Utilizing Virtual Worlds in Education: The Implications for Practice

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Abstract—Multi User Virtual Worlds are becoming a valuable educational tool. Learning experiences within these worlds focus on discovery and active experiences that both engage students and motivate them to explore new concepts. As educators, we need to explore these environments to determine how they can most effectively be used in our instructional practices. This paper explores the current application of virtual worlds to identify meaningful educational strategies that are being used to engage students and enhance teaching and learning.

Keywords—Virtual Environments, MUVEs, Constructivist, Distance Learning, Learner Centered.

I. INTRODUCTION

EDUCATIONAL institutions are beginning to look for strategies and methodologies to enhance teaching and learning in order to engage a new generation of learners. These learners, commonly referred to as "digital natives", seamlessly work with technology to gather, analyze, and synthesize information, and then present it in new and innovative ways [1]. Creating learning environments that provide digital natives with a sense of immersion into the content, with the ability to both manipulate the content and change the content into new understandings, are the next natural steps in teaching and learning for this new learner.

SecondLife (www.secondlife.com) is a 3-D Multi User Virtual Environment (MUVE) that has grown to more than a million residents since its inception in 2003. The world of SecondLife is created by its inhabitants. Residents have the potential to build meaningful objects, such as the Eifel Tower or a Revolutionary War community. Economics also plays a role in SecondLife through currency named the "Linden dollar". Linden Dollars can be purchased in SecondLife with real-world money to purchase commodities such as islands, office space, clothing and art work designed by residents, or access to some locations within the world itself. Presently, many residents within SecondLife are earning actual revenue for themselves by designing, developing, and then selling for profit commodities to fellow residents in SecondLife.

Appearances can also be designed to meet the residents' individual needs. Residents within MUVES create an online presence. When designing their representative figure called an avatar, residents have the opportunity to design clothing, hair color, style of dress, and communication techniques to best interact with other residents and within the environment itself. Avatars appearances can have a human likeness, robotic, or animal likeness to represent them within the virtual world. The avatar can mirror a real-world persona or it can move a step further by flying, breathing under water, and teleporting to other locations within the world itself [2].

SecondLife is a world created solely by its residents. Within this virtual world you will find advertisers marketing to residents to buy products and services in the real-world. You will also find colleges and universities creating environments within the virtual world, such as Dartmouth College who created a 3D virtual island in SecondLife to train community emergency response teams. Teams learn how to handle real-life emergencies by experiencing emergencies in a 3D environment [3]. Libraries are also needed in this world to provide collaborative spaces and opportunities to find quality resources and reading material. One such project is the Alliance SecondLife Library project. This has developed into a collaborative space for residents within SecondLife as well as a virtual library providing real-world library services [4]. SecondLife is rich with museums, Victorian era communities, Egyptian tombs, and many simulated experiences. The challenge continues as to how educators can best incorporate this virtual 3D world effectively into teaching and learning.

In an educational context, SecondLife has the potential to provide rich and engaging learning experiences for students to include discovery, investigation, and creation. Within SecondLife, simulations and collaboration on lesson objectives and topics are possible with other students and instructors around the globe. By utilizing a constructivist approach to learning within this community, students have the potential to discover content and create meaningful connections with the content through creativity and imagination [5]. This ability to create learning environments whereby students can immerse themselves in the content has the potential for students to transfer lessons learned within the virtual environment back into their real-lives, thereby creating meaning with the content and ultimately connections with the concepts being taught.

Virtual environments have the potential to fully engage

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students and enhance teaching and learning. They also have the potential to enhance a constructivist learning approach by providing learning opportunities for students that challenge them to learn by experiencing and through applied activities, rather than by direct instruction and passive involvement. This paper explores SecondLife, a Multi User Virtual World. It examines current research and suggests future possibilities for effective implementation of this virtual environment into teaching and learning with today's digital natives.

II. TEACHING AND LEARNING STRATEGIES

SecondLife has the potential to be a useful educational tool for teaching and learning by using a constructivist (constructionist) approach. In constructivism the learner is believed to construct their own understanding of content. Through this construction of knowledge the learner creates direct connections and meaning. In order for learning experiences to be beneficial to the learner within a constructivist methodology, the instructional experience must be authentic and intentional. Simply put, the instructor must provide learners with compelling problems that engage students not only in the adventure of the virtual world itself but additionally into a deep inquiry and analysis of a meaningful and authentic problem that students can relate to and that meets the lesson objectives [6].

