Enhancing Student's Academic Achievement with Virtual Learning Environment

Research-in-progress

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Abstract:

The advancement in technology allowed several innovative applications to be produced and used specially in the education field. Students have more choices to acquire knowledge than before. On the other hand, universities are striving to increase the effectiveness of education and reduce the costs at the same time. Universities are adopting the online education as a way to reach distant students and preserve the cost associated with traditional education method. However, the number of students in online courses is increasing and the need to adopt effective solutions to provide distant learning for those students is vital (Huynah, Umesh, & Valacich, 2003). Many learning tools have been introduced to serve as a bridge between students and knowledge. Virtual Learning Environment (VLE) is a technology-based software that helps students to achieve more knowledge. We are interested in raising the question, "Are the VLEs more effective than traditional classroom lectures for the instruction of information science topics?" This study is investigating the relationship between using the VLE and achievements of students. Also, the study is investigating the perceived engagement and the perceived learning of students. We are expecting that VLE tools are more effective than the traditional learning process. The results of this research will help universities, corporate training and any course provider to make the right decision about adopting such technologies. Also, the results will assure students that the online course option is at least as effective as the traditional learning option if it is not even better.

Keywords:

Computer learning, Virtual Learning Environment, Interactive Learning, Achievement, Perceived Engagement, Perceived Learning

1. Introduction

Technology is changing and new learning techniques are emerging continuously. The advancement in technology allowed several innovative applications to be produced and widely accepted specially in the education field. Students have more choices to acquire knowledge than before. Universities are striving to increase the effectiveness of education and reduce the costs at the same time. It is important to understand technology and its capabilities (Leidner & Jarvenpaa, 1995). It is also important to understand the traditional learning process. By combining both understandings, researchers can find the interactions between the two fields. This will result in alternative education processes that are completely suitable to the type of technology that they use. Moreover, technology has always been used to automate the process of achieving goals. However, it is an important role that technology should also change the process of achieving outcomes when necessary (Alavi, 1994). The effectiveness of technology in education is an interesting topic in education journals (Bostrom, 2009). Information System (IS) researchers have focused on topics such as group trainings and workplace education. Virtual Learning

Environment (VLE) tools have been introduced to serve as a bridge between students and knowledge. VLEs are defined as "computer-based environments that are relatively open systems, allowing interactions and encounters with other participants and providing access to a wide range of resources" (Wilson 1996, p. 8). VLEs are technology-based software that helps students to achieve more knowledge. To be more specific, the type of learning environment in this study is interactive. This means that students are not only watching (passive) but also responding (active).

Course materials and assignments can be transmitted over the Internet between instructors and students. Virtual environments allow not only transmission of assignments but also the interaction between students and the material through problem solving and practice. These environments are cost effective and easy to install and learn. Furthermore, companies are making profits by providing services related to VLEs (Alavi, Wheeler, & Valacich, 1995). The number of students interested and admitted to universities especially online courses is increasing and the need to adopt effective solutions to provide distant leaning for those students is vital (Huynah, et al., 2003). Research in this area will enrich the knowledge base and contribute to both theory and practice. Relevant theories such as cognitive learning theory and models such as Objectivism and Constructivism will benefit from this research. Also, research in VLE in education will shed the light on the relevant theories from other disciplines that concern education and contribute to build proper literature of education in the IS society. Moreover, developers and service providers of such learning environments will find it profitable to invest in building VLEs. As a result, various learning options will be available to students. Effective virtual learning environments or virtual collaborative environments can reduce the costs and also bring profits to organizations (Alavi et al., 1995).

The literature shows many research in the effectiveness of technology in education. Virtual learning environments improve the outcomes of the students (Alavi, 1994 ; Maki, Maki, Patterson, & Whittaker, 2000). VLE positively increases the learning attitude (Schutte, 1997). Technology has a positive impact on the interaction between students and teachers (Cradler, 1997 ; Schutte, 1997). Finally, many researchers investigated the impact of technology acceptance model TAM on the acceptance of VLEs (Nelson & Cheney, 1987 ; Ong, Lai, and Wang, 2004; Ong & Lai, 2006 ; Ngai, Poon, and Chan, 2007). However, studies about the relationship between computer-related courses and VLEs have rarely been addressed in the literature. In a recent study, Heemskerk, Kuiper, and Meijer (2014), there was no relationship between teaching with an Interactive White Board (IWB) and mathematics performance. However, Heemskerk et al, (2014), found that students' motivation for mathematics was positively related to combining lessons made for the IWB and providing these lessons on the VLE. Using a combination method was behind the reason why students appreciated the VLE.

