student-faculty interaction is emphasized by Chen, Gonyea and Kuh (2008) in encouraging learner engagement, satisfaction and successful results of the learning process. The main responsibilities of staff in ensuring meaningful interactions with learners lie in clearly showing how learners will access the instructor and timely response to learners’ concerns, (Graham et al 2001).

The learning process is again significant when it involves learners being active, interactive as well as reflective in their learning (Payne 2007). The use of the discussion forum to exchange knowledge through participation in discussions can benefit learners by allowing them to dialogue with peers and self-reflection which leads to knowledge construction, (Chen and Looi 2007).

2.2.2 The use of the LMS and its tools

The perceived functionality of any learning management system in on-line learning affects learner attitude to the usage (Pituch & Lee 2006). Through Moodle, Amandu, Muliira & Fronda (2013) noted that learners are able to get course materials like notes, power point slides, videos, journal articles and hand-outs which aid learners in self-directed learning. Learners fondly make use of features such as accessing lecture notes and materials, uploading coursework as well as accessing grades while the use of the calendar, forums and personal messages were least used (Norris, Sporre & Svendsen 2013). The survey by Berg and Lu (2014) indicated that the student satisfaction with Moodle was mainly in the ease in searching for course information on the system as well as downloading and uploading assignments with ease and convenience on the system.

Tools like the discussion forum are known to promote interaction and discussion as well as increase student engagement fostering critical analysis, reflection and the social construction of knowledge between learners in addition to giving assistance in building learning communities, (Garrison 1993). The use of the forum enhances active learning and developing learner thinking capacity and motivates learners to learn more, (McKeachie et al 1986). The chat and news forum are good in sharing information and announcements as well as seeking clarity on what is not understood ((Amandu, Muliira & Fronda 2013).

2.2.3 Technology quality

Technology quality including internet quality has a significant effect on satisfaction in online learning (Piccoli, et al 2001). Once there is high quality and reliability in IT, there is assured high learning effects (Piccoli, et al 2001). Othman and Musa (2012) indicated that the internet browsing speed is most critical as well as campus internet access reliability.
2.2.4 Face-to-face support

Satisfaction with face-to-face was indicated by Reisetter (2007) and Akkoyunlu and Soylu (2008) showed that face-to-face sessions ensure interactions. The proportions of online versus face-to-face sessions vary considerably according to studies. Ranganathan et al. (2007) found out that the proportion varies from 75% online with 25% face-to-face to 13% online with 87% face-to-face and that this was largely dependent on the given institution. He finally proposed that consideration should be given to students, professors and institutions to determine the online and face-to-face proportions.

2.3 Learning outcomes in blended learning

2.3.1 Intrinsic motivation

Intrinsic motivation is considered as a learning outcome because it is used to measure the learners’ experiences with regard to the experimental tasks set in the blended learning intervention. Emotional feelings of anxiety, nervousness and tension among learners taking part in blended learning environments can negatively influence their intrinsic motivation. The state of learner anxiety for instance, can result from, among other factors, the utilization of a learning management system or the tasks to be attempted therein (Saadè and Otrakji 2007). Again, much as course grades are usually used as indicators of student achievement, affective factors are also as good as cognitive factors in indicating outcomes of learning (Kuo et al. 2013). Doing work with ease, fun, enjoyment and competence have been found to indicate learners’ intrinsic motivation (Kremenska 2009) and call for examination in this study to establish the success of a blended learning intervention.

2.3.2 Satisfaction

Naaj, Nachouki and Ankit (2012) noted that the satisfaction of learners under blended learning environments is the baseline requirement in order for a successful implementation plan. Debourgh (1999) found a high correlation between learner satisfaction and the course instructors’ performance especially in regard to availability and response time to students.

Reliable and accessible equipment in terms of technology is vital for learner satisfaction, (Bower & Kamata 2008). The frustration of learners with technology involved in blended learning often leads to low satisfaction in the learning process as noted by Chong (1998). Research further shows that the planning of the course content and its teaching in blended learning environments are known to lead to learner satisfaction (Debourgh 2003). Jones and Chen (2008) found out that the course instructor kept learners up-to-date and gave prompt feedback and that learners made extra effort to interact with the instructor as compared to a traditional classroom. In many studies learners have indicated satisfaction though some aspects do not measure to perfection in some other studies (Giannousi et al 2009; Jones and Chen 2008).

2.3.3 Knowledge construction

Research indicates that the process of learning from others as a way of knowledge construction in online learning produced results through learners exchanging ideas as well as sharing information (Rahman, et al 2011). High levels of knowledge construction were found in a doctoral program in which the instructor had well designed learning programs and assigned roles geared towards learner acquisition of their own knowledge, (Lai 2013). Helling and Petter (2010) reported a situation whereby learners were able to post opinions to questions that were initiated by instructors in task descriptions.

2.3.4 Learning performance

Comparisons of learner performance while doing traditional face-to-face instruction and blended learning have previously shown that blended learning instruction yields better performance (Hill, Chidambaram and Summers, 2013) although the contrary has also been found out in other studies (Brown and Liedholm 2002). Kwak, Menezes and Sherwood (2013) found no effect of blended learning on the performance of students in a statistics course. In the final analysis we note that some particular studies report performance in blended courses to be the same as in traditional face-to-face (Delialioglu and Yildirim, 2009), superior or better (Atan, Rahman and Idrus 2004) or even worse (Brown and Liedholm 2002).
Given the reviewed literature, successful designs of blended learning environments require a successful examination of learners’ characteristics and backgrounds and the technologies involved (El-Deghaidy & Nouby 2008). There is no particular existing theory that sufficiently explains the phenomena under consideration in this study. The research therefore borrows from Bean and Metzner’s (1985) framework of online drop-out considering factors prior to the course and those during the course. Prior to the course factors include learner characteristics of gender, age, employment status among others and during the course factors such as time conflict, family issues as well as technological aspects. In addition, Tinto 1987, 1993) also shows that student interactions are known to lead to learner persistence in online courses and many students get affected by the balance between class, work, family and community roles (Graham & Gisi 2000). Bean and Metzner (1985) further refer to learners above 24 being greatly influenced by their reference groups including peers, friends, family and employers. They also identify age, hours of employment, family responsibilities and outside encouragement as factors affecting learner persistence in online courses. Based on the above presented literature, we developed the conceptual model of the present study.

### 3 Research objectives and questions

The following objectives were formulated for the research:

- To examine the learner characteristics and background in a blended learning environment.
- To find out the levels of use and satisfaction with blended learning design features by learners.
- To identify the student characteristics/backgrounds and blended learning design features that significantly affect learning outcomes in blended learning.

This study was guided by three main research questions:

- What are the learner characteristics and background features in a blended learning environment.
- What is the level of use and satisfaction with the blended learning design features by learners in a designed blended learning environment?
- What are the student characteristics/background and blended learning design features significantly affecting learning outcomes in blended learning?

### 4 Research conceptual model of the present study

The literature indicates that student background and characteristics have to be taken into consideration in designing a blended learning environment. The design elements are crucial as they form the medium in which practical approaches to blended learning are realized. This study is therefore based on the following conceptual model where learners’ background and characteristics are examined in a blended learning design set up as they engage with technology to lead to learning outcomes in a transition from face-to-face to blended learning.

![Conceptual model of this study](Figure 1: Conceptual model of this study)
5 Method

5.1 Research design
This is a quantitative study in which we determine how student characteristics/background and design features of blended learning affect learning outcomes in a transition from face-to-face to a blended learning environment. The subjects of study have been measured once thus associations between the variables were investigated.

The study is based on a planning evaluation research design Guskey (2000) since the outcomes are aimed at evaluating the blended learning design. This is because of its strong link with practice and can develop more effective educational interventions (McKenney, Nieveen and Van den Akker 2006). We have employed an inductive research approach since the conceptual aspects have been derived from the literature to bring out generalizations in the design of blended learning. Tests have been carried out on the various concepts leading to the conclusions as illustrated in the results.

5.2 Participants
In the schools of Education (n=48) and Business and Management Studies (n=188), sophomore students were involved due to the fact that they have been introduced to ICT basics during their first year of study. Finalist students were used from The School of Informatics and Computing (n=18) since most of the year two courses had a lot of practical aspects. From the Postgraduate Directorate (n=16), first and second year students were selected because they were involved in blended learning approaches by paper-based modules. This brought the total number to 270 participants.

The study population comprised of 146 male students representing 54.1% and 124 females representing 45.9% with an average age of 24.6 years.

5.3 Instruments
Formative and summative evaluation results from the students were used to measure learning performance of different age groups and sexes in blended learning.

We applied the Online Self-regulated Learning Questionnaire (OSLQ) by Barnard et al (2009) for the students’ self-regulatory learning skills in the learner characteristics measure. This was to establish the self-regulatory skills of learners as they undertook blended learning during the experiment. Sub-scales of goal setting, environment structuring, task strategies, time management, help-seeking and self-evaluation were used. We used the sub-scales to gather data on a five point Likert scale ranging from 1=strongly disagree to 5=strongly agree. We used the Intrinsic Motivation Inventory (IMI) by Deci and Ryan (1982) which assesses the interest of participants or enjoyment (6 out of 7 items), the perceived competence of the blended learning intervention (all 6 items), effort (all 5 items), pressure/tension (all 5 items), value/usefulness (4 out of the 7 items). The other scales of this study were self-developed.

5.3.1 Reliability of the instruments
Cronbach’s alpha was used to test reliability and the table below gives the results. All the scales and sub-scales had good internal consistency reliabilities except the internet reliability sub-scale where one item was deleted to improve reliability to .75 from .45, the interaction sub-scale in the attitudes scale where the deletion of one item raised reliability to .64 from .41 and finally we deleted two items from the pressure/tension sub-scale in the intrinsic motivation scale to raise reliability to .69 from .36. The instruments were based on the outcome of the literature review that addressed elements which are an integral part of learning outcomes in blended learning.
Table 1: Reliability results for the scales and sub-scales

<table>
<thead>
<tr>
<th>Measure</th>
<th>Scale</th>
<th>sub-scale</th>
<th>Cronbach’s alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>BL design features</td>
<td>Online tools &amp; resources</td>
<td>Usability</td>
<td>.854</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Navigation</td>
<td>.824</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Content</td>
<td>.866</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Perceived usefulness</td>
<td>.829</td>
</tr>
<tr>
<td>Interactions</td>
<td>Student-student interactions</td>
<td>.799</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Student-content interactions</td>
<td>.760</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Student-teacher interactions</td>
<td>.803</td>
<td></td>
</tr>
<tr>
<td>Technology quality</td>
<td>Availability</td>
<td>.696</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Quality of materials</td>
<td>.754</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Internet reliability</td>
<td>.754</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Moodle effectiveness</td>
<td>.740</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Face-to-face support</td>
<td>.706</td>
<td></td>
</tr>
<tr>
<td>Student characteristics &amp;</td>
<td>Self-regulation (based on OSLQ)</td>
<td>Goal setting</td>
<td>.857</td>
</tr>
<tr>
<td>Background</td>
<td></td>
<td>Environment structuring</td>
<td>.774</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Task strategies</td>
<td>.724</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time management</td>
<td>.684</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Help seeking</td>
<td>.633</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Self evaluation</td>
<td>.784</td>
</tr>
<tr>
<td>Attitudes towards BL</td>
<td>Learner autonomy</td>
<td>.849</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Quality of instructional methods</td>
<td>.802</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Course structure</td>
<td>.717</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Course interface</td>
<td>.784</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Interaction</td>
<td>.639</td>
<td></td>
</tr>
<tr>
<td>Family support</td>
<td></td>
<td>.759</td>
<td></td>
</tr>
<tr>
<td>Social support</td>
<td></td>
<td>.736</td>
<td></td>
</tr>
<tr>
<td>Management of workload</td>
<td></td>
<td>.686</td>
<td></td>
</tr>
<tr>
<td>Learning outcomes</td>
<td>Motivation (Based on IMI)</td>
<td>Interest &amp; enjoyment in tasks</td>
<td>.672</td>
</tr>
<tr>
<td></td>
<td>Perceived competence</td>
<td>.674</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Effort/importance</td>
<td>.738</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pressure/tension</td>
<td>.685</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Value/usefulness</td>
<td>.820</td>
<td></td>
</tr>
<tr>
<td>Satisfaction</td>
<td>Instructor</td>
<td>.838</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Course content</td>
<td>.766</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Technology used</td>
<td>.789</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Interactions</td>
<td>.819</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Face-to-face sessions</td>
<td>.829</td>
<td></td>
</tr>
<tr>
<td>Knowledge construction</td>
<td>Initiation</td>
<td>.719</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Discovery</td>
<td>.860</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Accomplishment</td>
<td>.770</td>
<td></td>
</tr>
</tbody>
</table>
5.4 Data analysis

Descriptive statistics were applied with cross-tabulations to establish the frequencies of the variables under measurement and demographic characteristics of the study population.

Regression analysis was done between the student variables and design elements with learner outcomes to determine the significant factors for learner outcomes in blended learning.

Independent t-test was applied to find out the differences between male and female students in grades obtained in blended learning. One-way ANOVA between subjects was conducted to establish if there were differences in performance between age groups of students. Normality tests were performed on the students’ grade data to qualify them for parametric tests and the normality results are presented in table 2 below.

Table 2: Normality test results for the students’ grade data

<table>
<thead>
<tr>
<th>Grades</th>
<th>Mean</th>
<th>Trimmed mean</th>
<th>Skewness</th>
<th>Kurtosis</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>76.2</td>
<td>77.1</td>
<td>-0.82</td>
<td>1</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Shapiro Wilk results qualified the use of parametric tests because there were no violations of the parametric assumptions found. The fact that significant values were found to be less than 0.05 could not necessarily disqualify the use of parametric tests (Pallant 2010). We therefore had to consider the results for skewness and Kurtosis that were found to be between -1.0 and +1.0 thereby indicating that the distribution was sufficiently normal to use parametric tests (Gray 2014). The selected methods have been applied elsewhere in other studies but for our case, they are applied with a new approach considering the design of blended learning in a different setting.

6 Results

6.1 Students’ background and characteristics (RQ1)

6.1.1 ICT competence

As an important requirement for effectively engaging in blended learning, students’ ICT competence, confidence and extent of usage were analyzed before the commencement of the study. Results show that they are competent enough in word processing (67%) and were confident (64%). They are however below average in e-mail packages (41.3%), spreadsheets (39%), web browsing (33%) and html tools (20%). In general, learners work with computers at an advanced level (80%), (Kintu & Zhu, 2015).

6.1.2 Self-regulation

Self-regulation practices were analyzed and results show that students exhibited good levels of self-regulation in blended learning with mean ranges of between 3.3 and 4 and standard deviation between 1.1 and .89 for the sub-scales of goal setting, environment structuring, task strategies, time management, help-seeking and self-evaluation.