Within the 3-D virtual environment of SecondLife, learners are represented as avatars. Avatars become representatives of people participating in an online environment. They interact with tools and objects within the virtual world as well as with other avatars. They have exceptional behaviors such as being able to fly. They can also look at and manipulate 3-D representations of objects in both the first and third person. This skill provides learners with the ability to discover information from different angles and perspectives. Through these and other unique experiences in the virtual 3-D environment, a constructivist method of learning is possible. Learners have the ability to create, manipulate, and exist within a knowledge-building community. From a constructivist perspective, knowledge-building communities have the potential to build many collaborative strategies through mentors and peer role models, open classrooms, role reversals, and interactions with an audience. Learning environments such as MUVEs provide an opportunity for an interactive style of learning due to the built-in collaboration and meaningful engagement offered through a virtual time and space [7]. These built-in collaboration opportunities include chat devices as well as plug ins such as babble for voice interactions. Each of these collaborative possibilities provides the learner with varying degrees of engagement, which is an important element for learning to occur [8].

From an educational perspective, as the avatars continuously interact with tools, objects, and other avatars, this interaction allows learners to construct their own understanding and meaning [9]. As a result, scaffolding is possible from a conceptual, procedural, and metacognitive level. As learners' process content by thinking about and working through real-world problems, they are able to build upon prior knowledge and create workable solutions [10].

Through embedded learning in this 3-D virtual environment there are multiple opportunities for learners to be active with the content. By becoming active participants within their own learning, students take control of their instructional process and become leaders of their own learning. Instruction should make individuals think, explore, discover, and manipulate content to become better problem solvers and to learn [11]. As problems become more complex and meaningful for the learner, interactions additionally become more complex. This involvement in the environment and ultimately the content creates an opportunity for learners to work through higher order learning. This higher order learning is created through the interactivity of the environment and the ability for learners to manipulate content through exploration. This complex environment has the potential to frustrate learners but as engagement in the complex problem becomes more meaningful, students become more stimulated bringing about opportunities for a more intense learning experience [12].

Within a 3-D virtual environment such as SecondLife, you have many possibilities for a learner-centered model. This focus on the learner and the overall learning process means the instructor becomes more of a facilitator rather than a lecturer. Facilitators are flexible in that they serve as guides to support the learner through the process of solving relevant real-world problems. A facilitator provides resources to help learners through complex and well structured problems. It is important that learning goals and objectives be clear and meaningful. Evaluations are designed to ensure that individual needs of learners are met and learning is aligned with objectives and standards. Within this learner-centered approach, students have the opportunity to test their understanding of content through discussion with other learners and can challenge each others perspectives [13].

Technology provides opportunities to apply a constructivist approach to teaching and learning. Today's learners challenge traditional methods of teaching and learning and become encouraged by interactive, meaningful learning environments that utilize technology. It is important to note that technology in and of itself should not be the sole learning tool to engage students in the process of learning. Instead, a multi-modal model, one that integrates the technology as well as provides class contacts with the instructor and fellow learners should be encouraged and can be enhanced with the virtual 3-D world. This combination of technology integration and personal communication and collaboration provides rich and dynamic learning experiences that both engages students and prepares them for further study with the content [14].

III. POTENTIAL FOR TEACHING AND LEARNING

As the theoretical approach of constructivism suggests, learning environments form a community that provides opportunities for learners to collaborate, manipulate objects,

discover new information, and present information in new and meaningful ways. Within a 3-D virtual environment such as SecondLife each of these elements can be included into the learning experience. As education evolves, instructors must look at teaching and learning differently in order to ensure that a true learning community can be developed and maintained. The traditional approach of a stand-and-deliver lecture should not be the only method utilized because of its one-dimensional approach. Rich environments that appeal to a variety of learning styles are those which offer many different types of learning activities to appeal to different learning approaches. By creating meaningful learning tasks that provide different approaches through which learners can access, gather, and work with content aids in creating dynamic, interesting, and relevant learning environments [15].

