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Exploring Students' Reactions to Virtual Worlds

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ABSTRACT

Our research explores multi-user virtual environments for teaching university-level courses. This paper focuses on undergraduate students' reactions to five virtual worlds explored as part of a Computers and Ethics course. Written reports from twenty-five students were qualitatively analyzed with respect to perceived ease of use, user satisfaction, and user concerns. Our preliminary findings indicate that students' perceptions and attitudes were mixed. Some students perceived virtual worlds as relatively easy to use regarding object interactions, communication and user interaction. However, there were some instances of difficulty in navigation and in completing some tutorials. Furthermore, students expressed concerns beyond usability issues, such as user misbehavior and cheating. These issues could become significant barriers to using virtual worlds for college courses. We present suggestions for reducing such barriers.

Keywords

Virtual Worlds, Learning Management Systems, Technology Acceptance Model, User Satisfaction, User Concerns, Qualitative Research

INTRODUCTION

In this technological era, many educational institutions around the world are still using traditional methods and tools for teaching. Lessons are frequently taught using a lecture-type style in which students are passively learning by listening to the instructor. Also, students are still expected to internalize their knowledge through mechanisms such as rote learning or memorization by repetition. These commonly practiced teaching methods are antithetical to the constructivist learning theory advocated by many educational experts (e.g. Piaget, 1972; Vygotsky, 1962). The constructivist theory holds that "knowledge is not mechanically acquired, but actively constructed within the constraints and offerings of the learning environment" (Liu and Matthews, 2005, p. 387). This theory also suggests learning techniques and environments that allow students to connect concepts to real life are likely to be more effective. Modern information and communication technologies, such as virtual worlds, can provide teachers with the capabilities of introducing concepts to students using more concrete and real-life illustrations.

Students of the millennial generation (born after 1980) are more in tune with technology than their predecessors. Consequently, new approaches to teaching using technology are more likely to be embraced by them. Siemens (2004) suggests that earlier learning theories developed prior to the advent of modern communication technologies may still have some relevance; however, there is a need to develop new theories that are more applicable in learning environments in which modern technologies are used. According to Siemens (2004, p.1) "learning needs and theories that describe learning principles and processes should be reflective of underlying social environments."

In this research, we focus on the use of a specific type of technology, virtual worlds, in the learning environment. Virtual worlds are defined by Bouras, Philopoulos, and Tsiatsos (2001) as computer-based environments that provide a way to combine the best features of real-world interaction (e.g. visual cues) with the best features of online navigation (e.g. quick cross-referencing). Virtual worlds can provide individuals with opportunities for a constructivist approach to learning, due to their immersive multiplayer characteristics (Oblinger 2006). However, there are issues, such as user concerns and barriers pertaining to the use of virtual worlds that must be addressed in order to utilize them effectively in the learning environment. It is therefore important to conduct research aimed in understanding these issues.

In this paper, we present the results of an exploratory study that elicited from students their perceptions and attitudes towards the use of virtual worlds in a learning environment. We also identify ethical and social issues, privacy concerns, and barriers relating to the use of virtual worlds in education and training.

The remainder of this paper is organized as follows: First, a literature review on virtual worlds including Second Life as a learning tool is presented. Next, the methodology is outlined. The results from the study are then reported along with a discussion of the implications of these results. Finally, conclusions drawn from the results along with limitations and suggestions for future research are presented.

VIRTUAL WORLDS IN EDUCATION

Prior literature has identified various ways in which virtual worlds can be used in a classroom setting. Virtual worlds can be adapted to implement learning strategies that can be costly, complex, and even dangerous to implement in a physical classroom (Kluge and Riley 2008). They can also allow students to perform tasks and simulations that can closely match those encountered in the real world (Kluge and Riley 2008). Second Life (SL), which is one of the most popular virtual worlds, has been used by many educational institutions for promoting themselves and in offering classes. Some of these institutions have made SL an integral part of their curriculum, and others are using it as an experimental educational venue (Davidson 2008). Research on virtual worlds in education is very limited primarily because of the novelty of the technology. Some researchers have explored (1) the effect of virtual worlds on perceived learning (Delwiche 2006); (2) the value of these worlds in developing skills in perspective taking, that is, “putting yourself in someone else’s shoes” (Mullen, Beilke, and Brooks 2007); and, (3) the use of an extended technology acceptance model (TAM) in predicting students’ behavioral intention to use (Vogel, Guo, Zhou, Tian, and Zhang, 2008).