6.1.3 Attitudes towards blended learning

The attitude of the learners towards blended learning was analyzed and results show that learners generally have positive attitudes towards aspects of blended learning. Mean and standard deviation ranges for the sub-scales of learner autonomy, quality of instructional materials, course structure, course interface and interactions range between 3.2 to 4 and .86 to 1 respectively.

6.1.4 Family support

The results for this show that learners get support from their respective families with mean values for the scale ranging from 3.2 to 3.8 and standard deviations between 1.0 and 1.3. However, there is little support in cases where learners face problems with computers and internet (M=2.8; SD=1.3). 5.1.5 Social support
Results show that there is support from the society towards learners in blended learning who do not feel isolation but community belonging as they learn. Only their reliance on peers showed a mean of 3.1 with standard deviation of 1.0.

6.1.5 Management of Workload

Learners who at the same time work have an enabling environment for a successful involvement in blended learning. Mean differences ranged from 3.6 to 4 with standard deviations between 1.1 and .83. The students’ attention to their study was analyzed against the attention to other activities and results show that 26% of the learners spend less than three hours doing other activities that are not related to study, 24.3% spend three hours, 22.4% spend six hours, 14% spend eight hours while another 14% spend more than eight hours on other activities. The hours spent on other activities other than study interfere a lot with their concentration on learning (M=3.2; SD=1.1). They however take their own decisions on when to concentrate on other activities and when to study (M=3.7; SD=1.0). However, learners are always punctual in meeting deadlines in blended learning (M=3.9; SD=.86).

6.2 Involvement of learners and satisfaction with technology and blended learning design features in blended learning (RQ2).

6.2.1 The use of the LMS tools and features

An analysis of their usability, navigation, posted course content, and perceived usefulness was conducted. Results show that, to a large extent, learners made use of the tools and resources and perceived them as useful. The means of the items ranged from 3.0 to 4.2 with standard deviations between 1.8 and .80. There was however a low mean of 2.9 regarding posting challenges for peers’ ideas online as part of online interactions. The use of Moodle was analyzed to determine the levels of use and learner satisfaction with it.

Table 3: Percentage of moodle feature use by learners (N=270)

<table>
<thead>
<tr>
<th>Moodle feature/function</th>
<th>percentage use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Messaging</td>
<td>82</td>
</tr>
<tr>
<td>Search for materials</td>
<td>84</td>
</tr>
<tr>
<td>Calendar</td>
<td>53</td>
</tr>
<tr>
<td>Discussion forum</td>
<td>56</td>
</tr>
<tr>
<td>Posting to instructor</td>
<td>68</td>
</tr>
<tr>
<td>Downloading files</td>
<td>70</td>
</tr>
<tr>
<td>Uploading items</td>
<td>46</td>
</tr>
<tr>
<td>News</td>
<td>57</td>
</tr>
<tr>
<td>Login</td>
<td>88</td>
</tr>
</tbody>
</table>

Measure: Yes; No

The level of use as seen from table 3 above shows excellent utilization of messaging, searching for materials and logging into the system. Learners did well with the use of the calendar, forum discussion, posting work to the instructor, downloading files and the news forum. They were however below average with uploading items on the system. Their overall rating of Moodle usage to satisfy their learning requirements was satisfactory (M=3.5; SD=0.9) and they considered it effective in their learning (M=3.7; SD=0.9).

Table 4: Use of Moodle

<table>
<thead>
<tr>
<th>Moodle aspect</th>
<th>With difficulty</th>
<th>Without difficulty</th>
<th>N=272</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logging in</td>
<td>37%</td>
<td>63%</td>
<td>266</td>
</tr>
<tr>
<td>Opening Moodle features</td>
<td>30%</td>
<td>70%</td>
<td>266</td>
</tr>
<tr>
<td>Internet connectivity &amp; strength</td>
<td>55%</td>
<td>45%</td>
<td>266</td>
</tr>
<tr>
<td>Proper functioning</td>
<td>28%</td>
<td>72%</td>
<td>266</td>
</tr>
</tbody>
</table>
Measure: Yes; No

From table 4, majority of the learners did not find logging into the system, opening its features as difficult and Moodle functioning was good. The difficulty was however found by many learners in the internet connectivity and strength though it is not threatening as 45% of the learners did not find difficulties with it.

6.2.2 Face-to-face support

The use of face-to-face sessions by the learners in blended learning is good and they were generally satisfied with mean ranges between 4.3 and 4.0 and standard deviations between 0.7 and 0.9. Learners therefore prefer that face-to-face sessions continue in blended learning since they were satisfied with them.

Table 5: Student preferences for face-to-face session periods

<table>
<thead>
<tr>
<th>F2f session period</th>
<th>Percentage</th>
<th>N=270</th>
</tr>
</thead>
<tbody>
<tr>
<td>At the beginning of the semester</td>
<td>33</td>
<td>252</td>
</tr>
<tr>
<td>In the middle of the semester</td>
<td>12</td>
<td>252</td>
</tr>
<tr>
<td>At beginning, middle &amp; end of the semester</td>
<td>46</td>
<td>252</td>
</tr>
<tr>
<td>At the beginning &amp; end of the semester</td>
<td>10</td>
<td>252</td>
</tr>
</tbody>
</table>

Measure: 1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly agree

Findings show that face-to-face sessions should take place at the beginning, in the middle and at the end of the semester.

6.2.3 Technology quality

The technology used during the blended learning intervention study was analyzed in regard to its availability, quality and reliability. Results show that learners were satisfied with the technology set up for the intervention study. Mean results in the items ranged from 3.1 to 4 with standard deviation ranging from 0.9 to 1.1.

6.2.4 Interactions

An analysis of learner interactions with peers, instructor and content showed that meaningful interactions occurred. Mean ranges were from 2.9 to 4.1 and standard deviation ranging from 0.9 to 1. Low means were a result of the lesser number of students posting challenges for peer’s ideas on-line.

6.3 Factors predicting learning outcomes in a blended learning design (RQ3)

Performance

Students’ performance by age and gender

An independent samples t-test was conducted to compare the performance grades by male and female students. Results indicated that there is no significant difference in the performance of male students (M=65.1, SD=11.6) and female students (M=65.5, SD=10.5); t(231)=-.286, p=.775 (2-tailed). This shows that male and female students performed equally well in a blended learning environment design. A one-way between subjects ANOVA was also conducted to establish if there were differences between age categories of students in regard to their respective grades. Results indicate that there were no significant differences in performance between the three age groups i.e. young, middle aged and old at the p>.05 level for the three age groups F(2,226)=1.372, p=.256. This means that different age groups can perform equally well in blended learning.

Factors predicting blended learning outcomes

Regression analysis showing the significant factors predicting outcomes in blended learning was carried out. Regression results reflecting the significant factors of student characteristics and design elements towards learner outcomes are reported in table 6. Learner attitudes towards blended learning were found to be significant factors in learner satisfaction (β=.11, t=1.22, p=.05) and motivation (β=.26, t=.26, p<.05) though not significant in knowledge construction and performance. This is followed by management of workload (β=.14, t=2.03, p<.05). The students’ background in terms of their management of workload is a significant factor for knowledge construction (β=.13, t=2.01, p<.05). Among the blended learning design elements, learner interactions were found to be significant factors to learner satisfaction (β=.23, t=2.42, p<.05) and to knowledge.
construction ($\theta=.21$, $t=2.12$, $p<.05$). As noted here, apart from learner attitudes being significant factors for satisfaction ($p<.05$), motivation ($p<.05$) and management of workload being a significant factor for learner satisfaction ($p<.05$), knowledge construction ($p<.05$), all the other learner characteristics and background are not significant factors for the respective learning outcomes. Furthermore, apart from interactions (in the design elements) being a significant factor for learner satisfaction ($p<0.5$), all the other features are not significant factors for the respective learner outcomes ($p>.05$ for all the scales).

Table 6: Significant factors in learning outcomes in a blended learning environment

<table>
<thead>
<tr>
<th></th>
<th>satisfaction</th>
<th>motivation</th>
<th>knowledge construction</th>
<th>Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\theta$</td>
<td>$t$</td>
<td>$p$</td>
<td>$\theta$</td>
</tr>
<tr>
<td>Student characteristics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attitudes to bl</td>
<td>.19</td>
<td>1.93</td>
<td>.055*</td>
<td>.26</td>
</tr>
<tr>
<td>Management of workload</td>
<td>.14</td>
<td>2.03</td>
<td>.044*</td>
<td>.13</td>
</tr>
<tr>
<td>Design features</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interactions</td>
<td>.23</td>
<td>2.42</td>
<td>.016*</td>
<td>.21</td>
</tr>
</tbody>
</table>

*p<.05, NB: Only significant factors

7 Discussion

7.1 The students’ background and characteristics in a blended learning environment

In this study we have taken the learning outcomes as dependent variables to study the learner characteristics/background and design features that are significant for blended learning design, taking students from three out of five schools and one directorate as sample groups. The study suggests that to a great extent, student characteristics and background such as their attitudes towards blended learning and their management of their workload at work places are crucial for satisfaction and motivation as well as learner knowledge construction in blended learning. The good level of technology use is a big factor since it affirms ease of use in technological applications. Results on gender and age differences support previous findings that no differences exist in learning performance between ages and sexes in blended learning (Coldwel et al), though different from the findings by Reinen and Plomp (1993,1996 and 1997), Hoskins and Hoof (2005) and in line with this, Price (2006) found that female learners in online environments are always engaged and could out-perform their male colleagues. Learner background in terms of being supported by families and society members is important for blended learning design. It assures emotional enrichment and reduces anxiety in ICT usage (Bimber 2000). Working learners have all it takes for peer interactions as their workload at places of work does not inhibit participation in blended learning. The interference posed by other activities on study time could slow down learning progress as shown in the results but thanks to the fact that learners take their own decisions to do study or concentrate on other activities. This self-regulatory aspect makes blended learning feasible.

7.2 Involvement of learners and satisfaction with technology and blended learning design features in a blended learning environment.

Regarding our second research question, students’ engagement in the use and application of the various resources in blended learning shows that there was good use of the features and learners were satisfied with them. Students satisfactorily used the learning management system (Moodle) to log in, post on the forum and submit their work through the system. As noted by Thomas (2002), the interactive practices by learners brought about good student engagement and led to critical analysis and knowledge construction by the learners. Some few interruptions in the internet connectivity were noted though this did not have an effect on the learners’ completion of their on-line activities during the connection. This somehow agrees with Othman and Musa (2012) regarding internet access and speed as key to learner satisfaction in blended learning. The face-to-face support in blended learning is seen to be satisfactory and in line with Ranganathan et al’s (2007) proposal, learners in this study were able to determine online and face-to-face proportions for the latter to be at the beginning, in the middle and at the end of a semester (supported by 46%) different from the format
used in this study which was face-to-face at first and at the end for review and final examinations supported by only ten percent of the respondents.

7.3 Learning outcomes and associated factors

There are very few factors associated with blended learning outcomes among the independent variables according to this study. Learner attitudes, management of workload and learner interactions were the only significant factors for learner satisfaction while management of workload and interactions are significant factors for knowledge construction in blended learning. The learners’ positive attitudes are also a significant factor in their intrinsic motivation according to this study. None of the three variables (attitudes, management of workload and interactions) contributed to learning performance in terms of final grades in blended learning. This resulted from students spending more hours at work places which interfere with their concentration on learning and a lesser number of learners posting challenges to peers’ ideas online, exchanging knowledge through Moodle and 44 percent of the learners not using the discussion forum. The variables including self-regulation, family and social support, technology quality, online tools and resources as well as face-to-face support are not significant factors for learning performance. We note that some of the items under self-regulation and learner attitudes scored means below 3.5 which reduced these variables in regard to becoming a significant factor in some of the learning outcomes. Tangible support from family towards learners in blended environments has been found to be crucial (Jacobson 1996). The failure of this variable as a significant factor in learning outcomes is thus attributed to low mean scores on learners getting assistance from family to get over internet problems according to this study. Research has shown that the quality of technology and internet do affect learner satisfaction (Piccoli et al., 2001). Generally, if there is high quality and reliability in IT, there is meant to be some high learning effects in blended learning (Hiltz 1993). In this study, internet reliability means of 3.1 and the fact that about 37 percent of the students found difficulty in logging in Moodle and 55 percent reported difficulties with internet connectivity and strength may have accounted for technology quality and online tools not being factors in learning outcomes of satisfaction, intrinsic motivation, knowledge construction and performance.

Despite the failure of some variables to show as significant factors to blended learning outcomes, learners showed a high affinity to engage in blended learning; which accounts for learner attitudes being contributors to learner satisfaction and intrinsic motivation. In the same vein, knowledge construction is highly exhibited and significant factors in this include learner interactions and management of workload. Interactions have been found to be predictors of learner satisfaction as this study has confirmed (Kuo et al. 2013) and Wu, Tennyson and Hsia (2010) also named interactions among the primary determinants of student learning with blended e-learning systems.

8 Conclusion and recommendations

The reviewed literature indicates that the learner characteristics and backgrounds are strong factors worth considering in the design of blended learning environments and so are the design elements of blended learning. The findings here confirm the importance of these elements and further indicate the significant factors that are predictors of learning outcomes in blended learning among the elements. It is further noted that gender and age are factors that pose no setback on learner performance in blended learning.

This study recommends that blended learning design should take into consideration the various learner characteristics and examine the ability of learners to make use of and interact with learning management systems for successful blended learning undertakings. More designs can be done to establish other learner characteristics for blended learning and find out other factors that predict learning outcomes for successful designs. Such factors could be instructional methods, learning styles institutional readiness and student capabilities.

9 Limitations and implications for blended learning design

This study has not dealt with all the learner characteristics in a blended learning design environment and neither have all the design features been examined. The choice of specific age categories was not made by a systematic sampling procedure but was got from the filled demographics section of the questionnaire. Therefore, the category of elder learners did not have a sufficient representation. Follow up focus group interviews were not possible due to logistical, procedural and administrative setbacks. Such interviews would have given useful qualitative information regarding learner experiences with a blended learning intervention and would therefore have added to our answers to research question three. Learner outcomes could have
been influenced by quite a number of other factors not tackled in this study. It was also not possible to convincingly explain why many of our independent variables did not significantly contribute to the learning outcomes. Future studies could tackle other social and possibly economic variables that could be additional factors in the design of blended learning environments.

The study nonetheless provides a clear cut procedure for designing instructional technology. On the whole, insights gained from this study can be useful in regard to studying learner characteristics and background in the design of instructional technology for rural settings. Technology in its infancy should be taken on for teaching and learning but a lot of care needs to be given to empowering the users with skills to enable the ease of use.