SecondLife provides opportunities for both the instructor and the student to create and manipulate objects, thus creating a rich and dynamic learning environment. This ability to create and manipulate learning objects gives the participants in this environment the ability to create a physical dimension or world. For any object to be created, members within the learning community must interact, anticipate, support, and collaborate with fellow members. This interaction can lead to conflict which can be positive from the vintage point that it enhances relevancy and ultimately learning.

Creation of learning objects within SecondLife could entail studying art and then having students create artwork themselves emphasizing the styles and theories of masters. From there, students could create a museum to house their art work within SecondLife and then invite other avatars and inhabitants of the world to visit their museum to critique their art work. As the instructor, you could ask students to additionally create notes for each art piece where museum visitors can click on and learn more about the piece to include the research behind each piece.

Another object manipulation possibility could be to have students create a replica of a historical location within SecondLife. Students would need to research the location, its people, the concerns and politics of that time to incorporate relevancy into their design and creation. Learners could create cards for visitors to click on to learn more about an object, as well as the importance of this time in history and how that historical era relates to the world today.

In each example, students need to research, analyze, synthesize, and produce content in new and interesting ways. Learners think critically about topics and transfer lessons learned in the classroom into a project that can be viewed by individuals outside of the classroom through the medium of SecondLife. This is what the digital native of today seeks to do and where their skills lie. The digital native is seeking meaningful experiences that engage them to think critically and create new understandings that they can transfer to their real-world. Educational organizations need to provide experiences for students to develop skills that revolve around and enhance proficiency in important areas such as information literacy, information technology, problem-

solving, collaboration, flexibility, and creativity. Our challenge in the 21st century with our world changing so rapidly is to find a successful model of teaching and learning that breaks away from the traditional model we are presently using, 'to teach the same way we were taught' in order that as teachers we can develop and strengthen these necessary core skills in our students.

In addition to students creating their own worlds, multi virtual user environments can also be created for the learner in SecondLife. The created environment would simulate a real-world experience. Within this simulated environment, the learner takes on roles to solve a problem that is relevant to the learner's "real" world and to the curriculum being studied. RiverCity, which teaches learners about science, is one such example for the K12 student. RiverCity is a learning community which was designed for high school students to explore people and their environment. The benefit of this learning community is that it engages students in the problem and is in a constant state of evolution due to the continual increase of participants. As virtual learning environments grow and develop within MUVEs they have the potential to become more relevant and richer within an educational context. This relevancy enhances motivation in learners and has the potential to engage them in ways that a face-to-face environment cannot [16].

In conjunction with virtual environments such as SecondLife, gaming paradigms are slowly moving into education as an engaging and enjoyable method for online learning. QuestAtlantis is an example of a 3-D gaming environment exploring science issues and concerns. It utilizes strategies in typical gaming environments so learners can travel through the world, participate in educational activities, and discuss content with experts and other learners, as well as build a personal avatar. The idea is to engage students in the content being explored and through this engagement motivate them to solve real-world problems that are relevant in their real life.

Vygotsky's work on social constructivism, social context for activity, and the zone of proximal development builds on each of these examples. Vygotsky also discussed the need for play in teaching and learning to ensure that engagement, motivation, and ultimately learning occurs [17]. Instructors designing an element of play into a virtual environment must consider collaboration opportunities to do such things as solve a quest, engage in activities that relate to the learning objective and are realistic such as building and organizing a virtual society, building and managing a virtual business, setting up a government and then running a campaign in a virtual society. In each example, complex cognitive processes must take place [18].

IV. SURVEY OF RESEARCH

Studies indicate that learners will be engaged in the virtual 3-D environment as well as in the content being explored if the learning activities have clear objectives and few

distractions such as irrelevant tasks, objects, or language [19]. For learners to be engaged in the process and procedures contained within a virtual environment such as SecondLife each task should flow seamlessly. This relates to Csikszentmihalyi's flow theory. Csikszentmihalyi theory has been integrated into both human computer interface design and virtual reality. In order for an online learning environment to flow, Csikszentmihalyi's theory suggests that the environment must hold the learner's attention, arouse the learner's curiosity during the interaction, and the learner must find the activity intrinsically interesting [18]. In each of these points the learner must be both challenged and provided with relevant and intentional tasks. As in Vygtosky's Zone of Proximal Development, the degree of a challenging task should be equal to or a little higher than the learner's level of comfort. If the challenge is too high the learner will become frustrated; if the level of challenge is too low the learner will disengage in the activity. This balance is key and important when creating learning environments in a MUVE.