In a study involving students at a liberal arts college, Delwiche (2006) found that SL had a positive impact on students’ perceived learning and on the quality of their projects’ outcomes in a game-design course. Mullen, Beilke, and Brooks (2007) did a study in which SL was used to instruct student-teachers in the application of rhetoric fundamentals in research. The student-teachers became academically and socially immersed in the SL culture, through role-playing, blogging, and participant observation; appearing to have more empathy, which is desirable in pedagogy. In a series of studies involving students from the University of Hong Kong, and the University of Eindhoven in the Netherlands, Vogel et al. (2008) compared SL with email, instant messaging, discussion forum, and video conferencing using the constructs of an extended TAM model. Comparatively, SL was rated poorly with regard to perceived usefulness, perceived ease of use, perceived team attitude, and intention to use. However, it scored highly with respect to perceived team enjoyment, interaction capacity (power of transmitting multiple cues — i.e. body language, tone of voice), emotions conveyed, and design style (i.e. attractive interface).

Based on this and a more extensive literature review, we identified our motivation for this research. The first motivation is to gain insight on how virtual worlds can be successfully integrated in instruction and learning and the potential benefits that can be achieved. The second motivation is the discovery of user concerns, which refer to potential barriers that end-users perceive that may hinder, stop, or discourage them from using these environments.

RESEARCH METHODOLOGY

In this study, both quantitative and qualitative data were collected on the experiences of undergraduate students in a Computers and Ethics course at a Northeast US university. We chose to focus on the qualitative data for this paper; therefore we used an interpretivist approach in our analysis. This approach puts users’ words and observations into a consistent picture; maintaining the participants’ “voices” (Trauth and Jessup 2000). A convenience sample technique was used to recruit students for the study as the sample frame was one class taking the Computers and Ethics course. Participation in this study, although voluntary, was treated as a course project assignment that contributed to 25% of students’ final grade. Students who chose not to participate were required to complete an equivalent alternate assignment. Although a total of 28 students volunteered to participate in this study, three did not produce usable reports, resulting in a sample size of 25. The course project assignment was done in six phases.

Phase One

Students completed the “Human Subject Assurance” training administered online by the Office for Human Research Protections (OHRP). The goal of this training was to make students understand issues related to the protection of human subjects who participate in research; this was one of the course’s objectives.

Phase Two

Students downloaded and installed the Second Life (SL) client software. They then created avatars to represent themselves, and assigned names to these avatars. Once they finished with the avatar creation, students logged in, took the orientation tour, customized their avatars, and visited specific locations listed in the assignment.

Phase Three

Students were required to complete an online survey comprising questions relating to the following:

- Social negotiation - extent to which students have opportunities to discuss their questions and solutions to questions.
- Inquiry learning – extent to which students are actively engaged in problem solving.
- Reflective thinking - extent to which students have opportunities to reflect on their own learning and thinking.
- Authenticity of the learning - degree to which the information in the game is authentic and representative of real life situations.
- Complexity of the learning environment - degree to which the game playing environment is user friendly and easy to navigate.

We attempted to use quantitative scales, but the response rate to the survey was too low to provide acceptable statistical power; therefore, the results were not included in this report. We used perceived ease of use, end-user satisfaction, and user concerns as the basis for a scheme to code the students' reports as explained in the next section.

Phase Four

Students were asked to select, from the following list, a second virtual world that they wished to explore: Entropia Universe, Active Worlds, IMVU, and "There". The key characteristics of these virtual worlds are highlighted in Appendix 1. For the second virtual world selected, each student was required to download and install the respective client software, as well as create an avatar. Also, each student was required to spend some time exploring the second virtual world with his/her newly created avatar.

Phase Five

Using the twelve design principles for a constructivist learning environment presented in Muñoz Rosario and Widmeyer (2007), students evaluated the two virtual worlds that they had explored (SL and the self-selected one). In this evaluation, students rated each of the two virtual worlds using the 12 principles along a five-point scale (1-"Almost Never", 2-"Seldom", 3-"Sometimes", 4-"Often", and 5-"Almost Always"). In order to help students to interpret the design principles, a description of each principle was provided. Students were also told that they could contact the researcher for clarification. In addition to rating the virtual worlds, students had to provide written justification for the rating of each virtual world environment with respect to each principle. With the exception of Active Worlds, all the virtual worlds used in the evaluation were not designed as learning environments.

Phase Six

Participants wrote a ten-page report, describing their experiences and reflections on the ethical issues these environments presented. This report included reflections, and lessons learned sections. In the *reflections* section, students had to: (a) describe the advantages and disadvantages of using each of the two virtual worlds as an educational environment; and (b) express their opinions on whether a system such as SL should be integrated into the course in the future. Furthermore, they had to justify their answer regardless of being in favor, neutral or against the idea. In the *lessons learned* section, students had to explain the social and/or ethical issues raised by these systems as compared to text-only means of interacting online such as with WebCT™. In addition, they had to discuss the possible risks that universities, governments and business have to be aware of when using 3D virtual worlds.