References


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The Effectiveness of Instructor Personalized and Formative Feedback Provided by Instructor in an Online Setting: Some Unresolved Issues

Dolors Plana-Erta,1 Soledad Moya2 and Pep Simo3

1Open University of Catalunya, Spain 2 ESADE Business and Law School, Spain, 3Universitat Politecnica de Catalunya, Spain
dplana@uoc.edu

Abstract: Formative feedback has great potential for teaching and learning in online undergraduate programmes. There is a large number of courses where the main source of feedback is provided by the instructor. This is particularly seen in subjects where assessments are designed based on specific activities which are the same for all students, and where the assessment is performed by the instructor, not by a peer. Additionally, in introductory or basically procedural courses, there is often a need for instructor feedback, as opposed to peer-feedback, as it demands high quality feedback both in the content and in the process in order not to mislead students. Therefore personalized feedback provided by instructor is an academic demand in the current educational models that have positioned the student at the center of the learning process. However in the present context of high student-staff ratio, it is not easy to extend the use of individual comments delivered by instructors among the academic community. This article focuses on the virtual higher education environment given its present and future potential as well as the amount of queries currently surrounding it. Literature on formative feedback in higher education has been reviewed for the period 2000 to 2014, in order to find answers as to which aspects are relevant to efficiently implement personalized feedback prepared by the teacher. Findings show that effective personalized feedback in an virtual environment requires a three-dimensional analysis: from the student perspective, from the instructor one and from the media perspective (written text, video recording or audio recording), in order to find shared aspects that contribute to the enhancement in the use of personalized feedback performed by faculty.

Keywords: formative feedback, effective feedback, online feedback, student-professor dialogue

1 Introduction

Placing the focus of attention on the student’s learning process and not on the teaching process entails profound transformations in higher education. In order to successfully implement this new approach we need to reformulate the planning, the employed methodology as well as the way we evaluate teaching and learning processes (de Zarraga, Jaca, & Viles, 2012). What’s more, changes need to be made to the student’s and teacher’s role. Students need to adopt an active attitude and professors need to guide, orient and counsel the activities carried out by their students. The faculty has to lead this process but inertia and lack of familiarity are elements that may slow down progress towards this new model.

The feedback that students receive within their coursework is one of the most powerful influences on their learning process (Hattie & Timperley, 2007) and it’s central to the development of effective learning (Sadler, 2010). Although Orsmond, Maw, Park, Gomez, & Crook (2013) identify the characteristics of current approach to feedback, it’s not easy to give effective feedback. It’s necessary that students read the feedback provided and apply it. Therefore, the feedback must not only be drawn up and given in time for it to be useful but that it must also promote the student’s self-regulation capacities (Nicol & Macfarlane-Dick, 2006) in order to ensure the student is engaged in learning and accomplishes the desired goal in higher education. Moreover students prefer personalized than general feedback (Cramp, 2011).

Faculty feedback or instructor feedback, a term coined by Wolsey (2008), has not awoken the same interest from researchers as has peer feedback. Some of the reasons for this may be the practicality of feedback among peers and the possibility of employing it to simulate what takes place in professional settings (van der Pol, van den Berg, Admiraal, & Simons, 2008). Having said this, it is not always possible to guarantee that the student has sufficient knowledge in order to take on the role demanded by this strategy.
In the light of the current exponential growth in online courses which is expected to continue (Allen, Seaman, & Garret, 2007). Feedback is a need and we therefore have to take an in depth look at the phenomenon of instructor feedback as a feasible strategy that will cover a broader range of subjects and types of continuous assessment activities. Adopting the instructor feedback strategy in the current context of high student-staff ratio constitutes a significant challenge which requires identifying those elements of instructors, students and ways of communication that further the optimum use of personalized feedback in online settings.

This theoretical article conducts a review of the literature on formative feedback in order to efficiently implement the personalized feedback in an online setting

2 Methodology

A great number of articles have been published about formative feedback in an educational context, which makes it very difficult to perform an exhaustive review of what has been written regarding this topic.

The first search on formative feedback literature started with the most cited article (Nicol & Macfarlane-Dick, 2006) provided by the online databases ISI Web of Knowledge (ISI) and SCOPUS for the period 2000-2014. Based on the terms “feedback”, “formative feedback” and “feedforward” we looked for the article that had been most cited for the mentioned period and in both databases, and that one was the study by Nicol & Macfarlane-Dick (2006).

The reference list in the articles selected was then used to find new articles, continuing iteratively throughout the review process, a method sometimes referred to as snowballing (Jonsson, 2013). Furthermore, to make our revision more comprehensive, all articles citing Nicol and Macfarlane-Dick’s work were also considered. Both theoretical and empirical research studies on formative feedback in higher education were included, and the search has been limited to include only printed and peer-reviewed material, such as articles in journals, edited books, research reports and doctoral dissertations.

The review is also limited to studies that have investigated formative feedback provided only by instructor feedback, not by peers, the students themselves, or computers. The main reason is that feedback from an instructor is a major source of feedback for the students (in some institutions the only source).

3 Effective feedback

3.1 Evolution of the effective feedback concept: from one-directional to two-directional

The feedback provided to students is one of the crucial elements of a learning-oriented evaluation system (Hounsell, 2003).

But what feedback is effective? One part of the scientific community refers to feedback as a relatively imprecise concept that may lead to confusion due to the different interpretations that professors and students may have concerning its objective. What’s more, it is not easy to work out what type of feedback works. There are problems as regards the way teachers and students perceive the feedback facilitated concerning an activity. Carless (2006) found that professors believe that the feedback they provide is more detailed than what their students perceive they have received, and professors consider that the information they have facilitated is more useful than their students perceive it to be. What’s more, its implementation comes up against obstacles on the part of faculty because they are pressed for time and because of the widespread belief that students are only interested in their marks despite all the evidence to the contrary (Orsmond, Merry, & Reiling, 2005; Carless, 2006). On the other hand students find it hard to apply the feedback because they don’t understand it (Crook et al., 2012), they don’t know exactly where they need to improve or they have received the comments too late for them to be useful to them.

We find ourselves at a time of transition, when the original concept of feedback is being revised. The original view of feedback that still persists among faculty and university institutions was one-directional. In the new framework, feedback is viewed as two-directional. The student has now become the center of the learning process and education needs to promote beneficial and fruitful learning throughout one’s lifetime. This transformation demands that students and faculty integrate feedback as yet one more element in the learning
process and not as a simple supplement (Hounsell, McCune, Hounsell, & Litjens, 2008). Table 1 outlines the characteristics of the current approach to feedback.

**Table 1**: The New approach to feedback compared to the initial model. Adapted from Orsmond, Maw, Park, Gomez, & Crook (2013)

<table>
<thead>
<tr>
<th>Current feedback model</th>
<th>Initial feedback model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dialogue. It encourages dialogue between the provider of the feedback and the receiver</td>
<td>Monologue. The feedback facilitated by the professor is often one-directional</td>
</tr>
<tr>
<td>It involves class colleagues (peer)</td>
<td>It does not involve class colleagues (peer)</td>
</tr>
<tr>
<td>It explicitly promotes self-regulation and demands engagement on the part of the student</td>
<td>It does not explicitly promote self-regulation</td>
</tr>
<tr>
<td>Feedback on the process</td>
<td>Feedback on the product</td>
</tr>
<tr>
<td>It promotes a proactive attitude on the part of the student towards the feedback</td>
<td>It promotes a reactive attitude on the part of the student towards the feedback</td>
</tr>
</tbody>
</table>

Feedback needs to constitute a dialogue between the person who facilitates it and the one who receives it. It must explicitly promote self-regulation and a proactive attitude on the part of the student towards it; at the same time, it needs to focus on the learning process and involve class colleagues.

Sadler (1989) brought about a change in the way feedback was originally conceived. In his theoretical analysis feedback was considered effective if it met three conditions, the third of which entailed the student’s engagement with the feedback, assigning them an active role in the learning process. Despite the leap that this approach involves with regard to the previous approach, its impact on learning has been limited because in general the facilitated feedback does not go beyond improving the activity carried out by the student and, as such, continues to be a transmissive feedback model where the professor provides the student with information on the divergence between the task the student has performed, and the set standard. Conceiving feedback as a tool for improvement in the short term is not viable because it doesn’t place emphasis on facilitating learning strategies and tools to the student which, once they have left college and the professor’s support has been removed, will prove useful to them to continue learning.

If what we want is to further learning capacities of students to learn “how to learn” the feedback must constitute a control mechanism designed by faculty, which stipulates the path students must take towards a process used by the students to facilitate their own learning (Boud & Molloy, 2013). This approach to feedback requires that students take on an active role, not only acting as simple receivers of information and that professor become learning facilitators.

With this approach, Hattie & Timperley (2007) put forward a feedback model that differentiates between four levels of feedback: the activity, the processes, self-regulation and the students themselves (self). In order to be effective, feedback must be focused on the task and on the learning and evaluation processes, whilst at the same time facilitating the students’ self-regulation processes. The formative feedback model developed by Nicol & Macfarlane-Dick (2006) is along these lines and bases learning self-regulation on seven feedback best-practices principles. Its aim is to further the student’s capacity to autonomously regulate learning processes through formative assessment and feedback.

Furthermore, the assessment system needs to be structured around a series of learning activities which enable students to master the contents and to form an adequate representation of the objectives and evaluation criteria whilst at the same time familiarizing themselves with the regulation and control tasks. Some authors highlight dialogue between students and professors, or among students, as an essential element in the learning self-regulation process (Handley, Price, & Millar, 2008; Nicol, 2009, 2010; Carless, Salter, Yang, & Lam, 2011). Quality education must be interactive and discursive, and feedback forms part of this process. With this vision, Carless et al. (2011) reformulate the concept of feedback by adding dialogue to self-regulation and put forward the term sustainable feedback in order to design it. It is evident that if the students are not engaged by the feedback facilitated by faculty it will be difficult for them to incorporate improvements into their learning process.

Higher education professors should focus their efforts on developing their students’ capacity for self-regulation, and feedback should be at the service of this purpose (Nicol, 2009). The important role and
responsibility this assigns to students in the learning process makes one reconsider whether students and faculty have the information, the knowledge and the necessary skills in order to fully and effectively participate in this process. It is important to train professors and students on how to give and receive feedback (Carless, 2007; Nicol & Macfarlane-Dick, 2006) and to make widespread the concept that feedback is a means for increasing the student’s capacity for making adjustments and acting on them (Boud & Molloy, 2013).

3.2 The characteristics and media for effective feedback

Despite the available research on successful strategies for designing and implementing feedback we need to be cautious. It is difficult to generalize when it comes to setting down a feedback strategy due to the several factors involved in the cause and effect relationships.

In Evans' (2013) review of feedback, he points out that there is no consensus as to the characteristics that good feedback should have. There are contradictory opinions concerning the ideal volume of feedback (Lipnevich & Smith, 2009); concerning the effectiveness of presenting drafts of the activity before the definitive feedback (Fisher, Cavanagh, & Bowles, 2011); concerning the right moment for giving feedback (immediate or after a period of time) (Fluckiger, Vigil, Tixier, Pasco, & Danielson, 2010). Having said this, there seems to be a certain amount of agreement concerning students’ preferences whereby they prefer individual feedback to group feedback, despite existing studies that point to the benefits of group discussions. What’s more, there are few guidelines for applying the principles of feedback effectively in different fields. Perhaps, as Thurlings, Vermeulen, Bastiaens, & Stijnen (2013) point out, if we focus research efforts on effective feedback patterns within different learning theories this would enable us to make headway in our understanding of effective feedback. According to the authors mentioned above, each learning theory has a particular feedback process and researchers should be aware of the differences between each one of these and weigh up the appropriateness of a feedback strategy in the light of the learning theory it is based on.

Nevertheless, we do find some indicators in the literature on pedagogical best practices. Gibbs & Simpson (2004) present a series of characteristics that faculty must take into account in order to make feedback useful for students. According to them, feedback needs to be regular, quite specific, centered on contents and not on the student’s personal characteristics and facilitated on time in order to be applied in further learning, a balance needs to be found between expediency and quality. Before the process takes place, there is no way to ensure that the students will read or take note of the feedback despite the fact that the professor has followed the indications in the literature.

On the other hand, the spread of information and communication technologies (ICT) has enabled universities to set up online learning platforms and make use of several communication technology tools (e.g. written text, audio recording or video recording) thus enabling them to reach a greater number of students within a shorter period of time. This phenomenon has been the subject of several studies on the virtues of different media for communicating feedback to students. According to Merry & Orsmond (2008) audio provides more complex and detailed feedback than text, whilst at the same time highlighting the main points of the discourse to students through tone and intonation.

Other authors consider that video recording has great communication potential via the image. It has been seen to generally go down well with students and could provide a more enriching format than audio (Cann, 2007). One other advantage that it has in common with audio is that students can view the recording as many times as they like. Crook et al. (2012) made use of video to facilitate general feedback before sending the activities and general feed-forward once these had been carried out. The results show that videos enabled staff to facilitate feedback expeditiously and in time for students to use it for the next activity. What’s more, it also made staff reflect upon and make positive changes to the way they phrase their comments to students. Using video also improved the students’ engagement to the feedback. The main advantage that students mentioned was the clarity of information compared with other media. They also mentioned certain drawbacks concerning technological aspects and the fact that they did not receive personalized feedback.

Hence, both the characteristics of the feedback and the media we are going to use to facilitate it need to be adapted to the technological and educational context where the teaching activity is being carried out, always taking into account one fundamental premise: that the students are able to improve their learning process and
in order to do this they need to become efficacious regulators of their learning, and feedback, conceived as a process of dialogue, is the mechanism for achieving this.

### 3.3 Effective feedback in an online environment

Online teaching is becoming increasingly widespread in higher education. Gikandi, Morrow, & Davis (2011) define online instructor assessment as the application of formative evaluation in a virtual learning environment where students and staff do not coincide in time and/or space, and where a substantial part of learning activities are carried out via web-based information and communication technologies (ICT).

Online teaching and learning does not differ from that provided in other regulated education contexts. As such, it appraises students’ needs, it provides and administers contents, it prepares learning activities and it evaluates the student’s learning (Anderson, 2008). Having said this, the specific peculiarities of the learning environment call for a rethinking of the role traditionally assigned to the teacher with a view to creating efficacious and significant learning experiences (Coppola, Hilitz, & Rotter, 2002). In recent years both international organizations as well as the scientific community (e.g. Coppola, Hilitz, & Rotter, 2002; Guasch, Alvarez, & Espasa, 2010), have shown a certain interest in organizing and rigorously categorizing the roles and competencies of online instructors in order to precisely define their profile (Muñoz Carril, Gonzalez Sanmamed, & Henández Sellés, 2013). There is a certain amount of consensus in the literature concerning the role that online instructors should have and Guasch et al. (2010) have grouped it into three categories: 1) planning and design role, 2) social role and 3) instructional role (educational), as well as two overlapping areas: technology and administration. In contrast there is a lack of consensus when it comes to prioritizing the functions and assigning a list of competencies to each of the online professor roles (Alvarez, Guasch, & Espasa, 2009). The cited authors believe that the essential competencies for teaching in an online setting only make sense within a specific technological and educational setting (situated learning) and consequently, any attempt to define them or outline them must take into account this particular circumstance.

