The Role of Place in Designing a Learner Centred Virtual Learning Environment

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Abstract: *There are numerous approaches and tools for creating a virtual learning environment. The most common approach is to provide a repository of learning materials on a network to facilitate the distribution of the course content and to supplement this material with communications software such as email and bulletin boards. In this paper we highlight the role of place in creating a learning experience and its relevance to current learning theories. Architectural design becomes an important consideration when virtual learning environments are considered places. We present a framework for guiding the development of virtual learning environments that shows how place and design can combine with learning theories and technology. Finally, we draw on our experience in developing a virtual campus and virtual design studios to demonstrate how place and design can be the basis for virtual learning environments*

1. INTRODUCTION

Virtual Learning Environments are built on a foundation of two key elements: computer technology and education. The technology aspect of virtual learning environments provides facilities for learning management tools, on-line learning frameworks, collaborative learning environments, web course design tools, etc. The software typically resides on a server and is designed to manage or administer various aspects of learning; delivery of materials; student tracking; assessment; and so on (Milligan, 1999). Though predominantly found using on-line technology virtual learning environments

are not restricted to this domain, but utilise computing technologies afforded by CD-ROM and more recently DVD-ROM. Many virtual learning environments also combine the two technologies, on-line and CD-ROM.

These two technological environments, not withstanding current technical capabilities such as storage and data transfer, have two distinct differences. On-line environments are dynamic and operate in a state of flux, subject to change at any given time. This ability to document change quickly makes them an ideal environment for communication and management. In juxtaposition, CD-ROM and DVD-ROM environments are fixed, and stable in terms of change. They provide an environment that can store fixed resources and content, which like books have to be edited and reproduced to document the new changes and conditions contained within their environment.

Traditionally, virtual learning environments were simplistic and crude, containing lots of text and simple graphics, with very little dynamic interaction. The design and development was influenced and carried out by programmers and subject matter experts. These were little more than electronic books containing the lecturer's notes. As computing technology advanced the capability to provide more sophisticated and dynamic applications for both CD-ROM and on-line environments increased. The design and development process saw the introduction of graphic designers who made the environments visually more engaging. Learning technologists helped to balance the influence of the programmers on the learning environment and bring the focus back to the pedagogical issues.

Today, we have the ability to create very sophisticated and complex interactive virtual environments. Virtual environments are not restricted to just text and graphics, but can include sound, video, and animation, all possible on both CD-ROM and on-line. These virtual environments are populated with communities, which are able to interact and communicate with each other in many forms. These virtual environments have the shapes, form, structures and functionality that are akin to the physical world. It is appropriate then to consider the role that architectural design can take in the design and development of virtual environments.

In this paper, we consider the importance of place in learning and present a framework for guiding the development of a learner centred virtual environment. We justify the use of place in learning with a constructivist view of learning and bring the focus back to the learner as the centre of the virtual environment to provide them with a learning experience. By developing the sense of place as the core of a virtual learning environment students are able to construct external representations of their knowledge in a manner similar to creating artifacts in a physical room. In this paper we

present how the role of place can influence the design of virtual learning environments.

2. A FRAMEWORK FOR VIRTUAL LEARNING ENVIRONMENTS

Virtual Learning Environments are inevitably designed with a pedagogical model in mind, that is not made explicit (Britain and Liber, 1999).

The development of virtual learning environments is typically guided by the consideration of two key elements: Technology and Education as shown in Figure 1.

1. **Technology**: is made up of many sub-categories based on computing technology.
2. **Education**: is made up of many sub-categories based on educational models.

Figure 1. Traditional framework for virtual learning environments

In previous research by Clark (Clark et al, 1998, Clark et al, 1999), it was found that using this traditional framework can aid in the designing of virtual learning environments. Murder under the Microscope - Professional Challenge 98 was a hybrid multimedia CD-ROM and on-line web-based virtual learning environment (see Figure 2). The learning environment was based on a 'REAL', rich environments for active learners. REAL's are comprehensive instructional systems that engage students in dynamic, authentic learning activities that increase their control and responsibility over the learning process while they learn problem solving and collaborative skills and content (Dunlap and Grabinger, 92. Grabinger, Dunlap and Duffield, 97).

Professional Challenge 98 was targeted at a broad section of the educational community from schools to universities, communities and businesses, and aimed to create an awareness of different environments (town, forest, crops, industrial, coast) and human impact on them. Teams of students worked to determine the impact of a diverse range of problems – dam proposals, farming, urban development and tourism – and propose alternative solutions. Each team was able to specify the problem(s) they

wanted to tackle(see Figure 3), their level of involvement (simple to complex) and the time they could spend on the tasks (Clark, 98, Grabinger, 98).

Figure 2. Murder under the Microscope Professional Challenge 98.