FINDINGS

This section presents the results of an initial qualitative analysis of the students' reports in terms of perceived ease of use, end-user satisfaction, and user concerns. Regarding the students' reports, it is important to note that all students who used Second Life (SL) had a series of tasks to perform, whereas in their second virtual world they were not assigned any specific tasks. Therefore, it should not be surprising that SL had more critiques than the other worlds. This doesn't mean that the other worlds are better than SL regarding such criticisms, but these findings for SL should be taken into account in further studies involving the assignment of specific tasks to be performed in other 3D virtual environments.

Perceived Ease of Use

Subjects were asked to express their opinions on ease of use with respect to four aspects of the virtual worlds that they examined: (1) navigation, searching and exploration, (2) communication and user interaction, (3) object interaction, and (4) "in-game" tutorial. Navigation refers to moving around the virtual world. Communication and user interaction deals with "talking" with others and making oneself understood. Object interaction refers to the interaction of the user with objects in the environment (chairs, signs, etc.). The "in-game" tutorial provides training and orientation in performing various actions (e.g. navigation and exploration).

In Second Life (SL), students encountered navigational difficulties, particularly using the controls (arrow keys) to maneuver around obstacles while walking. Some students also wanted to have the capability of mapping their preferred keys to control the movement of their avatars in SL. Communication was considered simple by users, since it was very similar to instant messaging. Tutorials were generally easy, although some tutorials did not detect completion by the user.

Some of the most interesting comments were related to object interaction. Objects can be created in all of the virtual worlds that the users in the study were asked to explore. However, at least one student did not think that doing so was intuitive. RM5 complained about it being “very complicated and under explained.” If users are experiencing great difficulty in creating objects using the design tool, they may not derive some of the benefits of doing so. Users who can create objects can obtain monetary gains by selling them and can earn recognition as a designer.

RM5 pointed out the difficulty he had in reading signs in SL: *“There were signs posted up but it would take very long for my character to get right in front of it in the direction where the sign could be read.”* To read signs in SL, avatars must be facing them directly, and not from an angle. This difficulty in positioning the avatar to read signs coupled with the challenges of walking (as some users had) could make the use of SL a frustrating experience. A possible solution is to have the user click on the sign in order to be directed to a webpage with the sign's content. Thus, there will be no need for the user to spend time and effort in aligning his/her avatar with the sign in order to read it.

Problems relating to the display of multimedia content (e.g. movies) were also noted. For instance, RM25 complained about the difficulty experienced while trying to watch movies in SL:

This island had big movie monitors on it. These monitors supposedly had content from other second life players. When I tried to see the movies I had a lot of trouble. First I could[n't] get them to play. Second I tried to click on the website that popped up to see if I had to go there to see the video but that didn't help either. I must have spent a good half an hour trying to figure out how the screens worked. I am pretty computer savvy but this world and the controls were new.

If RM25 was indeed a savvy user, then less adept users would be likely to have greater difficulty. This suggests that future object interaction tutorials should include instructions on how to play movies along with documentation on the multimedia formats (e.g. avi) supported by the environment. Also, in-context feedback should be given to the users when it is apparent that they are encountering difficulties.

End-User Satisfaction

Subjects were not explicitly asked about their satisfaction with the virtual worlds used. However, many of them still expressed their satisfaction or dissatisfaction in their final report. Nine of 25 subjects explicitly noted dissatisfaction with Second Life (SL). Some of the comments made are discussed below.

RM1 had a complaint related to the hardware and software: *“Again, SL was frustrating because of software issues that arose, namely my computer would crash after only several minutes of navigating an island.”* This comment highlights the need for academic institutions, planning to use virtual worlds, to acquire the hardware and software requirements needed to minimize problems with the operation and utilization of these worlds. Additionally, answers to FAQs about common problems should be provided by these institutions, because obtaining technical support from the virtual world provider could take several days.

Seven of the 25 subjects expressed their satisfaction with SL over the other virtual worlds they explored. RM16 noted: *“Hands down I feel Second Life wins this time because to me Second Life is more interesting because it is easier to get around to places, the graphics are better and the maturity level of SL is higher than Active World. I spent more time in Second Life because it was more appealing”.* This comment was interesting because RM16 liked the graphics in SL, whereas others such as RM7 thought that SL lacked sophistication in terms of graphics design. The latter user was an experienced gamer, accustomed to playing cutting edge games such as World of Warcraft.

