

Scenario-Based MUVES in the Science Classroom: Pre-service teachers' perspectives

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Abstract: This paper presents the findings of a study on the understanding and attitudes of pre-service teachers in the use of scenario-based multi-user virtual environments in science education. The pre-service teachers involved in this study used a scenario-based multi-user virtual environment as part of a lecture on problem-based learning in science education and were then required to complete an open-ended questionnaire. Data from the questionnaire indicated that gender and current computer game use were both likely to have an effect the future use of virtual worlds in a classroom setting. Behavior management was also seen as a concern to pre-service teachers. The results of the study indicate that teachers are both aware of virtual worlds and have an understanding of both their potential advantages and challenges within a classroom setting.

Keywords: Virtual worlds, problem-based learning, science education, pre-service teachers, ICT

Introduction

There is a growing body of research surrounding the use of scenario-based multi-user virtual environments (MUVES) in inquiry learning in secondary school science education. A virtual world can be defined as 'an electronic environment that visually mimics complex physical spaces, where people interact with each other and with virtual objects, and where people are represented by a virtual character' [1]. Scenario-based virtual worlds such as *Quest Atlantis*, *River City* and *Virtual Singapura* have all shown that the environments are both highly motivating and challenging to students. Research studies to date have shown that the value of these tools in engaging and maintaining student motivation is substantial [2-6].

The role of teachers in facilitating the use of integrated classroom technology (ICT) is pivotal in the successful implementation of the technology in a classroom. Yet many teachers are resistant to using technologies such as MUVES for reasons that include the additional time pressure to learn new skills, the lack of technological support within the school and concern over the pedagogical value of the technology [7, 8].

The purpose of this paper is to present the findings of a study with pre-service science teachers on the use of a scenario-based MUVE to teach inquiry skills in secondary schools. The study investigates pre-service teachers' current knowledge of virtual worlds and their attitudes towards using a virtual world in a classroom setting.

1. Pre-service teachers and ICT

There is only a small body of research on pre-service teacher training and ICT – especially in regards to using MUVES. A pre-service teacher, in this instance, refers to an undergraduate or post-graduate student that is majoring in education that has not yet commenced classroom teaching. The limited and inadequate amount of training that pre-service teachers often receive before entering a classroom means that pre-service teachers, in many cases, do not feel that they have the technical support, the skills, or a pedagogical rationale for implementing ICT in the classroom [9, 10]. Many pre-service

teachers are also surprised that technology that is ubiquitous outside of the classroom is not ubiquitous in schools [11].

Henriques [7] suggests that to overcome the negative attitudes to using ICT in the classroom, pre-service teachers need to see the use of technology in the context of science education, and to see the relationships that exist between the two. Moreover, ICT should be presented as both accessible and worthwhile to pre-service teachers, rather than just as a box ticking activity. Pre-service teachers entering the school system that are interested in using technology in the classroom should be encouraged to explore this domain [11]. In this context, virtual worlds such as *Virtual Singapura* can bridge the gap between science education and technology by presenting teachers with a rich medium to present inquiry learning and science based problems that are free (in the case of *Quest Atlantis* and *Virtual Singapura*), easy to use, and provide students with an opportunity to interact with a motivating and engaging learning experience.

However, as Dede [8] notes, in order for ICT to be seen as worthwhile and to address the negativity surrounding ICT implementation in schools, factors such as pedagogy, curriculum, assessment and school organizations need to be addressed simultaneously rather than in a piecemeal fashion. Another factor that needs to be considered is pre-service teachers' views on teaching as many pre-service teachers tend to maintain an ideological underpinning for their teaching such as facilitating a student-centered classroom, yet when they enter the classroom they tend to use teacher-centered approaches, hence at this early stage in their teaching career their attitudes and values towards teaching have not yet solidified [12]. Changing the attitude of pre-service teachers needs to be supported in school and access to training and technologies such as virtual worlds needs to be maintained both in higher education settings and in the classroom.

2. Research Design

2.1 Participants

This research study involved 28 participants from a pre-service science education course at Sydney University. There were 13 female participants, 13 male participants and two participants did not identify their gender. The participants had all completed at least one in school practicum and were from either a Bachelor of Education (18 participants) or Master of Teaching (10 participants) program. None of the participants had ever undertaken work as a teacher within a secondary school.

2.2 Data Collection

The data collection took place during the normal lecture time for the group. Participants were provided with an overview of the scenario and were then allowed 40 minutes to explore the problem space. Participants were randomly assigned to teams of three. After the participants finished their in-world explorations they were asked to complete a fifteen-question open-ended questionnaire.

2.3 Data Analysis

The data presented in this paper was analyzed into two areas. Area 1 covered current knowledge of virtual worlds, game use and understanding of the technology. Area 2 covered the use of virtual worlds in education from the perspective of a teacher.