The important question that this research raises is "Are the VLEs more effective than traditional classroom lectures for the instruction of information science topics?" If they are more effective and engaging, they will be a better solution to the conventional learning processes. This study is interested is a specific type of VLE. It is more concerned about using the technology to teach about the technology. In other words, the VLE will be used to teach students about how to use software.

The paper is organized as follows. Theoretical foundation section will describe the related theories. Hypotheses development section will give an overview of the constructs that build the model and state the hypotheses of the study. Instruments and the process of their developments will be discussed next. Future work, will suggests how this study can be extended. Finally the conclusion part will sum up the study.

2. Theoretical Background

There is a call to integrate technology with education. One of the great areas is to use VLEs especially with technology related courses. Technology should advance the process of education to create more complex environments where students must feel that they are using the real application with knowledge support (Ferratt & Hall, 2009). Mayer (1981) introduced the process of meaningful learning. He said that the process of learning starts with the stimulus, which is the new information. Then, the brain searches the long-term memory for any related information and keeps it in the short-term memory. More usage and practical use of the information will transform it to the long-term memory (Davis & Bostrom, 1993). It becomes a constructive knowledge where students for example acquire new information from instructors or VLEs, process it by putting together all the parts and then analyze them to build a solid useful information that can be applied (Alavi, 1994).

There are five different learning models (Liedner & Jarvenpaa, 1995); objectivism, constructivism, collaborationism, cognitive information process and socioculturism. The first two models are part of Pedagogical Theory (Piaget, 1928). This theory divides learning into objective and constructive. The former type is an instructor oriented while the other one is more student oriented. (Wu, Hiltz & Bieber, 2010). VLEs have dual functions. In one hand they encourage students to construct the learning process. It assumes that individuals will learn more effectively if they have the chance to discover what they don't know yet. This is the constructivism model. On the other hand, VLEs help the transformation of knowledge into the long-term memory by allowing participants to practice and apply the knowledge in almost similar to real environments. This is the cognitive learning model. The theoretical foundation for this study is cognitive learning theory. This theory says that students will learn better using active learning processes and problem solving methods (Alavi, et al., 1995). Using VLEs can be a mixed learning process. In my case, we will use both teaching in class (instructor oriented) and also an online virtual learning application that allows students to solve problems (student oriented).

3. Hypotheses Development

Using interactive learning environments is assumed to have an impact on the learning process. This paper is investigating if using VLE has an impact on the student's outcomes. The research question would be: "What is the impact of using Virtual Learning Environment (VLE) on student academic achievements?" The unit of analysis is the students (individual level). The dependent variable in our study is the student academic achievement. We measure the academic achievement by the student's grades in assignments and exams. The independent variables will be VLE, perceived engagement and the perceived learning. The IVLE variable will differentiate between students who use the IVLE and students who use the traditional learning environment. The perceived engagement variable will affect the dependent variable directly and also affect the dependent variables via a mediating variable (Perceived Learning). The engagement and perceived learning variables will be measured through survey questions and some metrics from the VLE system. This experiment will control for gender, age and other variables. The research hypotheses for the basic model are:

–H1: Students who participate in VLE will receive higher academic achievements than students who use only conventional course material.
–H2: Students who participate in VLE will be more engaged than students who use only conventional course material.

–H3: Students who participate in VLE will have higher perceived learning than students who use only conventional course material.
–H4: Perceived engagement will positively influence perceive learning.
–H5: Higher level of perceived engagement will yield to higher academic achievement.
–H6: Higher level of perceived learning will yield to higher academic achievement.