The difference in opinion between RM16 and RM7 brings an interesting point into consideration with respect to selecting a proper virtual world for class activities. Students that enjoy playing high caliber MMOGs (Massively Multiplayer Online Game) will tend to have high aesthetic perceptions of the virtual environment in which they play. Therefore, they will expect the virtual worlds that they are asked to use in their lessons to be comparable in terms of quality. Also, they will be expecting platform stability and an intuitive user interface. On the other hand, students who are not 3D gamers might find SL to be engaging as a learning environment as RM10 commented: *“I personally feel that the ‘Second Life’ system should be utilized within our [Computers and Ethics] course curriculum. It seems to be an excellent tool for keeping students interested in class activity (provided every student is able to join up)”*

In regard to end-user satisfaction with the other virtual worlds, students' opinions were also mixed. Two of the four subjects who reviewed Active Worlds indicated that they liked it. Ease of navigation, the tutorials, the cartoonish style avatar, and its overall simplicity were some of the positive characteristics noted. Active Worlds's use of the "first-person view", in which the user's avatar is not seen, was preferred by at least one of the students. IMVU received praises from three of the six students who explored it, for (1) the capabilities it provides for interacting and communicating with others, and (2) the simplicity of earning credits – IMVU currency. In Entropia Universe, two out of four subjects expressed dissatisfaction. One of the reasons given was the extreme tediousness of obtaining in-game cash. Lastly, only one of eight subjects expressed satisfaction with "There". Its cartoon-ish style was the main reason given for disliking it. However, it was said to provide smoother gameplay and visuals than SL.

User Concerns

Ethical and Social Issues

User concerns refer to potential barriers that end-users perceive that may hinder, stop, or discourage them from using virtual worlds. The subjects of this study, as noted earlier, were students of a Computers and Ethics course, and thus their concerns mainly related to ethical and social issues. These issues pertain to behavioral aspects of individuals and organizations that are using these environments. Many subjects were concerned about user behavior that could affect the classroom environment. For instance, RM1, who had the impression that there would be no real-life consequences for misbehavior, had doubts about students' discipline in the virtual classroom. RM7 thought about outside influences: "*[There] are the people that mainly play and strive to be a pain to everyone around them [griefers]. Unfortunately, there is nothing that can be done about them ...*" It is interesting to see some students had the misperception that living in a virtual world grants them unlimited freedom. Jenkins (2004) noted that freedom of speech in Massively Multiplayer Online Role-Playing Games (MMORPGs), including Second Life (SL), is limited by the stipulations of the End-User License Agreement (EULA). For public areas "the same protections against abuses of free speech would apply as in the real world" (Jenkins, 2004, p. 11).

A second concern related to the avatar's appearance in the virtual world, which could cause class disruption. RM7 remarked: "*The first time I logged into Second Life, there was a naked male character standing there Would it be okay if a character like that appeared in a virtual class meeting?*" This kind of situation could not only interrupt the class, but also might have a negative impact on the reputation of the academic institution to which the disruptive student belongs. For example RM10 made a case for this argument:

There are some risks to be aware of when utilizing a multiplayer realm such as "Second Life." If a student does indeed abuse his privileges..., he or she not only affects the school's reputation, but they also influence the public's opinion on virtual education. What might have been a wonderful advance[ment] in teaching technique will have turned into an agitating scandal.

This disruptive behavior could be addressed by establishing written protocols and rules of conduct. For instance, a dress code for class attendance should be stipulated. These rules should be approved by the academic institution in order to hold students accountable should they deviate from them.

The third matter of concern pertained to proving student-to-avatar correspondence. There is the possibility of a student giving his or her account password to someone else, and for the latter to complete the work of the former. This problem is inherent to any non face-to-face computer-mediated communication tool. RM3 commented on this troublesome issue:

These virtual worlds do not require legal identification forms and, therefore, offer students the opportunity to pretend to be someone they are not, perhaps for the sake of a better grade; the fact that professors and students are not literally meeting face to face presents the opportunity for deception... a professor may never know whether a student is really paying attention, cheating, or sleeping.

Including additional technology such as webcams as part of the online curriculum might thwart problems with student misrepresentation, but this would require additional setup and configuration, which might discourage non-technical students and/or professors. There is a sample video in YouTube showing the integration between a live-webcam broadcast and SL through a website called Veodia.com (<http://www.youtube.com/watch?v=TaAPwweMACQ&NR=1>). This solution might not be feasible due to limitations of Internet bandwidth. A less technical solution that may help instructors prevent cheating is making the course hybrid; a mixture of face-to-face and online. Educators can have the best of both worlds; insisting students meet face-to-face for exams and project presentations, and have other class activities and student interactions online.