3. Results

3.1 Area 1 - Current Knowledge of Virtual Worlds and Games Use

Area 1 related to the participants current understanding of virtual worlds. The responses to the first question indicate that the participants all had a basic understanding of what a virtual world was. Responses included:

A made-up computer game based on the real world

A world that exists with a technology – it is not real, but simulates a real world

A world designed and accessible by computer technology

A simulation which allows interaction between a played character and the elements of the world

These responses were coded in relation to their similarity to the definition of a virtual world provided by Bainbridge [1] in the introduction. The level of understanding of a virtual world was not linked to current computer game use – people who used computer games more frequently did not show a more in-depth or detailed understanding of the technology. However, the responses indicated that a virtual world was a creation or made-up technology.

An important factor in the intent to use virtual worlds in education is linked to gender and game use (see Table 1). The results of these questions indicate that females are both less likely to play games as they are to use them in an educational setting, these findings are consistent with the review undertaken by Becta [13].

Table 1: Comparison of gender and game play and the use of virtual worlds in a classroom

		Gender				
		Female	Male		Female	Male
Computer game use	Infrequent or non user	91.6%	36.4%	Use virtual worlds in class	84.6%	100%
	Frequent user	8.4%	63.6%	Not use virtual worlds in class	15.4%	0%
<i>n</i>		12	11	<i>n</i>	13	13

3.2 Area 2 - Virtual Worlds in Education

The perceived advantages and disadvantages of virtual worlds in education were consistent with other studies on ICT (e.g. Becta 2004, Webb and Cox 2004). The results of the survey on Area 2 are presented in Table 2. The results indicated that there are clearly perceived advantages and disadvantages of using a virtual world in a classroom setting. The advantages being the ability visualize information that would not be possible from a text or normal classroom setting. The disadvantage was that students would be off-task and that it would be difficult to make sure that students were completing the activities when the teacher could not monitor student progress.

Table 2: Pre-service teachers views on the potential advantages, benefits, problems and issues of using virtual worlds in a classroom setting

Perceived Benefits		Perceived Problems	
Characteristic	%	Characteristic	%

Visualization	41.7%	Off-task	53.3%
Motivating	20.8%	Lack of resources	20%
Interactive, learner centered	16.7%	Not liking computers	10%
Engaging	8.3%	Too complicated	6.7%
Risk free	8.3%	Too expensive	6.7%
Team work	4.2%	Repetitive	3.3%
<i>n</i>	24	<i>n</i>	30

In regards to whether or not a pre-service teacher would consider using a virtual world in the classroom, overwhelmingly, 71.4% (20) of the respondents indicated that they would use the technology. All of the frequent computer game users indicated that they would use the technology in their classrooms. 21.4% (6) of the respondents indicated that they might possibly use the technology, but it depended on several conditions, such as smaller, groups, technical support, sufficient time and class behavior. Only 7.1% (2) participants indicated that they would not use the technology in their classrooms. The two participants that indicated that they would not use the technology were infrequent or non users of game technology.

It seems contradictory, or perhaps it is the result of greater awareness, but the participants that were most critical of the use of the technology in the classroom were the frequent users. For example, comments such as:

I don't see why you need to use ICT to do this role-play. It can be conducted in a classroom with different bits of information spread like Singapore and

Yes, but probably only with a smaller class. I would do a 'test' lesson with a class and then stop if they wasted too much time off task

indicate that the participants were thinking about how they would actually use the technology in a classroom setting.

4. Discussion

The use of virtual worlds in science education affords teachers with opportunities to enhance students' ability to visualize and engage with complex problems. The pre-service teachers in this study were aware of the potential learning affordances of a virtual space such as *Virtual Singapura*; yet, their main concern was in regards to behavior management and keeping the students on task.

The results of this study suggest that pre-service teachers perceive the issues relating to behavior as more influential on their chosen method of delivery than the technical or potential learning benefits of the virtual world. This shows that while pre-service teachers may be willing to use a tool such as *Virtual Singapura*, they would weigh this up against factors such as class size, class temperament, access to technology and skill requirements. This focus on behavior management is perhaps a result of their inexperience as classroom teachers. Experienced classroom teachers who participated in a similar study as part of this project were more concerned about time constraints and technical problems than behavioral issues, which is also consistent with Urhane [14] and Becta [13].

This study also indicates that the greater familiarity that a pre-service teacher has with computer games and virtual worlds the more likely they are to consider using this technology in their classroom. Correspondingly, as a greater proportion of male pre-service teachers in this study use computer games more frequently than females, more male pre-service teachers would be likely to use virtual worlds in their science classes, again this corresponds with the findings of Becta [13]. The results of this study indicate that there is a potential divide in the use of ICT in science education depending on both gender and technical literacy.

5. Concluding Remarks

This study sought to gain an understanding of how pre-service teachers perceived the use of virtual worlds in science education as a result of using a scenario-based MUVE. The results of the study suggest that a one-off encounter with a virtual world may seed the desire to use ICT in a classroom setting; however, as pre-service views on education have not yet crystallized ongoing support in the use of ICT in a positive ICT environment is necessary to develop an enduring belief in the value of ICT in education.

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