Developing effective learning in an online environment where interaction and communication are asynchronous is not at all straightforward. In this media it is crucial to develop and analyze tools that enable a greater amount of dialogue among the participants in the learning process. In this respect Tallent-Runnels et al. (2006) points out the wide range of existing formats for online interactions, many of which have been used to supplement f2f courses. Beyond its origins, we need to find out which format (written text, audio recording, video recording, ...) facilitates more communication and a more effective learning experience, for different types of students whilst also taking into account the specific pedagogical characteristics of staff members. The greater the amount and quality of interaction the more chances we have of increasing the efficacy of instructor feedback by reinforcing dialogue, one of the key features of the current feedback model displayed in Table 1. Feedback in an online setting needs to go beyond the concrete characteristics of the feedback and stimulate dialogue between the student and the professor and/or among students even further (Wolsey, 2008).

Feedback used effectively should enable each student individually to narrow the gap between the accomplished objectives and those desired or set by the professor (Stephenson & Sangrà, 2003). Online course design is crucial to achieving this benefit and requires detailed planning in order to provide opportunities for effective formative assessment (Wolsey, 2008). Learning in an online environment can constitute a positive springboard to the new role that professors need to take on in an education model where the student is at the center of the learning process.

### 4 Discussion

From a review of the literature we can safely state that providing effective feedback to students which they can then use is key to supporting and improving their experience in higher education.

An important number of researchers such as Hattie & Gan (2011), consider that research on feedback needs to focus mainly on the person receiving it and less on the person facilitating it. In other words, it should focus more on finding out what students need, how they understand it and process it and not so much on how professors can increase the amount and quality of the feedback they facilitate. We all agree that this is an essential perspective despite the fact that it has been one of the most widely studied aspects to date. Although, as Nicol (2009) points out, professors need to take on responsibility for developing self-regulation in
their students via feedback, we also need to address the issue from the perspective of faculty, otherwise we would only be focusing on one of the parts of the education process and consequently limiting the opportunities for feedback in the learning process.

We cannot overlook the current large numbers of students per classroom in higher education institutions, and this means that research must also take into account how we can optimize feedback with available teacher resources. This issue takes on more relevance if we take into account the fact that students prefer personalized feedback to general feedback provided to the whole class (e.g. Laryea, 2013). This demand on the part of students may be beneficial to their learning but it is not very realistic (Laryea, 2013), because of the heavy work load it entails for faculty. One solution for personalized feedback could be to explore the strategy of peer feedback. But it is not clear to what extent it cuts down the time employed by staff members. Furthermore, it is more suited to certain activities than it is to others (Liu & Carless, 2006). In undergraduate programmes there are two circumstances which bring on the need for feedback on the part of professors: 1) a significant number of subjects that are designed based on specific exams that are the same for all students, which require assessment carried out by examiners who are not linked to the teaching activity, 2) introductory subjects or subjects with considerable procedural weight where the person providing commentary has a high level of proficiency in the subject in order not to mislead students. This approach is akin to the characteristics of the current view of feedback held by Orsmond et al. (2013) where the key issue is to conceive feedback as a professor-student dialogue, as an opportunity for the student to carefully consider and clarify the received comments in order to improve their learning (Nicol & Macfarlane-Dick, 2006).

We have seen that efficacious principles and characteristics have been established in order to design feedback yet at the same time these have proven complex and difficult to implement. Feedback may improve results but not in all contexts and not for all students (Evans, 2013). One line of further research into the effectiveness of feedback is to frame empirical research under the umbrella of the learning theory it gives support to (an approach put forward by Thurlings et al.; 2013), in order to gather useful results in each educational setting.

Current research into online education has not resolved the issue of how to provide efficacy personalized instructor feedback, given the large number of students per classroom, and little time on the part of professors. Analyzing effectiveness involves determining the best balance between student demand and real capacity, both of faculty as well as of higher education institutions, and the crucial role that the medias may play stimulating dialogue between teachers and students.

One of the most widely accepted feedback models today is that of Nicol & Macfarlane-Dick (2006) based on metacognitivism. The seven of best-practice principles it expounds are also critical elements of an online learning evaluation process (Gikandi et al., 2011). Hence, a good starting point for analyzing the optimum use of personalized feedback facilitated by faculty in an asynchronous online environment would be to do so using this model and this learning theory. There are a number of issues that need to be addressed which have not been studied empirically by the scientific community. We need to find out what the relevant elements are for faculty, such as their attitude towards feedback, their technology skills, one of the two overlapping areas demanded of online instructors (Guasch et al., 2010), or their communicative competencies, essential for developing the social role of an online professor.

Furthermore, we need to study instructors’ attitudes towards continuous assessment and feedback based on the type of message, using action research. This would enable us to find out whether faculties share the vision of an education system that places students at the center of the learning process. If this is not the case then we need to find out which elements could promote a change towards the new educational model.

There are also important aspects that need to be researched from the point of view of students and their results. We have already mentioned that according to Sadler (1989) the only way to know the results of feedback on learning is if students facilitate a type of response which completes the feedback circuit. This approach entails finding answers to questions such as, what aspects of personalized feedback facilitated by instructors promote professor-student dialogue. Or whether greater satisfaction with the received feedback leads to more effective learning. We would imagine that the student will be more engaged with the feedback they have received if they are satisfied with the comments made by the instructor, if these have been transmitted in an appropriate tone and were received on time, if they comprised quality information on contents and processes or if this has led to an increase in the exchange of messages with the instructor. These
questions should be combined with looking at the interaction and the effect of the media chosen to facilitate the feedback, an approach initiated by Fernandez, Simo, Sallan, & Enache (2013). The usual written feedback in online environments does not enable faculty to provide more thorough and detailed feedback (Merry & Orsmond, 2008) that would help to overcome obstacles. Communication could become more significant if we explore the potential of exchanges in audio or video recording formats.

5 Conclusions

The scientific literature has shown that structuring a subject based on continuous assessment and providing feedback for each activity is the optimal way to educate people who are engaged with their learning and have the competencies to continue learning throughout their life. Having said this, given the large number of students per classroom it constitutes a challenge to extend the use of personalized feedback provided by instructor.

There are good proposals to do effective feedback practices, such as those put forward by Gibbs & Simpson (2004), by Nicol & Macfarlane-Dick (2006) or by Carless et al. (2011). However, if the objective is that those proposals are helpful both to professors (to help them provide effective feedback) and to students (to improve their learning), it is necessary to contextualize them in the light of a learning theory that balances demands from instructor and students with available resources.

This holistic approach would provide the opportunity to implement efficient feedback in the light of determined context and paradigm and would help to expand the use of personalized feedback in all faculties. Therefore, the analysis of personalized feedback provided by the teacher should be studied in the light of the three dimensions mentioned: students, teacher and media, in order to find shared aspects that jointly promote implantation.

References


The Relationship Between an Online Synchronous Learning Environment and Knowledge Acquisition Skills and Traits: The Blackboard Collaborate Experience

John Politis¹ and Denis Politis²
¹Charles Darwin University, Australia
²Imperial College London, UK
john.politis@cdu.edu.au
denis.politis06@imperial.ac.uk

Abstract: Online learning is becoming more attractive to perspective students because it offers them greater accessibility, convenience and flexibility to study at a reduced cost. While these benefits may attract prospective learners to embark on an online learning environment there remains little empirical evidence relating the skills and traits of knowledge acquisition with a synchronous online environment supported by Blackboard Collaborate. Without understanding this relationship colleges and universities cannot assess if their programs offered through educational communication technologies, such as Blackboard, enhance learner’s skills and traits that are essential for knowledge acquisition. The purpose of this paper is to (i) examine the relationship between an online learning environment, which is supported by Blackboard Collaborate, and the skills and traits of knowledge acquisition, (ii) assess the influence of online learners motivation on knowledge acquisition skills and traits, and (iii) propose alternative Blackboard Collaborate layout and structure derived from the process of a critical reflection. Data was collected from 84 learners who studied online courses in a Higher Education Institution in the United Arab Emirates. The Analysis of Moment Structures (AMOS) was employed to perform the path analysis and SPSS was used to determine the factor structure of the examined variables. The study revealed three major findings. First, easy access of the Blackboard Collaborate and an effectively designed structure enhanced learners’ problem understanding and communication. It also improved the personal traits of conceptualisation, tolerance and amiability that are essential for knowledge acquisition. Second, the readiness of the online learners with educational communication technologies had a positive influence on their liberal arts knowledge. Third, learners’ attested motivation to embark on synchronous online classes enhanced their knowledge acquisition skills and traits. Finally, alternative Blackboard Collaborate layouts and structures are recommended aiming at encouraging future researchers to further investigate the relationship between the knowledge acquisition skills and traits of learners and an online synchronous learning environment.

Keywords: Blackboard collaborate; e-learners, online learning; knowledge acquisition; synchronous

1 Introduction

The survival and competitiveness of institutions and academics depends on their ability to continuously adapt to the educational virtual world because colleges and universities have expressed significant interest to offer degrees and courses via the Internet. Although Cruz et al. (2015, p. 27) argued that “We live the most collaborative experience since the beginning of the World Wide Web”, the technological challenges and the inexperience of virtual educators hinder the effectiveness of online educational practices (Chen et al., 2008). The literature acknowledges that the online teachers should be equipped with unique experiences and skills in order to be effective virtual educators. It is argued by Davis et al. (2007, p. 28) that “effective virtual teachers have qualities and skills that often set them apart from traditional teachers”. Moreover, it is argued that virtual educators should be highly motivated to embark on virtual teaching delivery, must understand the requirements of teaching in a synchronous online environment, and should be equipped with e-technologies and online communication skills (Barbour, 2012; Easton, 2003). Although it is suggested by some that the synchronous model of online teaching is consistent with face-to-face instruction and teachers deliver lectures in a familiar way (Surrey and Ely, 2007), the challenge is to identify what motivates students to positively engage in synchronous online learning (Barbour, 2012).

Therefore, the integration of technology into the synchronous online classroom in a pedagogical approach needs to be addressed through teachers’ training in order to equip them with web-based knowledge and skills and online curriculum development (Davis, 2003), a view supported by Davis et al. (2007). Specifically, Davis and colleagues argued that very little emphasis is placed “on teaching and facilitation competencies for virtual
school education” (2007, p. 27). In a period where most of the information is in a digital form, it can be argued that the “Internet and learning management systems and participation in communities of common interest, social networks and group tasks” (Brindley et al., 2009: p. 2) could assist in the creation and acquisition of knowledge (Tomas et al., 2015). Therefore, teachers need to reflect on their online synchronous teaching practices and identify shortcomings, which might impact learners’ knowledge acquisition traits and skills (Lan et al., 2012). To the best of our knowledge, research is scarce in investigating empirically the relationship between online learners’ knowledge acquisition skills and traits and the online learning environment supported via Blackboard Collaborate. Being online instructors for a number of years we are specifically interested to answer the following questions. (i) What is the perception of e-learners experiences on a synchronous online learning environment provided via Blackboard Collaborate?, (ii) Does the online learning experience enhance online learners’ skills and traits for online knowledge acquisition?, and (iii) Can we identify deliberate Blackboard Collaborate layouts and structures to improve e-learners’ knowledge acquisition skills and traits? The purpose of this paper is to empirically investigate the relationship between the structure of a synchronous online learning environment and learners’ knowledge acquisition skills and traits. The synchronous online learning environment in this paper refers to the course content presentation; the structure supported via Blackboard Collaborate; the readiness to use instructional technologies, and the students’ e-learning motivation. Moreover, the paper suggests an alternative synchronous online learning environment in order for future researchers to further investigate the relationship of the examined variables.

2 Selective Literature Review – Hypotheses Development

It is acknowledged that online learning is a fast growing sector of education (Cruz et al., 2015; Barbour, 2012). However, authors and practitioners question the quantity of interactivity (Brindley et al., 2009) and the quality of distance learning (Chen et al., 2008; Swan 2001). Some authors even argued that online education is inferior compared to that of face-to-face instruction, because they found more than one third (43.3%) of the Southern States academic leaders believe that “sacrificing quality results from moving instruction online” (Allen and Seaman, 2006, p. 12). Chen et al. (2008) however supports the quality of e-learning and face-to-face instruction are positively related with “student-faculty interaction, peer-to-peer collaboration and active learning” (para. 2). Therefore, it is important for online instructors to design and set-up the online learning environment that offers students/learners as much as possible the “face-to-face instruction, via intact classrooms and live, two-way audio-visual interaction” (Al-Arimi, 2014, p. 86). As a result the role of the instructor is to create and facilitate a collaborative online learning environment rather than being the communicator of a fixed body of teaching and tutorial material. An approach in establishing an online learning environment (i.e. synchronous online pedagogy) is to employ instructional technologies, such as Adobe Connect, Blackboard Collaborate, and/or BigBlueButton, which could simulate the traditional learning experience. Although synchronous pedagogy is dated back to the 1990’s (Knox, 1997), a review of recent literature argued that there is limited discussion regarding as to how synchronous online learning technologies support effective learning (Asterhan and Schwarz 2010). A recent study however, provided some answers regarding the requirements for successful online learning. Specifically, Yamagata-Lynch (2014) conducted a study using synchronous meetings via Blackboard Collaborate and amongst other things she found that easy access to the lesson’s website (reliable Internet) and deliberate course structure helped students to become effective course participants. Another study on 40 students at Victoria University, Australia, revealed that students experienced meaningful interactions and acquired ‘higher order thinking skills’ (Wdowik, 2014: p. 264) utilising Blackboard Collaborate. Although the structure of Blackboard Collaborate was not disclosed in Wdowik’s study, it is reasonable to assume that accessibility to the Blackboard Collaborate and thoughtful structure for delivering online synchronous classes will be related to knowledge acquisition attributes of e-learners. This assumption is articulated into Hypothesis 1.

\[ \text{H1: Easy access and deliberate structure of Blackboard Collaborate will be positively related to knowledge acquisition attributes of online learners.} \]

Moreover, a review of the literature revealed that the challenges to utilise technology for knowledge acquisition/management are related to three phases of deployment, e.g., (i) set-up phase, (ii) the ongoing utilisation, and (iii) the long term effects of knowledge management support (Hahn & Subramani, 2000). The authors suggest the most important consideration in the set-up phase is balancing information overload and potential useful content. In the utilisation phase, the knowledge flow is an important issue, and the challenge is to balance additional workload and accurate content. A final issue raised is the long-term impact of the use of knowledge management systems on learning, innovation and experience development. Exploitation of existing solutions may be effective in the short term, but inhibit learning and innovation in the long term.
Therefore, the challenge for online instructors is to identify who are the participants and provide useful course content, which motivate collaborative and interactive learning (Brindley et al., 2009). Therefore, the course content and presentation of the online delivery should be designed to encourage learners participating in meaningful knowledge acquisition activities. Furthermore, the course content presentation should be supported by flexible synchronous communications technology (Yamagata-Lynch, 2014), because the technology could either motivate or frustrate learners.