Other User Concerns

Other concerns raised by students related to (1) technical issues — platform, Internet connection and latency issues that may prevent the successful execution and use of the virtual worlds; (2) privacy and security — issues the users may perceive as threats and measures that would make them feel safe in these environments; and, (3) costs — monetary concerns either from real or in-game currency. These concerns are summarized below.

Eleven of the twenty-five subjects had privacy and security concerns such as giving out personal information to solicitors posing as students or getting their money and information stolen by hackers. The problem of soliciting might be addressed by providing students with a list comprising classmates' names and corresponding avatar names. Technical issues raised by nine of the twenty-five subjects included software crashes, extremely high hardware requirements, account creation problems, and Internet lag. Consequently, these subjects' emotions, as reflected by their comments, ranged from mild annoyance to outright frustration. Finally, cost was also a factor of concern. Owning land requires the academic institution to pay an initial fee for setting it up and a monthly fee for maintenance. Additionally, the institution would have to cover the cost of the creation of the school and/or class virtual infrastructure (e.g. classrooms, chairs) by a designer and the cost of training instructors in the use of virtual worlds in the classroom.

CONCLUSIONS

In this study, we conducted an interpretivist analysis of students' reactions and impressions of virtual worlds. We examined twenty five students' reports to determine their perceptions of ease of use, end-user satisfaction, and user concerns while using virtual worlds as a learning environment. Reactions from students varied. Some students perceived virtual worlds as relatively easy to use, particularly with respect to object interactions, communication and user interaction. They, however, experienced some difficulties in navigation and in completing some tutorials.

Other reactions from students suggest that, at present, the problems of using virtual worlds for learning go beyond usability issues. Students expressed concerns that could become significant barriers such as user misbehavior, improper avatar clothing (or lack thereof), and cheating due to lack of student-avatar correspondence. Suggestions proffered to address these issues include enhancements to the virtual world interface, written protocols and rules of conduct, and the distribution of a list of trusted classmates with corresponding avatar names to students.

There were some limitations in this study. First, we could only do a qualitative analysis of the open-ended survey questions and the student reports, since many did not fully answer the quantitative survey questionnaire. However, students' responses to the open-ended questions highlight the importance of the "complexity of the learning environment" construct that we attempted to measure in the survey. Most specifically, students repeatedly called for user friendliness and ease of navigation. Another limitation was SL having compatibility problems with Windows Vista at the time of the study (Fall 2007). This might have restricted some students in participating in this study. Some students described their experiences with the other virtual worlds as boring, and this could have been attributed to the lack of specific tasks to perform in these worlds. We need more research on the most appropriate types of tasks to support student learning in these environments.

We intend to extend our research in this area by observing students' interactions with virtual worlds in other classes and by gathering, through online surveys, empirical data from a larger sample of students. We are specifically interested in measuring the five variables that we deemed as important in predicting outcomes (e.g. students' performance): social negotiation, inquiry learning, reflective thinking, authenticity of the learning, and complexity of the learning environment.

Virtual worlds have a great potential to be an engaging tool for online learning. It has already been used by several academics with some success. However, this study acknowledges that there are many obstacles to overcome, including technical requirements, ethical and social issues, privacy and security problems, and costs. Hopefully, these obstacles will be surmounted in time with enhancements and mindful implementation of these environments, perhaps leading more students to share RM15's opinion:

*...it was a joy to be able to experience a game that I have always wanted to encounter...
Having a virtual world where anything is possible and there is no roof or ceiling as to the
possibilities that a virtual world can have.*

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APPENDIX 1: VIRTUAL WORLDS EVALUATED

The following table summarizes key features of the virtual worlds seen in this paper:

Virtual World	Description
Active Worlds™ (AW) http://activeworlds.com/	The oldest virtual world in this group and possesses a development kit that allows users to create virtual games (e.g. soccer).
Entropia Universe® http://entropiauniverse.com/	A virtual world embedded in a MMOG, which combines e-commerce, social networking, and entertainment.
IMVU® http://imvu.com/	A 3D instant messaging (IM) client in which people communicate with each other, rewarding them with credits (IMVU currency) the more they converse.
Second Life® (SL™) http://secondlife.com/	A 3D world built and owned by residents, which provides users with 3D modeling tools and a powerful scripting language to create interactive objects (Delwiche 2006).
There™ http://www.there.com/	A virtual world similar to SL in which public conversations occur in chat balloons like cartoon strip and allows users to create their own custom products.

Table 1. Multi-User Virtual Worlds