



3D Virtual Learning Environments (3D VLE)

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What is a 3D VLE?

A 3 dimensional (3D) virtual environment is created entirely from a computer database consisting of objects modeled by computer-aided design (CAD) software. These objects are programmed to behave in certain ways as the user interacts with them (Winn, Hunter, Hollander, Osberg, Rose & Char, 1997).

A 3D virtual environment is special because the mixture of software and hardware gives the user an illusion of being immersed in a 3D space and the ability to interact with the 3D space (Byrne, 1996). To feel immersed, the user must get a sense that there are things all around. He/she must take these things literally as objects with position and properties. One good test of the illusion of immersion is the following: if one turns away from something in an environment, that thing should feel as if it is still there, just that it is out of his/her field of vision. In this case, we say that the object has a strong sense of presence. If the things in the environment have behaviour and react to the user's motions, he/she will take those objects more seriously as actual things and the illusion of immersion will be enhanced. Input devices like the keyboard and mouse allow the user to interact with the elements in the 3D space. Thus, the contributing factors that characterize a 3D virtual environment are the 3-dimensional element, interaction and the illusion of immersion.

Where a 3D virtual technology is used to create an immersive and interactive environment to

facilitate or aid learning, this is known as 3D virtual learning environment (3D VLE). Figure 1 is a screenshot of a 3D VLE called Quest Atlantis showing a scene of the user interface.

Typically, 3D VLE is a learning and teaching program that makes use of a MUVE (multi-user virtual environment) or a single user virtual environment to immerse students in educational tasks. The task may be termed a quest, mission or challenge, depending very much on the scenario of the 3D VLE. Students move around the 3D space to virtual places and perform educational tasks. In the pursuance of these tasks, students are able to interact with digital artifacts and they can represent themselves through 'avatars'¹ or virtual characters.

In addition, the multi-user version of the 3D VLE is online and enables students to communicate with each other using real time chat or email.

Simulation and 3D VLE

Computer simulations are computer-generated versions of real-world objects (for example chemical molecules) or processes (for example, population growth or biological decay). They may be presented in 2-dimensional, text-driven formats, or, increasingly, 3-dimensional, multimedia formats. Computer simulations can take many different forms, ranging from computer renderings of 3-dimensional geometric shapes to highly interactive, computerized laboratory experiments. A 3D VLE, allows

¹ A graphical [icon](#) that represents a real person in a [cyberspace](#) system. When you enter the system, you can choose from a number of fanciful avatars. Sophisticated 3D avatars even change shape depending on what they are doing (e.g., walking, sitting, etc.).

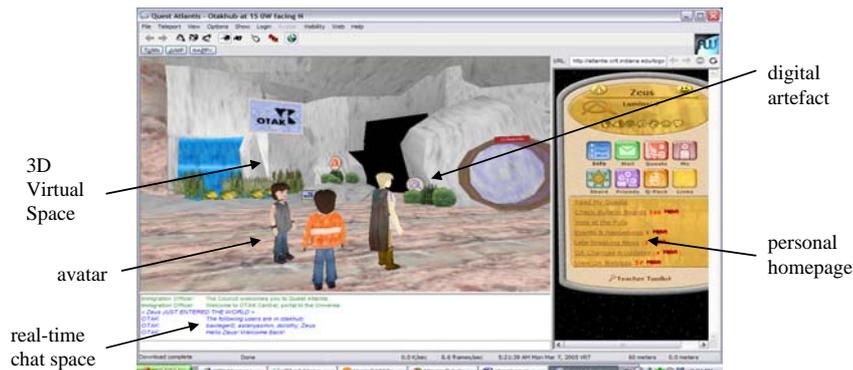


Figure 1. A screenshot from the 3D VLE, Quest Atlantis showing a scene of the user interface and elements of the interface.

students' immersion, exploration and manipulation of computer-generated, 3-dimensional, multimedia environments in real time. Thus, simulations can easily exist within a 3D VLE. Just to draw a small distinction, a simulation may well be non-virtual and non-immersive. Examples of 3D VLEs, 3D VE and interesting websites are cited in the Annex.

Reasons for using 3D VLE in Teaching & Learning

The main aim of the IT Masterplan 2 is to effectively harness technology to promote engaged learning. The 3D VLE has the potential to contribute positively to student engagement since the three-dimensional element reminds students of commercially available computer games. The immersive and interactive environment has the capability to ensure that students' engagement is positive and where the students' attention is willingly given and held (Chapman, Selvarajah & Webster, 1999). From the research literature, the following advantages have been associated with using 3D VLE for teaching and learning:

The novelty of the three-dimensional virtual reality environment (Byrne, 1992)

- The sense of empowerment, control and interactivity (Byrne, 1996) & (Bricken, 1990)
- The game-like experience, heightened levels of motivation and extrinsic and intrinsic rewards (BECTA, 2001) & (Fromme, 2003)
- The concretizing of objects to support visual learners (Yair, Mintz, & Litvak, 2001)
- It supports a constructivist approach to learning. Students can learn by doing rather than, for example, reading. They can also test theories by developing alternative realities. This greatly facilitates the mastery of difficult concepts, for example the relation between distance, motion, and time or abstract science concepts (Yair, Mintz, & Litvak, 2001)
- The allowance of greater self-awareness, support for interaction, and the enabling of real-time collaboration (Jonassen, 2000), (Schrage, 1990) & (Schwienhorst, 2002)
- The ability to situate students in environments and contexts unavailable



within the classroom (Yair, Mintz, & Litvak, 2001)

- The ability to scaffold student learning (Jiang & Potter, 1994) & (Follows, 1999).