As discussed earlier one of the instructional technologies employed to investigate the research questions is Blackboard Collaborate. Blackboard Collaborate offers innovative approaches to present the teaching content, which could intensely motivate learners towards online learning (Pengcheng et al., 2013). One could argue that virtual Blackboard is “an auxiliary tool for the class teaching and it is an extension and supplement of traditional blackboard” (Pengcheng et al., 2013: p. 4003). Moreover, it is being argued that if students required to dedicate more time to learn the content due to lack of immediate clarification of the online course content, that would hinder their learning process (Belcheir and Cucek, 2001). It is thus plausible the arrangement and classification of the material presented on Blackboard Collaborate for online learners (see Appendix I) would allow students to engage in a collaborative and active learning, leading to Hypothesis 2.

H2: The presentation and course content on Blackboard Collaborate will be positively related to knowledge acquisition attributes of online learners.

However, the employment of full-featured Blackboard Collaborate instructional technology will not alone solve all the challenges of online learning and knowledge acquisition (Hendriks, 1999). Some characteristics of human behaviour (e.g. readiness) (Olesen and Myers, 1999) and knowledge itself (Hansen, 1999) could hinder or support the process of knowledge acquisition. Davenport et al. (1998) for example, in a study of successful knowledge management projects, identified eight essential factors that led to project success. One of Davenport et al.’s factors which is related to human behaviour, is the factor of ‘change of learner’s motivational practices’. It is thus essential for online learning and knowledge acquisition researchers to assess the motivation, readiness and technological skills of online learners (Lishon-Savarino, 2013). It is argued in the literature that effective online course participants are those who have become proficient with course communications technology (Yamagata-Lynch, 2014; Lishon-Savarino, 2013). Yamagata-Lynch (2014) for example in her online course found students need to be “prepared for synchronous sessions by having access to and properly set up computer equipment and USB headphone/microphone for each session” (2014, p. 199), and be knowledgeable as to how to use online technologies (Holley, 2002), views supported by Brindley et al. (2009). Moreover, it was argued that the synchronous platform could become “a clunky environment” without the technical proficiency of participants (Yamagata-Lynch, 2014, p. 198). It is thus reasonable to hypothesise that the readiness to use the instructional communications technology will be the predictive variable of knowledge acquisition skills and traits of online students, leading to Hypothesis 3.

H3: Readiness to use instructional communications technology tools will be positively related to knowledge acquisition attributes of online learners.

Here it is essential to understand learners’ motivations for choosing an online study. It is acknowledged that learners opt for an online study because it offers them greater accessibility, flexibility, and convenience (Henry et al., 2014). Provided learners are motivated, enthusiastic and eager to join online classes they would achieve successful online learning (Bromme et al., 2005). In addition, the employment of appropriate educational technology plays a significant role towards learning motivation. Studies showed that in technology rich classrooms students’ performance was improved as well as their learning motivation (Yang and Wu, 2012). Moreover the creation of new knowledge is achieved when learners engage in online social interaction (Eryilmaz et al., 2013) and they are persistent towards online learning activities (Xie and Ke, 2011). Therefore, it is reasonable to assume that the enthusiasm and motivation for choosing an online study will be related to the skills and traits of knowledge acquisition of the online students. This assumption is articulated into Hypothesis 4.

H4: Students motivation towards online learning will be positively related to Knowledge acquisition attributes of online learners.

The functional relationship of the above hypotheses are shown in the schematic diagram of Figure 1.
Research Methods and Sample

3.1 Analytical Procedure

The relationship of the examined variables was assessed through a survey. The latent structure underlying the set of variables investigated in this paper was examined through factor analyses (FAs). Initial eigenvalues were examined to identify which observed variables are indicators of first order latent factors. Thereafter the first order latent factors were created and their reliability coefficient was computed, with $\alpha \geq .70$ being considered acceptable (Hair et al., 2011, p. 145). The reliability estimates were built into Munck’s (1979) equations to compute both the regression coefficients ($\lambda_i$) and the measurement error variances ($\theta_i$) associated with each latent construct. The $\lambda_i$ and $\theta_i$ for the single latent construct were built in the structural equation model in order to test the hypotheses (Politis, 2001a; 2001b). In the causal modelling the covariance-based methods are exemplified by packages such as AMOS, LISREL, EQS and PLS-SME. AMOS’ (Arbuckle, 2007) fit indices examined to evaluate the causal model fit. These are; the chi-square to degrees of freedom ($\chi^2$/df) and the goodness-of-fit (GFI) and the adjusted goodness-of-fit (AGFI) indices (Joreskog and Sorbom, 1984), the comparative fit index (CFI) (Bentler, 1990), the normed fit index (NFI) (Bentler-Bonett, 1980), the incremental fit index (IFI) (Bollen, 1989), and the Tucker and Lewis (1973) index (TLI). Each of these indices should have values $\geq .90$, and the root mean square residual (RMR) should equal to .05 and the root mean square error approximation (RMSEA) should be equal to .08 in order to accept the causal model (Hair et al., 2009). In addition, the average variance extracted (AVE) was computed to test the convergent validity of the constructs under investigation. The AVE should be “equal or greater than .5” (Hair et al., 2011, p. 145) in order to accept convergent validity. The AVEs were computed using the factor loads generated from the factor analyses.

3.2 Sample

The sample was drawn from a Higher Education (HE) Institution in the UAE, which began offering a number of Engineering Management subjects through Blackboard Collaborate in February 2011. The e-learners were part-time students enrolled in the final year of a Bachelors program. Every online student was full time employed either in the private or public sector. Students’ attendance was compulsory four hours per week over a period of 18 weeks. The size of the virtual classes was 22 ≤ class size ≤ 28. The class size was determined by the Institutions’ policy, which strictly prohibits classes being greater than 30. The lead author championed the synchronous online teaching delivery since February 2011 using synchronous Blackboard Collaborate virtual classroom. Appendix I depicts the delivery approach, content presentation, and the structure and layout of Blackboard Collaborate. The structure and layout of Blackboard Collaborate were consistent throughout the data collection period from February 2013 to June 2015. Questionnaires, written in English, captured e-learners’ perceptions on their experiences of the online learning and the knowledge acquisition attributes.

The total sample consists of 84 online learners (yielding 82.2 percent response rate). Online learners had at least one semester experience with Blackboard Collaborate educational technologies. The respondents were 100 percent male because the survey was carried out at a Men’s Campus. Approximately ¼ of the sample was in the 21-25-age range (21.4%), and 25% was in the 26-30-age range, whilst 44% was in the 31-35-age range. The respondents know the policies and educational procedures of their Institution very well because 63.1%
studied in the same Campus more than four years. As far as their engagement with online teaching educational technologies, 56% of the respondents have used the same Blackboard Collaborate layout and structure for a year, whilst the remaining 44% used it for two years. Moreover, 61.9% received training on Blackboard Collaborate from the Institution, whereas 38.1% learned Blackboard Collaborate through trial and error. Finally, all participants attained a diploma in engineering, which is a prerequisite to enrol in the Engineering Management program.

3.3 Measurement and Structural Models

As shown in Figure 1 we are measuring e-learners’ knowledge acquisition traits and skills and the predictive variables associated with Blackboard Collaborate course content presentation, structure, readiness to use instructional technologies, and e-learners motivation.

3.3.1 Independent Variables

The literature suggests that surveys are valid and reliable tools to evaluate user’s perception of web-based learning (Fan and Le, 2011). A survey was developed specifically for this study from Politis’s (2003a) original items, which demonstrated acceptable reliability and factors loading structure of the subscales. The original items were rewritten and/or edited to capture students’ perceptions on the Blackboard Collaborate course content presentation, structure, readiness to use instructional technologies, and students’ motivation towards online learning. The authors reviewed the items carefully to eliminate confusing language and grammar through Politis’s (2012) pilot study prior to continuing the process. The survey used in the study comprises 18 items shown in Appendix II. Each item was scaled from “definitely not true”, 1 to “definitely true”, 7. We conducted a FA using Varimax rotation of all items in order to check the independence of the constructs. As shown in Appendix III the FA clearly supported the independence of four constructs: Blackboard access and

3.3.2 Dependent Variables

The traits and skills of online students that are essential for knowledge acquisition were assessed by employing Mykytyn et al.’s (1994, p. 97) 26-item instrument, which was operationalised by Politis (2003b). The instrument measures six knowledge acquisition attributes namely: communication/problem understanding, personal traits, control, organisation, negotiation, and liberal arts/nonverbal communication. Each item was scaled from “very unqualified”, 1 to “very qualified”, 7. We conducted a FA using Varimax rotation of all items in order to check the independence of the constructs. The FA findings supported the independence of six factors: communication/problem understanding (four items, α = .83, AVE = .40), course content presentation (five items, α = .80, AVE = .33), readiness to use instructional technologies (three items, α = .65, AVE = .49), and online learning students’ motivation (three items, α = .85, AVE = .72). Item 13 was dropped due to cross loading, and hence was not included in the structural path model.

Given acceptable reliability and convergent validity of the measures, we reduced the number of observed variables by creating a composite scale of each of first order latent constructs using Politis’s (2005; 2001b) approach. Means, standard deviations (SDs), AVE, alpha (α) coefficients, and intercorrelations between the examined variables are depicted in Table I.
Table I: Means, SDs, AVE, $\alpha$, $\lambda$, $\theta$ estimates and Pearson’s bivariate correlations of the synchronous Blackboard Collaborate online learning environment, e-learners motivation and knowledge acquisition attributes

<table>
<thead>
<tr>
<th>Latent Construct</th>
<th>Mean</th>
<th>SD</th>
<th>AVE</th>
<th>$\alpha$</th>
<th>$\lambda$</th>
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<th>1</th>
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<tbody>
<tr>
<td>Blackboard Collaborate Online Learning Environment Attributes and e-Learners Motivation</td>
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<tr>
<td>Blackboard access and deliberate structure</td>
<td>5.21</td>
<td>0.40</td>
<td>1.11</td>
<td>1.01</td>
<td>.209</td>
<td>.83</td>
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<tr>
<td>Course content presentation</td>
<td>4.61</td>
<td>0.33</td>
<td>1.37</td>
<td>1.23</td>
<td>.375</td>
<td>.79**</td>
<td>.80</td>
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<tr>
<td>Readiness to use instructional technologies</td>
<td>5.15</td>
<td>0.49</td>
<td>1.31</td>
<td>1.06</td>
<td>.601</td>
<td>.61**</td>
<td>.67**</td>
<td>.65</td>
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<tr>
<td>Online learning learners’ motivation</td>
<td>4.96</td>
<td>0.72</td>
<td>1.49</td>
<td>1.37</td>
<td>.333</td>
<td>.38**</td>
<td>.45**</td>
<td>.17</td>
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<tr>
<td>Knowledge Acquisition Traits and Skills</td>
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<tr>
<td>Communication/ Problems Understanding</td>
<td>4.67</td>
<td>0.51</td>
<td>1.21</td>
<td>1.12</td>
<td>.220</td>
<td>.54**</td>
<td>.58**</td>
<td>.45**</td>
<td>.44**</td>
<td>.85</td>
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<tr>
<td>Personal traits</td>
<td>5.23</td>
<td>0.44</td>
<td>1.13</td>
<td>1.00</td>
<td>.281</td>
<td>.38**</td>
<td>.40**</td>
<td>.24*</td>
<td>.37**</td>
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<td>.78</td>
<td></td>
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<tr>
<td>Control</td>
<td>4.63</td>
<td>0.40</td>
<td>1.28</td>
<td>1.09</td>
<td>.459</td>
<td>.29**</td>
<td>.35**</td>
<td>.28*</td>
<td>.46**</td>
<td>.51**</td>
<td>.49**</td>
<td>.72</td>
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<td></td>
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<tr>
<td>Organisation</td>
<td>5.09</td>
<td>0.49</td>
<td>1.06</td>
<td>0.95</td>
<td>.213</td>
<td>.30**</td>
<td>.35**</td>
<td>.31**</td>
<td>.35**</td>
<td>.34**</td>
<td>.56**</td>
<td>.73**</td>
<td>.81</td>
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<tr>
<td>Negotiation</td>
<td>4.77</td>
<td>0.44</td>
<td>1.02</td>
<td>0.91</td>
<td>.208</td>
<td>.51**</td>
<td>.34**</td>
<td>.44**</td>
<td>.39**</td>
<td>.68**</td>
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<td>.59**</td>
<td>.42**</td>
<td>.80</td>
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<tr>
<td>Liberal arts knowledge/ nonverbal</td>
<td>4.08</td>
<td>0.53</td>
<td>1.54</td>
<td>1.29</td>
<td>.711</td>
<td>.46**</td>
<td>.60**</td>
<td>.47**</td>
<td>.37**</td>
<td>.80**</td>
<td>.59**</td>
<td>.47**</td>
<td>.42**</td>
<td>.65**</td>
<td>0.70</td>
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</tr>
</tbody>
</table>

Notes: *Significant correlations at .05 level; ** Significant correlations at .01 level; $^*$ mean of N = 84; $^0$ coefficient alphas ($\alpha$s) are located on the diagonal; $^\prime$ average variance extracted; regression coefficient, $^\prime\prime \lambda = \sigma * \sqrt{\alpha}$; has been rounded to two decimal places; $^\prime\prime\prime$ error variance, $\theta = \sigma^2 * (1 - \alpha)$ (Munck, 1979).