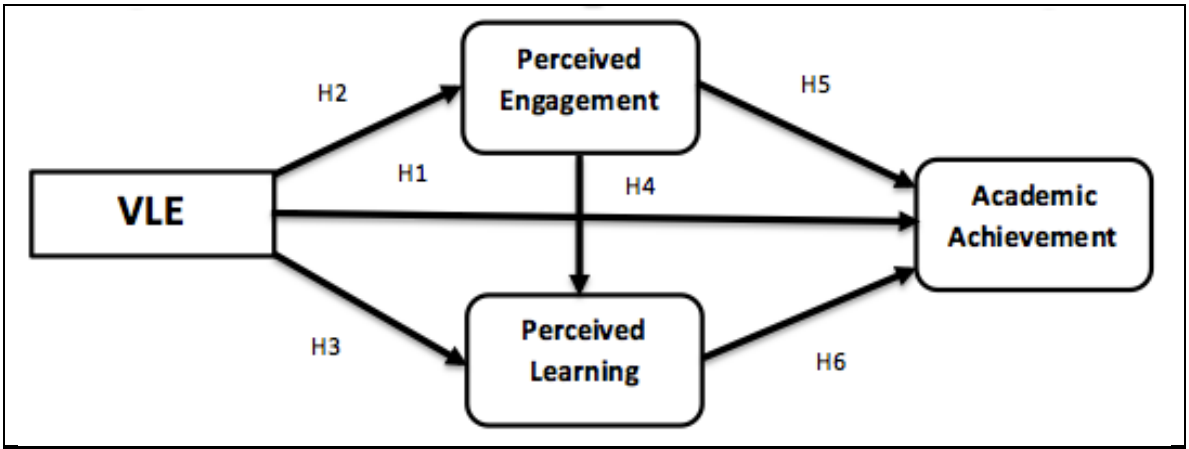

Figure 1. The research model

4. Instrument Development

Three constructs inform the research model presented in Figure 1. The constructs were extracted from the literature. Table 1 shows the proposed constructs, the paper that initially used the construct and the name of the constructs in that paper.

Construct	*Construct in Literature*	*Paper*
Academic Achievement	Perceived subject-matter learning	Alavi, Maryam, George M. Marakas, and Youngjin Yoo (2002), "A Comparative Study of Distributed Learning Environments on Learning Outcomes", Information Systems Research, 13, 404-415.
Perceived Engagement	Engagement	Webster, Jane, and Jaspreet S. Ahuja (2006), "Enhancing the design of web navigation systems: The influence of user disorientation on engagement and performance", MIS Quarterly, 30, 661-678.

Table 1. The proposed constructs

Measurement statements were mostly collected from the literature. Items for the construct "Perceived Learning" were not available in the literature. We adopted the objectives of the course to set the measurements for this construct. The course has two main topics: Excel and Access. Each topic has a list of objectives that each student should learn about. These objectives were used in the measurements. The statements were put in one list and scrambled randomly by using an online service from (www.random.org) website. Then, a document was prepared by listing all the random sorting statements and a table that has two columns. The first column is named Category and the second column is named Statement. At the top of the document there was brief introduction about the study and the purpose of it. Then, it asks the participants to place each statement in the most appropriate category. The document was sent by email to a total of 30

students who take the same course that the study is interested in but they are not part of the experiment. This will increase the validity of the test since the students are similar to the experiment sample. There was no compensation given to the students and all the responses were random and voluntarily. Finally, each statement was analyzed separately to see how many students were successfully able to match it to the appropriate category.

Only 17 students responded with four incomplete documents. Only the completed documents were processed. The results show that almost all statements were placed correctly. The cutoff point was 70%. Only nine statements were below 70% with the lowest rate of 35% correct matching. These statements are redundant and can be dropped. Table 2 shows the final proposed measurements of each construct.

Construct	*Items*	
Academic Achievement:	1	I became more interested in the course after using IVLE.
	2	I gained a good understanding of the course.
	3	I was stimulated to do additional exercises using IVLE.
	4	My ability to critically analyze issues was improved.
	5	I found IVLE to be a good learning experience.
Perceived Engagement:	1	IVLE kept me totally absorbed.
	2	IVLE held my attention.
	3	IVLE excited my curiosity.
	4	IVLE aroused my imagination.
	5	IVLE was engaging.
Perceived Learning (MS Excel)	1	I learned about how to format Excel worksheet.
	2	I learned about how to apply conditional formatting.
	3	I learned about how to use simple functions.
	4	I learned about how to insert tables.
	5	I learned about how to format tables.
	6	I learned about how to insert Pivot tables.
	7	I learned about how to insert charts.
	8	I learned about how to insert Pivot charts.
	9	I learned about how to use complex functions.
	10	I learned about how to deal with multiple workbooks.
	11	I learned about how to deal with multiple worksheets.
	12	I learned about how to apply macros.
	13	I learned about how to apply security in worksheets.
Perceived Learning (MS Access)	1	I learned about how to build tables.
	2	I learned about how to populate tables.
	3	I learned about how to build relationships between tables.
	4	I learned about how to create queries.
	5	I learned about how to edit queries.
	6	I learned about how to create forms.
	7	I learned about how to edit forms.
	8	I learned about how to create reports.
	9	I learned about how to edit reports.