Engagement

There is a myriad of definitions for the term engagement. What is apparent about the definitions of engagement is that they entail some kind of mindfulness (*the trait of staying aware of or paying close attention to*), cognitive effort and attention. Engagement is not an absolute term. In general, engaged students comply with minimal requirements of a given task and disengaged students go off-task (Bangert-Drowns & Pike, 2001). However, there are different levels of engagement that one can attain. The engagement can either be classified as high or low.

Points to note before making use of 3D VLE in Teaching

Although the idea of using a 3D VLE to motivate and engage students in learning is an attractive and worthwhile venture, the *following* must always be kept in mind.

Scaffold Learning

Anecdotal experiences indicate that problems may arise in 3D VLE without appropriate guidance and support for students (Ge, Yamashiro & Lee, 2000). The teacher needs to scaffold a lesson to ensure that his students are able to follow the lesson and learn. One must be aware of the two different levels of scaffolds. The first level takes place before the lesson begins and the next level of scaffolding is determined by the structure of the lesson in the 3D VLE itself. The first level takes place at the start of the lesson, that is, before even the students start using the computers. Pre-lesson

briefings, teacher demonstrations and guided worksheets are some examples of such scaffolds. Pre-lesson briefings help students to understand what to expect, what to accomplish and also allow students to clarify any doubt. The teacher should also conduct a demonstration in the 3D VLE so that the students do not lose their way or be distracted by irrelevant elements in the 3D space. A guided worksheet to direct students through the different tasks may be helpful and a map may be included if the 3D space is potentially complex or a flowchart sequencing the tasks may be required if the task online is potentially complex.

Know your Students

Teachers often develop comprehensive lesson plans with elaborate instructional objectives without really taking the student and his/her skill set into account. It is essential that the teacher first understand his/her students before embarking on the use of a particular 3D VLE. Some online tasks may require students to have specific IT skills, for example, they may need to 'cut and paste' information from websites or even access certain software outside the 3D VLE, like Microsoft Word or PowerPoint. Students who do not already have this IT skill may experience cognitive overload since they have to grapple with the task together with such IT related issues.

Know the 3D VLE

From experience, students appear upset, nervous, and lost when an unforeseen technical problem, such as being suddenly disconnected from the 3D VLE, occurs. Thus, the teacher should be able and prepared to troubleshoot when the need arises. For example, should the 3D VLE environment suspends during the lesson, the teacher should be able to re-start the system



independently; this ensures that valuable curriculum time is maximized on uptime. Needless to say, the teacher should know how to use the 3D VLE chosen for the lesson. This will be useful since students often ask ‘how’ questions when exploring the 3D VLE. In addition, before the students use the 3D VLE, the teacher may be required to handle user administration issues from the assignment of user identifications and passwords to the setting up of the different tasks in the 3D VLE for students to gain access.

Are 3D VLE gender biased since they are often viewed as or considered games? It has been constantly reported in research that boys play more video games per week than girls. However, it was also found that girls were more likely than boys to list educational games as favorites, but that for both boys and girls, there was a decreasing preference for educational games from fourth through eighth grade (Buchman & Funk, 1996). This simply tells us that the teacher needs to keep this issue in mind and be aware that using a 3D VLE in teaching may not necessarily achieve heightened levels of engagement.

Engagement in 3D space versus Engagement with the Content

Teachers cannot always assume that students are engaged with the content even if they are looking intently at the computer screens and not causing any disruption during the lesson.

A student can be engaged within the 3D VLE and roam aimlessly around the 3D space, for his/her own entertainment, thus, not engaging with the content at all. Indicators of such disengagement with content include the following:

- Moving around in the 3D space and not engaging in the task;
- Unreasonable delay in submitting work required by the task; and
- Handing in shoddy and/or incomplete work.

Once the teacher notices such indicators, intervention is necessary to get the student back on course and engaged with the content. The teacher needs to investigate the reason for the student not engaging with the content. The reasons may vary from willfully refusing to engage in the task to not being able to understand what the task requires of them.

Conclusion

There is a need to reiterate that one must not use technology for the sake of it. The use of technologies like the 3D VLE needs to fit into and add value to the lesson. Most 3D VLE is in line with inquiry based learning² and this encourages self-directed and independent learning. Undoubtedly, 3D VLE has a part to play in education as it possesses the potential to motivate learning and engage students.

² Inquiry based learning begins with questioning and making connections with students’ current knowledge. Thereafter, students plan and investigate the issue through a series of activities. They then record and report their findings and finally reflect on their findings. For more information on inquiry based learning, refer to <http://www.ndtw.org/Blackboard/P2SST2/inqu.htm>.



Annex

<p>Quest Atlantis (3D VLE)</p> <p>http://atlantis.crlt.indiana.edu/</p>
<p>River City (3D VLE)</p> <p>http://muve.gse.harvard.edu/muvees2003/index.htm</p>
<p>Monja Kids</p> <p>http://monjakids.no-ip.info/monjakids/</p>
<p>Moon Base (3D VE)</p> <p>http://www.maidmarian.com/</p>

Interesting Sites on 3D Worlds

1	<p>Worlds.Com 3D Portal</p> <p>http://www.worlds.net/</p>
2	<p>Active Worlds In Education</p> <p>http://www.activeworlds.com/edu/index.asp</p>
3	<p>Shop In 3D</p> <p>http://chicago3d.net/aw2.html</p>
4	<p>Virtual Worlds Learning Resources</p> <p>http://www.bized.ac.uk/virtual/home.htm</p>

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