### 3.3.3 Structural Model

Using Munck’s (1979) equations we computed both the regression coefficients ($\lambda_i$) and the measurement error variances ($\theta_i$) for each latent construct. The $\lambda_i$ and $\theta_i$ of each latent construct (see Table I) were built in the path model in order to test the hypotheses (Politis, 2001a; 2001b). The hypothesised relationships between the first order latent constructs were tested using the structural model shown in Figure 2. Figure 2 shows the estimated path coefficients ($\lambda$ values) of the best fit structural equations model. The analysis revealed that the model of Figure 2 was accepted as the best fitting model because it was found to satisfy fairly well the suggested threshold values of the most commonly reported fit indices; e.g., GFI = .90, AGFI = .73, CFI = .95, TLI = .89, NFI = .92 and IFI = .95. The $\chi^2 = 45.73$, the df = 21 and $\chi^2/df = 2.17$, with $p = .001$, and the RMR = .11 and RMSEA = .12. Worse fitting models were produced by adding, removing or reversing paths. The $\gamma$ values are provided to facilitate the discussion of the regression coefficients.

![Structural Model](image)

**Figure 2: Structural estimates of the hypothesised model**

$^a$ Standardised path coefficient; N = 84; $^1$; $^* p < .05; ^{**} p < .01; ^{***} p < .001.$

All correlations of exogenous variables were statistically significant @ .001 level.
3.3.4 Research Findings – Results

The means, standard deviations (SDs), AVEs, alpha coefficients and correlations of the examined constructs are reported in Table I. A number of observations are worth noting. First, the constructs display reliabilities greater than .70, which are considered acceptable (Hair et al., 2011). The construct of ‘readiness to use instructional technologies’, reported slightly lower alpha coefficient (α ≥ .65) indicating marginal reliability of the measurement scale. Second, five of the ten constructs display AVE higher than .49, suggesting a sufficient degree of convergent validity, meaning that these latent constructs “explained more than half of the indicators’ variance” (Hair et al., 2011, p. 146). The other constructs explained more than 40 percent of the indicators’ variance. Moreover, the Pearson’s bivariate correlations clearly supported the four hypotheses. Finally, the patterns of correlations parallel those obtained from the structural modelling shown in Figure 2.

As shown in Figure 2 the four hypotheses are supported by the findings of the structural modelling for at least some dimensions of the online synchronous learning environment. As predicted, students’ motivation towards online learning had a positive and significant effect on knowledge acquisition attributes of e-learners, supporting H4. Specifically, online learning students’ motivation is positively and significantly related to communication/problem understanding (y2 = .30, p < .01), personal traits (y6 = .34, p < .05), control (y9 = .58, p < .001), organisation (y10 = .37, p < .01), negotiation (y11 = .17, p < .1), and liberal arts/nonverbal communication (y12 = .47, p < .01). The expected positive influence of readiness to use instructional communications technology on the skills and traits of knowledge acquisition was supported by the data of this study for at least three knowledge acquisition attributes, hence partially supporting H3. Specifically, the readiness to use instructional technologies is positively and significantly related to control (y4 = .25, p < .05), organisation (y5 = .34, p < .01), and liberal arts/nonverbal communication (y6 = .80, p < .001).

As predicted by H2, there was one strong, significant and positive relationship between course content presentation and negotiation (y3 = .64, p < .001). The relationships between the other five knowledge acquisition attributes and course content presentation on Blackboard Collaborate were not supported by the structural model findings. Pearson’s correlations however supported these relationships. Similarly, the effect of Blackboard access and deliberate structure on communication/problem understanding and personal traits was strong, positive and significant (y1 = .58, p < .001; y2 = .40, p < .01, respectively). Hence, H1 was partially supported by the data of this study.

4 Discussion

This paper examined the relationship between a specific online synchronous learning environment (e.g., course content presentation and structure supported by Blackboard Collaborate, the readiness to use instructional technologies, and the students’ e-learning motivation) and the skills and traits of learners that are required for knowledge acquisition. The findings suggest that online learners found easily the course material on Blackboard Collaborate because the mean value of the Blackboard access and deliberate structure is equal to μ = 5.21, SD = 1.11. Moreover, the findings suggest that the layout and structure designed on Blackboard Collaborate and operationalised through the screenshots shown in Appendix I assisted online learners to enhance their communication and problem understanding skills (y1 = .58, p < .001), and personal traits (y2 = .40, p < .01). However, communication and problem understanding and personal traits are acknowledged as essential factors of knowledge acquisition (Mykytyn et al., 1994). Hence, it is implied in this result that easily accessed and well-structured online learning environment may enhance the quality of students learning and the online university experience, an argument supported by Yamagata-Lynch (2014). The finding also suggests that online instructors should design structures which include, but are not limited to, a main posting area for each session as shown in Appendix I, Figure 3. The specific Blackboard Collaborate study area motivated learners to become more engaged in their learning process leading to improved knowledge acquisition attributes of personal traits and communication and problem understanding. In relation to the Blackboard access and deliberate structure used by the e-learners a few points are noteworthy. First, the Blackboard Collaborate classroom was open 24/7 throughout the semesters. Second, the recorded sessions through Figure 4 of Appendix I, were available 24/7 throughout each semester.

The current study seems to highlight that there is a certain skill which is enhanced by the course content as it is currently exhibited on Blackboard Collaborate. The results of this study suggest that the course content presentation employed on Blackboard Collaborate (Appendix I, Figure 3 and 4) strongly influences the e-learners skill of negotiation (y3 = .64, p < .001). A closer examination of this relationship suggests that the
course content presentation and the interaction of online students with content, peers and the instructor (Appendix I, Figure 5 – 7) develops the negotiating skills of ‘diplomacy’, ‘patience’, ‘cooperation’, sensitivity’, and ‘hindsight’, which are required for e-learners knowledge acquisition. In that regard the Blackboard Collaborate technology is the enabler and not the catalyst for creating and enhancing the essential negotiating skills for knowledge requisition. As Kuh et al. (2006) concluded it is the instructor who creates an ICT challenging learning environment and facilitates collaborative and active learning. Therefore, it is the prior experience of the instructor using an online synchronous learning environment to substitute the face-to-face instruction received by the online learners.

In relation to the course content presentation on Blackboard a few points are noteworthy. First, the presented lessons via Blackboard Collaborate were well prepared and presented enthusiastically by the instructor. Second, the course content was progressively made available each week, and there was ample commitment to support collaboration and online learning interaction through announcements, course messages and online classroom presentations. Third, quizzes were designed for each synchronous session (see Appendix I, Figures 6 and 7) to engage students in an online discussions and debates in order to increase their interaction with the instructor and peers. Finally, the presentation of content exhibited on Blackboard was consistent throughout the data collection period. Some of these online practices have been well documented in the literature by Wdowik (2014), Mearns et al. (2007), and Kuh et al. (2006).

Furthermore, the findings of the present study supported previous arguments (Yamagata-Lynch 2014; Lishon-Savarino, 2013; Holley, 2002) in that the connectedness, readiness and interaction among peer-to-peer and learner-instructor enhanced the “development of critical thinking skills, co-creation of knowledge and meaning, reflection and transformative learning” (Brindley et al., 2009, p. 1). Specifically, it was found that having access to reliable Internet with at least an Asymmetric Digital Subscriber (ADSL) connection and effectively using the communication e-technologies provided learners’ suitable online collaboration and interaction. This in turn enhanced the development of knowledge acquisition attributes of control, organisation and liberal arts/nonverbal communication. Moreover, there is a strong and significant relationship between readiness to use instructional technology and liberal arts/nonverbal communication (γc = .80, p < .001). It is implied in this result that those who are trained in an interactive real-time computer assisted learning environment (Wdowik, 2014) are well-informed with liberal arts knowledge and are equipped with nonverbal communication skills.

A few points are noteworthy on the relation between readiness to use instructional technologies and knowledge acquisition attributes. The online learners that participated in the study had access to reliable Internet with at least an ADSL connection. Second, were equipped with microphones, USB headsets and laptops configured to properly operate Blackboard Collaborate. Third, 61.9% of the online students received training from the Institution on how to navigate through Blackboard Collaborate, and all had to adjust to learn in an online environment. Finally, the student-faculty evaluations consistently indicated students’ satisfaction with the employed interactive online technologies, an argument supported by Li and Pitts (2009).

Moreover, the significant and positive relationship between online learning students’ motivation and the five knowledge acquisition attributes suggests that it is the students’ attested motivation to embark on synchronous online classes. Through this motivation e-learners developed the skills and traits of problem understanding, liberal arts/nonverbal communication, control, organisation, negotiation and personal traits. Learners’ engagement with Blackboard Collaborate may be perceived challenging, enjoyable or even futuristic in a way that it enhanced intrinsic motivation and hence their engagement in synchronous online classes. Although intrinsic motivation was not properly measured in this study, it may be possible the correlations between e-learners motivation and the five knowledge acquisition attributes are attributed to “intrinsic motivation to know and to accomplish” (Giesbers et al., 2014, p. 38). This argument could present an interesting avenue for future research.

A few observations are noteworthy in relation to the online learning students’ motivation towards Blackboard Collaborate learning. First, learners were motivated to participate on virtual learning because they were full-time employed and it was logistically easier to connect to synchronous online classes from home or their work environment. Second, students-faculty evaluations showed that the e-technology employed in the courses (Blackboard Collaborate) was the source of motivation of collaborative learning. Third, the commitment, motivation and online experience of the instructor were key ingredients of the quality of online instruction, an
argument supported by Deubel (2003). Fourth, the instructor exhibited sensitivity to students’ problems and encouraged them to express their opinion during the synchronous online classes, an argument supported by Mearns et al. (2007). In fact students were frequently invited to engage in synchronous online debates on selected topics of the lesson.

Concluding, the findings of the study clarify which of the online synchronous Blackboard Collaborate learning characteristics best predict the skills and traits of knowledge acquisition. In particular, learners who are proficient with educational communication e-technologies are well-informed with liberal arts knowledge compared to those who are not prepared and motivated to use information and communications technology. In addition, easy access to Blackboard Collaborate and deliberate structure found to motivate learners become more engaged in their learning process leading to improved knowledge acquisition attributes of conceptualisation, tolerance and amiability (e.g. personal traits). Furthermore, the Blackboard Collaborate structure, shown in Appendix I, promotes learners problem understanding and communication. Finally, e-learners’ motivation towards online learning is a key ingredient to enhance their skills and traits of knowledge acquisition.

4.1 Limitations and Future Research

The current study has a number of limitations. First, the study was conducted at a HE Institution in the UAE, hence the generalisability of the findings cannot be assumed. The lack of generalisability coupled with the small sample size render the research findings to be sample bias. Future research should replicate the study using data from different campuses to validate the causal relationships of the examined variables. Second, the cross-sectional nature of the study leaves the current study susceptible to the common methods variance (CMV) (Podsakoff et al., 2003). However, according to Chang et al. (2010, p. 182) “if the research probes into difficult waters where data of any kind are scarce such as in severely understudied parts of the world (Africa, the Middle East) ..... it should not be rejected...solely on the grounds of common methods”. Since the study was carried out in the Middle East it should not require remedies for the CMV. Moreover, more confidence could be placed on the findings by replicating the current study (Craighead et al., 2011). Third, the usage of the relatively underdeveloped scales measuring the dimensions of the online synchronous learning environment supported by the Blackboard Collaborate needs to be further validated by using experimental studies.

The variables of the synchronous online learning environment were considered important in this study in capturing the structure, content presentation and readiness to use instructional technologies. However, future research must examine the intrinsic motivation, commitment and satisfaction of the online learners in the context of knowledge acquisition. Moreover, future research should measure the variables of autonomous motivation and engagement in synchronous communication in the context of knowledge acquisition. Finally, different layouts and structured virtual classrooms should be introduced by researchers to further investigate the strength of relationships between the examined variables. An alternative Blackboard layout and structure are presented in the following section aiming at encouraging future researchers to investigate the relationship between knowledge acquisition skills and traits of online learners and an online synchronous learning environment.

5 Reflection on an Online Synchronous Blackboard Collaborate Learning Environment

Although the findings of the study suggest that easy access, layout and structure of Blackboard Collaborate enhanced learners’ communication, problem understanding skills and personal traits, the employed layout and structure was not related to control, organisation, negotiation and liberal arts/nonverbal communication. Reflecting on the layout and structure shown in Figure 3 of Appendix I, it is acknowledged that the employed layout does not provide online learners immediate and direct access to a variety of course resources. In that regard we propose a more innovative and thoughtful layout and structure, which should have the appearance displayed in Appendix IV, Figure 1. As shown on the left hand side, the proposed layout provides direct access to: Course Information, Teaching Material, Course Assessments, Discussion Board, an Online Classroom, Student Resources such as Blackboard Collaborate class information and study skills online, and Research Resources such as e-library resources, Course email, and Announcements. Moreover, we suggest providing online learners with guidelines on how to access and operationalise the variety of the features and resources offered via Blackboard Collaborate. In addition, it is also important to promote peer-to-peer, and student-to-
faculty synchronous interaction and online university experience during the first week of the semester, practices advocated by Mearns et al. (2007).

In relation to the content presentation on Blackboard we suggest making the entire course content available and accessible from the first week, in order for online students to plan their workload. Therefore, we propose the presentation of course content to have the appearance displayed in Appendix IV, Figure 2. Online revision question and tutorial tasks should be also included for each lesson, as shown in Figure 2 of Appendix IV, followed by the discussion board debates, blogs and online challenging quizzes.

Although the findings of the study suggest the connectedness and readiness to use instructional technologies were positively related with knowledge acquisition attributes of control, organisation and liberal arts/nonverbal communication, we feel that employing additional online interactive tools might enhance learners’ motivation and determination towards online learning. In that regard we propose to assist learners outside the synchronous Blackboard Collaborate online environment with blogs, emails, RSS feed (Rich Site Summary), Skype, voice podcasts and wikis (see Appendix IV, Figure 3). In addition, we recommend preparing a handbook titled 'Experience the Power of Collaboration', and distribute it to online learners a few weeks ahead of the semester. The objective is to enhance learners’ the communications technology skills. Moreover, each Power Point slide should be simple to avoid cramming, as shown in Appendix IV, Figure 4. In addition, it is envisaged to present one slide per two minutes during the synchronous online class. The class size should be 12 ≤ class size ≤ 18 in order to engage learners in active and effective online synchronous class debates and discussions. Finally, we found e-learners need support on how to break down assignment requirements and start researching. Therefore, we suggest creating YouTube videos to assist online learners deciphering the requirements of the assignments. A typical YouTube video can be found at: http://youtu.be/wuqN3MjrSrs.

Acknowledgements

We would like to thank Professor Greg Shaw for his comments on a previous draft of this manuscript as well as the online learners who participated in the study.

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**Appendix I**

The screenshots from Blackboard Collaborate shown below depict the course layout and structure which was employed for the online synchronous delivery of the various courses offered throughout the period of February 2013 to June 2015.

**Figure 1:** Login Window
Figure 2: Launch-Open the Enrolled Course

Figure 3: Posting Area of the Online Classroom
Figure 4: Launch the Session and Recorded Sessions

Figure 5: Typical Online PPT Presentation
Figure 6: Typical Synchronous Online Quiz

Figure 7: Learners’ Statistics to Quiz
Appendix II

Items used to measure the online synchronous learning environment.