Table 2. The proposed items for each construct

5. Research design and Hypotheses Testing

The theoretical population for this study is going to be all students who are going to use VLE to learn about software. The sample for this study will be a convenience sample of students who will be taking an undergraduate course at a Midwestern U.S. research institute. There will be two main sections of the course: online course and conventional course. The experiment requires two groups: treatment group and control group. One online section and one condensational section will be in the treatment group. The other online section and conventional section will be in the control group. We are expecting about 40 students to be in each section. To test the hypotheses we will be conducting a quasi-experiment. The control group will use only the traditional course material that is offered to all students. The treatment group will use VLE. An instructor will give a tutorial on how to use the VLE in the first week of the semester. Students will be given tasks and exercises to do during the experiment. These tasks and exercises match the objectives of the course. All groups will be taking a unified final exam. Moreover, the treatment groups will also answer a brief survey. The survey will include some manipulation checks and measurements for the engagement and the perceived learning. However, manipulation checks will depend on the student's actual work on the software that is captured by the VLE. The collected data will be used for analysis.

6. Expected Results

We anticipate that the members in the treatment group who are using the VLE as a learning tool will outperform those who are using the conventional course. We will analyze the collected data and compare each group in terms of demographics and conduct t-tests. We will use ordinary least squares (OLS) estimation in our models. We will estimated two sets of equations to test the proposed hypotheses:

1. $Academic\ Achievement = \beta_1\ Engagement + \beta_2\ Perceived\ learning + e$
2. $Academic\ Achievement = \beta_1\ Engagement + \beta_2\ Perceived\ learning + \beta_3\ IVLE + e$
3. $Perceived\ learning = \beta_1\ IVLE + e$
4. $Engagement = \beta_1\ IVLE + e$

We will run several tests to assess for the robustness. We will check for multi-collinearity by computing variance inflation factors (VIF) after regressions. Then we will conduct white tests for heteroscedasticity.

7. Future work

There are many ways to extend the research in this topic. Virtual learning environments became common practice in education such as distance learning (Piovesan, Amaral, Arenhardt, and Medina, 2012). The nature of these environments is static. In other words, the development of these mediums assumes that teachers and students are going to access them through conventional computer devices. The dependence on mobility devices such as smart phones and tablets has increased in the last years. These devices are connected to the Internet by various speed connections. The expansion in using ubiquitous computing specially with the advanced developments in cloud services require that these environments should adapt and respond to these changes. The literature focuses on the development and the evaluation of the traditional VLEs (Piovesan et al., 2012). The authors believed that such adaption would have impacts on using the system more and benefits students and teachers. It will also provide new tools that help increasing the effectiveness of the material covered in the VLEs. Studying the habit of accessing VLE from

various devices and how that affects the student's engagement and perceived learning is an interesting study. The material in the VLEs may not be suitable to be accessed with limited Internet connections for such devices or the lack of powerful processors. Also, the view of the contents through the screens of these ubiquitous devices makes it hard to achieve the maximum benefits from these materials because the materials do not adapt to these changes.

Another way to look into this study is by adopting the collaborative learning approach. Many researchers in the IS journals discussed and investigated the effectiveness of computer mediating learning that uses a collaborative learning process. Students are assumed to learn better and faster when the task involves more participants. The VLE can be a continuous project where groups are competing to accomplish certain tasks. During the learning process, participants are exposed to ideas and are required to perform tasks that are pre-designed to follow the course objectives.

8. Conclusion

The basic theoretical foundation for this research is cognitive learning theory. One main attribute of this theory is that participants conceive knowledge through problem solving. By using interactive virtual learning environments (VLE), participants engage in an interactive situation where they receive information and practically respond to questions. This study will contribute to the body of knowledge by providing more support to the theory using an educational instrument. Also, by providing evidence of the usability of this type of educational tool companies could focus more on the development of applications that help students to acquire more knowledge in an effective and efficient way. This will be beneficial for both businesses and academic institutions.

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