Throughout this process the learner must have clear and concise ways to reflect on experiences within the learning environment. One way to ensure that learners are able to transfer new knowledge from the MUVE to real-life application is to ensure that a community of practice is developed within the learning environment [20]. Being able to create an inviting diverse cultural space within the 3-D virtual environment is important to help develop a learning community, to create a sense of trust between learners and the instructor, and to ensure that dynamic and engaging instructional experiences flourish [21].

Engaging the student in the process of learning is key to a constructivist methodology and is important for learner success [22]. Research demonstrates that student engagement is increased when learners are able to interact and create objects within a virtual environment [23]. Bangert-Drowns and Pyke created "Characteristics of Seven Levels of Taxonomy of Student Engagement" that provide observable indicators to determine if engagement is occurring within the MUVE activity. The seven types of engagement outlined within the taxonomy involve literate thinking (the ability to integrate new knowledge with personal values and beliefs), critical engagement (self-initiated and systematic knowledge-building), structure dependent engagement (ability to develop schemas for content comprehension), frustrated engagement (developing specifics schemas for software use), unsystematic engagement (acquiring disconnected facts about software and content), and disengagement (no quality of learning). The goal from this taxonomy is to have students reflect on both the software as well as the goals and objectives of the activity itself. This focus provides opportunities for critical thinking and ultimately engagement and learning. Without engagement students stop working with both the software and the activity itself [24].

Immersion in the 3-D environment occurs when students become engaged. This is developed when the learning environment has inquiry-oriented learning activities that can be worked on individually and in groups and that students can relate to. By creating interactions that provide opportunities for complex metacognitive processes and scaffolding, students can design and conduct experiments and identify and solve problems. It is important that students become immersed in the environment to limit self-consciousness. When students can interact with the objects in the environment, two-way communication is open and interactivity is built into each activity. When students become active participants and become more involved in the activities themselves, learning takes place.

QuestAtlantis provides a combination of completing virtual quests while at the same time blending these virtual quests into real-world activities that are both academically and socially meaningful. This combination involves research cultures, analyzing newspaper articles, interviewing members of the community, and using technology tools to create a document that demonstrates understanding of the quest itself and all of its elements. This inquiry-oriented activity enhances the learning experience and provides meaning to the science concepts explored [25].

V. Future Directions in Education

The possibilities inherent in 3-D Multi User Virtual Environments are exciting for education. Students have opportunities to take ownership of their learning and teachers can more fully motivate and enhance learning in ways not possible before technology. The possibility for students to create self-efficiency and motivation for the topics being studied is exciting. Including a global sense to a classroom provides many opportunities and puts a twist to telecollaborative lessons. Education in the 21st century should focus on communication, autonomy and control over a students own learning, and increased innovation and creativity. If 3-D MUVEs are used effectively there is strong potential for instructors and learners to create a constructivist approach to teaching and learning.

As educators, we need to look at our own learning standards to determine whether we can practically and instructionally implement this dynamic tool in our K12 classrooms. Technology infrastructure needs to be explored to determine if school systems have the hardware and software capabilities as well as the bandwidth capabilities to utilize virtual mediums such as SecondLife. There are opportunities to create dynamic distance learning experiences that provide rich interaction with the content but institutions need appropriate bandwidth and technological capabilities.

It is important that educators not jump on this new technology platform of virtual worlds if they do not meet the instructional course needs. However as educators, we do need to continually explore new strategies and methodologies to engage students in the process of learning and to create learning environments and opportunities that blend both technology tools and collaborative methods of teaching and learning.

VI. CONCLUSION

Within the field of education, we are currently witnessing a transformation in terms of what equates to effective teaching and learning. Educators are being tasked to develop engaging interactive models of teaching that both connect students in the process of learning as well as create citizens for the 21st century. While there are many issues to consider in terms of a schools technology capabilities to incorporate such 3D tools into a curriculum, research is showing that immersing students in a MUVE learning environment is both engaging and meaningful. Student achievement increases due to their interest in the task and this ultimately increases both teacher and student input in terms of eliciting change and continuing on the path of effective transformation with the ultimate goal to increase learning for the digital native.

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