I. Blackboard Collaborate access and deliberate structure
1. It was easy to find the educational material on Blackboard Collaborate.
2. The Blackboard Collaborate was well organised and clear to understand
3. On Blackboard Collaborate I found what I was looking for quickly and easily.
4. I liked using the Blackboard Collaborate for my learning.
5. The Blackboard Collaborate has encouraged me to visit it again and again.

II. Course content presentation
7. The content on Blackboard Collaborate was easy to read.
8. The Blackboard Collaborate links were easy to find and read.
9. There is too much information on Blackboard Collaborate.
10. The information on Blackboard Collaborate was useful.
11. The Blackboard Collaborate pages and sections were clearly laid out.

III. Readiness to use instructional technologies
15. I have access to reliable Internet connection with an Asymmetric Digital Subscriber (ADSL).
14. I enjoy spending time browsing the Blackboard Collaborate.
13. I use a computer on a regular basis for educational purposes.
1. I am comfortable using information and communication technologies.
IV. Online learning students' motivation
16. I do enjoy trying new things such as the Internet.
17. I am a self-started and motivated to study online.
18. I have a desire to obtain online skills for future job opportunities.

Appendix III
Table 1: Factor loadings of Blackboard Collaborate leaning environment

<table>
<thead>
<tr>
<th>Item</th>
<th>Factor Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blackboard Collaborate access and deliberate structure</td>
<td></td>
</tr>
<tr>
<td>5. The Blackboard Collaborate was well organised and clear to understand</td>
<td>0.81</td>
</tr>
<tr>
<td>3. The Blackboard Collaborate pages and images were quick to download</td>
<td>0.80</td>
</tr>
<tr>
<td>2. I liked using the Blackboard Collaborate for my learning</td>
<td>0.68</td>
</tr>
<tr>
<td>1. It was easy to find the educational material on Blackboard Collaborate</td>
<td>0.49</td>
</tr>
<tr>
<td>12. The Blackboard Collaborate has encouraged me to visit it again and again</td>
<td>0.46</td>
</tr>
<tr>
<td>4. On Blackboard Collaborate I found what I was looking for quickly and easily</td>
<td>0.35</td>
</tr>
<tr>
<td>Course content presentation</td>
<td></td>
</tr>
<tr>
<td>8. The Blackboard Collaborate links were easy to find and read</td>
<td>0.73</td>
</tr>
<tr>
<td>10. The information on Blackboard Collaborate was useful</td>
<td>0.63</td>
</tr>
<tr>
<td>6. The Blackboard Collaborate pages and sections were clearly laid out</td>
<td>0.38</td>
</tr>
<tr>
<td>7. The content on Blackboard Collaborate was easy to read</td>
<td>0.45</td>
</tr>
<tr>
<td>9. There is too much information on Blackboard Collaborate</td>
<td>0.40</td>
</tr>
<tr>
<td>Readiness to use instructional technologies</td>
<td></td>
</tr>
<tr>
<td>14. I enjoy spending time browsing the Blackboard Collaborate</td>
<td>0.84</td>
</tr>
<tr>
<td>1. I am comfortable using information and communication technologies</td>
<td>0.62</td>
</tr>
<tr>
<td>15. I have access to reliable Internet connection with an Asymmetric Digital Subscriber (ADSL)</td>
<td>0.62</td>
</tr>
<tr>
<td>13. I use a computer on a regular basis for educational purposes</td>
<td>0.25</td>
</tr>
<tr>
<td>Online learning students' motivation</td>
<td></td>
</tr>
<tr>
<td>17. I am a self-started and motivated to study online</td>
<td>0.87</td>
</tr>
<tr>
<td>16. I do enjoy trying new things such as the Internet</td>
<td>0.85</td>
</tr>
<tr>
<td>18. I have a desire to obtain online skills for future job opportunities</td>
<td>0.82</td>
</tr>
</tbody>
</table>

*Factor: 1 = Blackboard Collaborate access and deliberate structure, 2 = Course content presentation, 3 = Readiness to use instructional technologies, 4 = Online learning students' motivation.*

Appendix IV
Blackboard Collaborate suggested course layout and structure for a synchronous online learning.
Figure 1: Layout and Structure Offering Direct Access to a Variety of Course Resources

Figure 2: Course Content Presentation and Online Learning Activities
Figure 3: Additional Interactive Online Tools

Figure 4: Avoid Cramming on the Power Point Presentations
Enhancing Students’ Language Skills through Blended Learning

Choosri Banditvilai
English Department, Faculty of Liberal Arts and Science, Kasetsart University, Thailand
cbanditvtlai@yahoo.com

Abstract: This paper presents a case study of using blended learning to enhance students’ language skills and learner autonomy in an Asian university environment. Blended learning represents an educational environment for much of the world where computers and the Internet are readily available. It combines self-study with valuable face-to-face interaction with a teacher. This study puts the spotlight on learning outcomes in an English for Specific Purposes (ESP) class in Thailand in which e-learning strategies are used in parallel with traditional classroom language teaching methods of the four language learning skills. These skills are listening, speaking, reading and writing. The achievements and attitudes of students were compared between the control group and the experimental group to measure the potential of available technology to develop language skills and learner autonomy. The findings from this study show that online practice is directly beneficial to enhance the four language learning skills as well as autonomous learning and learner motivation.

Keywords: blended learning, e-learning, learner autonomy, Communicative Business English, English for Specific Purposes (ESP), motivation

1 What is blended learning?

The concept of blended learning has been around for a long time, but its terminology was not firmly established until around the beginning of the 21st century. Graham (2006) defined “blended learning systems” as learning systems that “combine face-to-face instruction with computer mediated instruction.” Poon (2013: 1) adds that the aim of the two delivery methods is to complement each other. Currently, the use of the term blended learning involves combining Internet and digital media with established classroom forms that require the physical co-presence of teacher and students. (Friesen, 2012). The article underscores the concept that many “ingredients” can comprise a blended learning model, including instructor-delivered content, e-learning, webinars, conference calls, live or online sessions with instructors, and other media and events, for example, Facebook, e-mail, chat rooms, blogs, podcasting, Twitter, YouTube, Skype and web boards. In addition, Pankin et al. at MIT (2012: 1) define blended learning as:

Structured opportunities to learn, which use more than one learning or training method, inside or outside the classroom.

This definition includes different learning or instructional methods (lecture, discussion, guided practice, reading, games, case study, simulation), different delivery methods (live classroom or computer mediated) and different scheduling (synchronous or asynchronous) ...

2 Background of the study

The language learning process is highly individual and complex (Launer, 2010). In traditional classroom teaching in Thailand, a teacher or a team of teachers lectures content while students listen, take notes and participate in class activities. In addition, most Thai students are passive and they are willing to accept what the teacher says without questioning (Wiriyachitra, 2002). Most classrooms in Thailand are teacher-centered (Noytim, 2006). Moreover, students are different in terms of intellectual ideas and perception. Some students can learn and understand more quickly and easily than others. In conclusion, classroom teaching alone may not be enough to suit individual requirements leading to the need for modern technology to serve each student’s needs. To address this, additional lessons were developed on the web for the purpose of this study, here called “E-learning”. The lessons in this e-learning program were used to support conventional types of learning. They contained activities and tasks that were not identical but parallel to the classroom lessons — on the same theme, with some of the same vocabulary and some of the same linguistic structures as the students were studying in the classroom. Students were able to access the additional lessons whenever they wanted. The e-learning in this study required students to be self-directed and autonomous. In addition, it should be noted that e-learning is in-line with the current Thai Education Plan. E-learning is described as “anywhere—anytime” learning. An additional benefit is that e-learning provides the students with an opportunity to adapt to the digital era and equip themselves with the skills to be ready for e—university, e-work and life in the 21st century.
3 Literature Review

E-learning is a new technological innovation that is increasingly used in education. Under the National Information and Communication Technology Plan (ICT) and Education Policy, the government is aware of the potential of e-learning and they have provided support with tangible strategies and infrastructures through the Thailand ICT Master Plan and the e-education framework. Within this framework Thai students are provided with opportunities to enhance their studies by accessing knowledge from every part of the world through digital learning (Suktrisul, 2007). Therefore, e-learning has increased in several Thai universities both in Bangkok and other cities. Kasetsart University, a governmental institution, encourages its staff to use e-learning pedagogical tools to support students’ learning. The University is currently integrating ICT into classroom-based language teaching and integrating the network into the curriculum. E-learning has not only become widely used in Thailand, it has also affected teaching methodology and pedagogy and enhanced educational experience by increasing motivation and allowing learners to interact more freely in academic and work settings. Many researchers have studied the relationship between the use of online learning resources and the enhancement of language skills. This line of research has established a high correlation between using this technology in the language classroom and higher achievement in language proficiency. Dawley (2007) found that e-learning encouraged learners to seek information, evaluate it, share it collaboratively and, ultimately, transform it into their own knowledge. This conclusion is supported by Tanveer (2011) who conducted a research study “Integrating E-learning in Classroom-based Language Teaching: Perceptions, Challenges and Strategies.”

In his study he has found that both teachers and learners perceive that e-learning can help students take responsibility for their own learning by making them autonomous and confident. This enables introverted students to interact more freely, provides diversification of activities, fosters an intrinsic impetus of learning and permits the acquisition of valuable study and time management skills. Moreover, e-learning also allows teachers to have a more student-centered form of learning (Poon 2013). In the English as a Foreign Language (EFL) environment, Soliman (2014) carried out a study on using e-learning to develop EFL students’ language skills and activate their independent learning. The findings revealed that e-learning is an essential tool that should be used to supplement the EFL face-to-face classroom lessons. It is seen to enhance the students’ language proficiency and promote independent learning.

Larsen (2012) studied the use of blended learning, its productiveness and the extent to which these factors affected student perceptions of the ESL writing course. Students were found to work more autonomously and to be more focused while becoming more responsible for their own learning. Not only was autonomous learning enhanced by blended learning, but students actually took ownership of the material. The term “autonomy” and “self-directed learning” are often used interchangeably, however, they still have some distinctions: autonomy is the ability to take charge of one’s own learning”, whereas, self-directed learning refers to “learning in which the learners themselves take responsibility for their own learning” (Holec, 1981:3-4). Holec first used the term autonomous learner in relation to the development of second language learning, defining it as the learner’s ability to take charge of his/her own learning. Poon (2013) stated that enhancing students’ motivation to learn on their own “at their own pace and in their own time” is an important aspect of a blended learning environment. Masie (2002: 59) argued that blended learning adds significantly greater opportunity for the learner to master material and move towards transfer and performance. When properly implemented, blended learning can result in improved student success, satisfaction, and retention. (University of Central Florida, 2015) With this proven success in mind, a blended learning environment was created for this study.

The purpose of this article is to discuss the effectiveness of a blended learning environment which combines one form of e-learning with traditional classroom teaching in order to determine if students’ language skills as well as their perceptions of this program are enhanced.

4 Research

4.1 Research Questions

This study attempts to answer two research questions:
1. How can a blended learning program develop students’ language skills better than in-class-only teaching?
2. What are the students’ attitudes towards blended learning programs?
4.2 Subjects

The subjects in this study were a class of the second year undergraduate English majors at the Faculty of Liberal Arts and Science, Kasetsart University, Kamphaeng Saen Campus in Thailand. They were all Thai. Their ages ranged from 18-21. There were 60 students, 8 males and 52 females. They were a homogeneous group because they were the same age and they had passed three compulsory English courses for English major students. i.e. English Reading, Introduction to English Listening and Speaking Skills and English Structure. They had little experience in using blended learning prior to attending this course. Both groups of students studied the same course, Communicative Business English the first semester of the academic year 2014-2015, which is an elective course. This course focused on improving listening, speaking, reading and writing, to help the students to develop their learning skills and succeed in their chosen careers.

4.3 Research procedure

In this study, sixty students were given a pre-test (TOEIC test) to determine homogeneity in terms of English language ability. The scores of the pre-test were used to place the students into 2 groups of thirty students each (see Table 3). Group 1 students (the control group) studied Communicative Business English in a classroom setting while Group 2 students (the experimental group) had their classroom studies supplemented with e-learning procedures.

Both groups of the students were required to attend 3 hours a week class instruction. However, after classroom instruction group 2 students were required to participate in e-learning program to reinforce their classroom learning. The students accessed the e-learning at their own place and in their own time.

4.4 Research instruments

In order to evaluate the effectiveness of the use of e-learning to supplement classroom learning, the following research instruments were used:

4.4.1 E-learning lessons

The e-learning lessons include various learning activities related to the content of each unit. There are six units in this program that consolidate, reinforce and expand on the classroom lessons and students can check their answer automatically. It provides students opportunities to either revisit skill-building activities or increase the skills they have already attained, thus enhancing their language learning. These online lessons were developed by the researcher for students studying Communicative Business English. During the development of the program, the units were tested by the English lecturers at the department to confirm that it covered similar content to the classroom lessons.

4.4.2 Achievement Test

At the end of the semester, the control group and the experimental group were given a post-test. Both groups were tested with the same achievement test (AT) to determine the amount of progress they had made.

4.4.3 Questionnaire

The questionnaire (See Table 4) was used to obtain student’s reactions towards using e-learning to supplement an in-class Communicative Business English course. The subjects’ responses to the questionnaire were analyzed in terms of mean scores and standard deviations on a five-point Likert scales which were interpreted as follows:

- 4.51 to 5.00 = Strongly agree
- 3.51 to 4.50 = Agree
- 2.51 to 3.50 = Undecided
- 1.51 to 2.50 = Disagree
- 1.00 to 1.50 = Strongly Disagree

Students in the experimental group were required to do a questionnaire. The initial version of the questionnaire was piloted before use. Thirty second-year English major students at the faculty of Liberal Arts and Science were randomly selected to do the pilot questionnaire. The purpose of piloting was to ensure that the language used in the questions was understood by students and the questions successfully elicited the required information. Based on the comments and feedback from the students, the questionnaire was revised.
to make sure there was no confusion. The questionnaire was divided into two parts. Part one collected the students’ personal information regarding gender, age and blended learning experience. Part two consisted of ten questions aimed at obtaining student’s reactions towards using e-learning to supplement an in-class Communicative Business English course. Questions 1-5 aimed at collecting information on the students’ attitudes towards using e-learning to supplement in-class teaching. Questions 6-10 were designed to elicit students’ responses on the capacity of the blended learning program to develop students’ languages skills.

4.4.4 Semi-structured interview

To provide further support, 15 students from the experimental group were randomly selected for interviews of 8 questions at the end of the experiment. Students were asked for their opinions on using e-learning to supplement Communicative Business English course. The interview was recorded, transcribed, and coded with similar themes categorized.

Table 1: Summary of research questions and instruments

<table>
<thead>
<tr>
<th>Question</th>
<th>Instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td>How can a blended learning program develop students’ language skills better than in-class-only teaching?</td>
<td>Achievement Test in the pre-test, post-test and students’ attitudes in the questionnaire</td>
</tr>
<tr>
<td>What are the students’ attitudes towards the blended learning program?</td>
<td>Questionnaire and semi-structured interview</td>
</tr>
</tbody>
</table>

5 Instructional design

In this study Group 1 (the control group) was taught using face to face instruction only. The students received lecturers, tutorials and homework. Group 2 (the experimental group) was taught using the same method of teaching as Group 1. However, it was supplemented by e-learning lessons. There was an orientation phase to introduce the e-learning program and provide an example of e-learning supplementary material to Group 2. According to Soliman (2014), there are many e-learning activities that can be used to enhance students’ language proficiency and independent learning. In this study, the researcher developed e-learning lessons which were parallel with the classroom lessons. The main objective of the e-learning program was to develop the four language skills: listening, speaking, reading and writing. Students practiced listening for gist, speaking, reading and writing tasks. There were a variety of activities such as, multiples choices, matching and short answer questions. The students completed the activities independently and they were tested on their understanding of the content. Students could progress to the text page, be taken back to a previous paper or be redirected down a different path.

6 Instructional Procedure

According to the class schedule, the morning class (Group 1) underwent the experiment without e-learning and the afternoon class (Group 2) underwent the experiment using e-learning to supplement in class teaching. An example of the procedure was as follows:

Table 2: Stages for teaching Group 1 and Group 2

<table>
<thead>
<tr>
<th>Stages</th>
<th>Group 1</th>
<th>Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher lectured.</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Students did activities.</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Teacher assigned homework.</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Teacher introduced the e-learning program.</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Students studied with the e-learning program.</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Students completed a questionnaire.</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Teacher interviewed the students.</td>
<td>✗</td>
<td>✓</td>
</tr>
</tbody>
</table>
7 Findings from the application of the three research instruments

7.1 Data from the test (AT)

At the end of the course, both students in Group 1, the control group who had received no supplementary e-learning, and Group 2, the experimental group who had received supplementary e-learning, were given a post-test with a 50-minute time limit. The scores were collected from each group, and then the mean and standard deviation of the control group and the experimental group were calculated. To ensure that the control group and the experimental group were similar in terms of language abilities, we conducted independent t-test. The results are shown in table 3.

Table 3: Independent t-test between control group and experimental group

<table>
<thead>
<tr>
<th>Test</th>
<th>N</th>
<th>Mean</th>
<th>S.D.</th>
<th>T-Value</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test Control group</td>
<td>30</td>
<td>27.53</td>
<td>5.65</td>
<td>0.37</td>
<td>0.715</td>
</tr>
<tr>
<td>Experimental group</td>
<td>30</td>
<td>27.01</td>
<td>5.33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-test Control group</td>
<td>30</td>
<td>37.28</td>
<td>4.81</td>
<td>-3.38</td>
<td>0.001</td>
</tr>
<tr>
<td>Experimental group</td>
<td>30</td>
<td>41.43</td>
<td>4.7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3 shows that the mean score of the pre-test of the control group and experimental group were nearly the same (27.53 and 27.01, respectively) and the results of t-test indicated that there was no significant difference between the two groups with respect to their language abilities (t = 0.37, p > 0.05). From the post-test results, the experimental group had a higher mean score than the control group (37.28 and 41.43, respectively) and the results of t-test indicated that there was significant difference between the two groups (t = -3.38, p < 0.05). The significant increase in mean score in the experimental group highlighted the potential for accelerated development of students’ language skills through e-learning.

7.2 Data from the questionnaire

After finding a significant increase in learning for the experimental group, students received a questionnaire to determine the reasons for their enhanced learning. In the questionnaire, the subjects were asked about their perception of e-learning’s effect on their language skills.

Table 4: Questionnaire

<table>
<thead>
<tr>
<th>Questions</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 The e-learning lessons help the students understand the subject better.</td>
<td>4.50</td>
<td>0.51</td>
</tr>
<tr>
<td>2 The lessons in the e-learning program are interesting.</td>
<td>4.40</td>
<td>0.56</td>
</tr>
<tr>
<td>3 The teacher should use this program to supplement in-class teaching.</td>
<td>4.57</td>
<td>0.50</td>
</tr>
<tr>
<td>4 This e-learning program motivates the students to study by themselves.</td>
<td>4.65</td>
<td>0.55</td>
</tr>
<tr>
<td>5 The students’ learning experience is enhanced by this e-learning program.</td>
<td>4.43</td>
<td>0.50</td>
</tr>
<tr>
<td>6 This e-learning program develops students’ language skills.</td>
<td>4.53</td>
<td>0.51</td>
</tr>
<tr>
<td>7 This e-learning program develops students listening skills.</td>
<td>4.40</td>
<td>0.47</td>
</tr>
<tr>
<td>8 This e-learning program develops students speaking skills.</td>
<td>3.80</td>
<td>0.41</td>
</tr>
<tr>
<td>9 This e-learning program develops students reading skills.</td>
<td>4.30</td>
<td>0.44</td>
</tr>
<tr>
<td>10 This e-learning program develops students writing skills.</td>
<td>4.23</td>
<td>0.53</td>
</tr>
</tbody>
</table>

As can be seen from Table 4, the students in the experimental group had favourable attitudes towards enhancing their language skills through e-learning. Most students thought that this program should be a supplement to in-class teaching. In addition, there was a favorable response relating to motivational aspects delivered through the use of technology. It motivated the students to study by themselves. It also helped them better understand the lesson because the supplementary lessons covered similar content. Moreover, students felt that this program could both facilitate and enhance their learning experience. It helped them develop their 4 language skills—listening, speaking, reading and writing. Here a caveat should be noted: the mean value of
question number 8 is lower than other items because the students felt this program did not afford them enough speaking practice.

7.3 The data from the semi-structured interviews

The results of the semi-structured interviews show that most of the students in the experimental group had positive attitudes towards using supplementary e-learning. They considered this program more interesting than normal classroom learning because they could study by themselves without losing interest. The following are summaries of the students' stated reasons for both positive and negative aspects of using e-learning to supplement in-class teaching. Extracts showing a positive response include:

7.3.1 Accessed whenever convenient

“I like the e-learning program because it is simply accessible anytime and anywhere.”

“I like this teaching program because I can access my lessons at any time. This makes me feel relaxed and enjoy learning.”

“I want the teacher to supplement e-learning in-class teaching because I can access when I want it.”

“I can review materials when I want and feel very comfortable doing the task at home.”

“I like this program because I can work whenever and wherever I prefer.”

7.3.2 E-learning improves their language skills

“This program helps me think and develop my language skills.”

“I like e-learning because it can help me improve myself in learning English.”

“E-learning helps me develop my listening skills. If at first, I cannot understand what they say. So I listen again and again until I can understand.”

“My reading skills have improved and I can read faster.”

“I think it is good to use this program because I have more opportunity to practice listening, speaking, reading and writing.”

7.3.3 Motivates students to learn more

“E-learning can motivate me to learn more because I actively involved in learning.”

“The exercises are motivating and I like doing it a lot.”

“I enjoy learning a lot and I also have a better attitude towards learning English.”

7.3.4 Self-directed learning

“With e-learning, I take the responsibility for my own learning.”

“Traditional classrooms are teacher-centered but in e-learning we do everything by ourselves.”

“I plan my time to study by myself.”

“E-learning offer flexibility to learn on my own pace.”

“With e-learning I am exposed to the language outside the classroom and work independently on improving my language skills.”

7.3.5 Immediate feedback

“I prefer e-learning activities as I get immediate feedback.”

“The task that I like most is listening to complete the conversation. It is challenging and I find that simultaneously checking the answers by myself is very interesting.”
7.3.6 **Interested and easy presentation**

“The presentation is interesting and stimulating and there are a lot of visuals and sounds which make it similar to a real communication in the classroom. Moreover, material is easy to follow.”

7.3.7 **Reinforce classroom learning**

“I really like this program because the lessons are very similar to the lessons in my class. I can use the knowledge I already had to link with the new knowledge. It improves my language skills.”

“Though the content of in-class teaching and e-learning are similar, the e-learning seems to expand what we learnt in class.”

However, five interviewees highlighted negative aspects of the e-learning program:

7.3.8 **Lack of an actual teacher’s face-to-face feedback**

“I prefer to get the feedback from the teacher in class rather than virtual feedback because I can discuss with the teacher directly.”

“If I have a difficult time to understand how the passage goes, no one is there to explain it to me like we have in a classroom.”

“I prefer face-to-face feedback because it is more effective and personal.”

“I like to study in a classroom because I can talk to the teacher. When I don’t understand the lesson, I always ask her.”

“I prefer face to face interaction with the teacher.”

7.3.9 **Slow computer or network**

“Sometimes the Internet connections are so slow and unavailable that I am wasting my time while I wait to be connected”.

“I can’t find the server, so I can’t use e-learning”.

Data from the semi-structure interview showed that e-learning reinforced students learning with parallel lessons, thus sparing the students the embarrassment of asking the teacher to repeat something over and over again. In addition, it gave the students more freedom to control what they wanted to learn and how they wanted to learn it. Moreover, it provides flexibility for students to work at their own pace and time, not at the teacher’s pace, with prompt feedback online (Poon, 2013). In this way, students could concentrate more on the material they found challenging and increase their pace on the tasks/activities that were quickly acquired. Furthermore, students were exposed to the language outside the classroom and worked independently on practicing their language skills and improving their learning. However, some students stated that having the teacher available was more conducive to learning, especially to answer questions promptly and explain them in details.

The downside is that of time constraints caused by the computers/network being down or very busy. These technical difficulties may be dealt with through upgrading and maintaining of technical equipment — server, intranet and the Internet. In the event that additional spending on system upgrades is unrealistic or impossible, a self-defined blended learning environment can be established within the situational constraints.

8 **Discussion and practical applications**

E-learning received both positive and negative feedback from the students. The goal of the study was to find out if the addition of e-learning in a blended learning environment would enhance learning. It might be noted that some student’s preference was face to face interaction. However, the findings of e-learning program demonstrated that an increase in students’ motivation and the development of more autonomous learning.

8.1 **Enhanced Learning**

The data obtained from all three sources indicates that the supplementary e-learning program developed students’ language skills better than in-class-only teaching. The online program reinforces and expands the textbook and classroom activities, thus providing students opportunities to revisit activities and tasks that are
skill-building. It also enhances the skills they have already achieved. E-learning also encourages students to study independently and spent more time engaging in the English language to improve their language proficiency.

8.2 Changes in Roles

From a response to an interview question: “Traditional classrooms are teacher-centered but in e-learning we do everything by ourselves.” It can be inferred that the transfer from teacher-centered to student self-directed learning suggests considerable changes in the delivery of language skills learning. Poon (2013) supports this idea that blended learning is a fundamental redesign of the instructional model with a shift from teacher-centered to student-centered. A transformation of the role of the teacher from lecturer to facilitator enables the students to actively engaged in their learning and take more responsibility for their own learning while receiving support and encouragement from a facilitator (Moores, Akhurst & Powell, 2010). In addition, students also appreciated the change in role of the teacher to scaffolding builder/facilitator (Noytim 2006). Students regarded this e-learning program as a helpful tool for them to learn English. E-learning also encourages learners to work independently as each student can work on different tasks at their own pace and able to work faster and finish more activities than novice learners. (Nedeva & Dimova, 2010). In addition, it should be pointed out that students at all levels of English ability were further challenged by the e-learning tasks because the lessons were not identical to the classroom lessons but parallel to them. Hence the lessons were not redundant, as they related to the textbook and classroom materials.

8.3 Motivates Students’ Learning and Learner Autonomy

The data from the questionnaire and the semi-structured interview (See results under “Self-directed learning”) demonstrates that students have a positive attitude towards the use of e-learning because it enables them to become more motivated and more involved in the learning process. This can often encourage learners to become more responsible and willing to engage in their own learning, which is defined as learner autonomy (Benson, 2004; Dornyei, 2001; Ely, 1986; Gardner, 1985; Kyriacou & Zhu, 2008). Wan-er (2008) found that students’ positive attitude and learning motivation, leads to greater autonomy. Ellis (1994) recognized learner motivation as a key factor influencing the rate and success of second/foreign language learning. In this research we found that motivation not only leads to enhanced learning, but self-directed e-learning motivated students to greater autonomy in the learning process.

8.4 Face-to-face interaction

While there are many positive aspects to blended learning, the lack of actual face-to-face feedback from a teacher may be difficult for some students to cope with. Some students interviewed believed that we can use e-learning to aid students’ learning, but it should not be used to replace the valuable interaction between teachers and students. Human interaction provides a feeling of social connectedness not possible in virtual communication. A possible solution to this discomfort with a lack of face-to-face interaction (Key, 1980) is to create a blended learning environment that actually provided more teacher/facilitator interaction, in a word, redefining the blended learning mix towards a larger classroom component.

9 Conclusion

Blended learning is a valuable concept that can be used to more successfully achieve teaching goals. It allows students to develop and practice English language skills outside the classroom at anytime and anyplace they choose, as long as they have access to an Internet connection. In addition, it permits them to repeat lessons without judgment or pressure. The proven enhancement of student learning documented in this study validates this type of blended-learning. The addition of e-learning to classroom teaching provides students with opportunities for autonomous learning and a decentralized transfer of knowledge.

10 Limitations and future studies

Although this study was carefully developed, one limitation of this study is that it was limited only to one class of Kasetsart University (Thailand) students. Further studies might be conducted with different academic/non-academic institutions, disciplines, age groups and blended learning combinations. These studies would need
to be structured according to institutional, budget considerations and materials/media, as well as students’ learning styles.

Appendixes 1-4: Samples of screen images from e-learning program

Appendix 1: Course Description

Appendix 2: Course Objectives

Appendix 3: Contents

Appendix 4: Listening Exercises

Appendix 5: Questions of semi-structured interview

1. Do you think blended-learning enhances your listening, speaking, reading and writing? If yes, how?
2. What are the differences between classroom learning and blended learning?
3. How do the teacher’s and students’ roles in this program differ from those in your normal classes?
4. What are the advantages and disadvantages of this blended learning program?
5. How would you describe the relationship between the e-learning and in-class learning?
6. Would you like other teachers to use blended learning in English classes? If so, how?
7. Do you prefer a normal classroom or a classroom supplemented by e-learning?
8. Are there any other comments you want to make about the program or about what you have learned in the program?

References