Professional Challenge 98 took over six months to design, develop and implement. In the beginning, the multidisciplinary project group worked in isolation from each and the project was driven by technological capability. The introduction of the framework with both technology and educational concerns brought the project back into alignment and provided a clearer sense of perspective. At first the project was driven by technology with pedagogical issues secondary. The framework brought a shift in the group focus and balanced the focus between technology and education. With a clearer pedagogical direction and how technology could best deliver, the group as a whole became more cohesive.

Professional Challenge 98 provided an excellent example of a "REAL", promoting study and investigation within authentic contexts, encouraging student responsibility, initiative and decision-making while cultivating a collaborative learning community. Unfortunately, what Professional Challenge 98 lacked was a sense of place. Participants in the challenge were aware that other competitors were competing and could chat to experts and other teams on-line, but these events were still in isolation and alienating with no metaphorical references to physical embodiment. The challenge and

its environment lends itself ideally to the possibilities that are afforded by creating a sense of place.

Figure 3. Projects web-page for Murder under the Microscope.

Focusing on supporting the learner and the learning environment the traditional framework does not make explicit the importance of the learning experience and the context in which the learning occurs.

We propose a framework for virtual learning environments that considers the learning experience and draws on design as a pedagogy, illustrated in Figure 4.

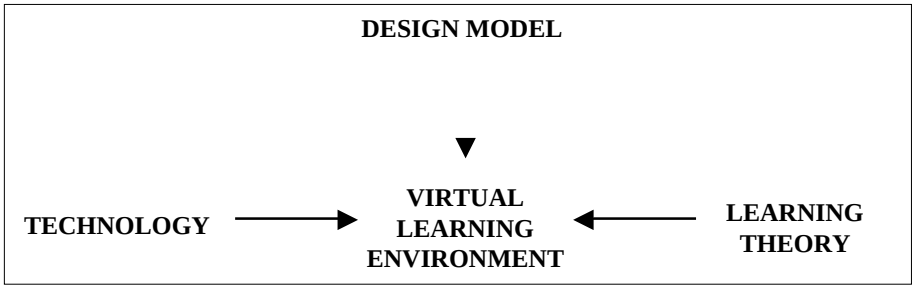

Figure 4. A framework for virtual learning environments that considers the importance of design

The development of this framework leads to a model for virtual learning that can benefit from architectural theories and principles of design teaching. Figure 4 illustrates the framework as having a third component, design models. Design models bring relevant design theories and pedagogy to the learning environment, focussing on the role of context and experience.

Where each of the components of the framework in Figure 4 can be elaborated to take into account numerous alternatives, we focus on a specific style of virtual learning environments. In Figure 5 we show how the technology aspect of a learning environment can be supported by a virtual world, the learning theory that we apply is constructivist, and the design model that we consider important for learning is situatedness.

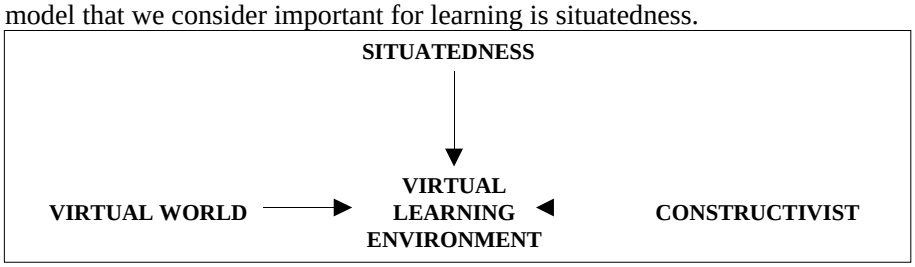

Figure 5. Model for designing a learner-centered virtual learning environment

This style of virtual learning environment supports the four key processes fundamental to a constructivist learning environment identified by Jonassen and Duffy: context (meaningful and authetic), construction (of knowledge), collaboration and conversation (between student/student and teacher/facilitator/mentor) (Jonassen et al, 1995. Duffy and Cunningham, 1996. Jonassen, 1994). The role of place in a learning environment is to provide the basis for these key processes. The place is designed specifically for the context. For example, in teaching a web site design course the virtual place is a gallery of student work. The place is also designed explicitly to support the construction of knowledge, where the student has the ability and is expected to contribute to the place. For example, in teaching web site design the students add to the gallery with their own exhibitions. And the use of virtual worlds intrinsically support collaboration and conversation.

Situatedness is the notion that addresses the role of the context. This concept is founded on the work of Bartlett (1932) and Dewey (1896) and has recently been introduced into design research by Gero (1998). Situated design considers the context in which the designing occurs as an important component to the design process and the knowledge available to the designer. When using this approach to learning and designing, the virtual learning environment provides the tangible situation in which the learning occurs. The design of the environment as a place takes this into consideration, resulting in a specially designed place for each learning experience.

Situatedness and constructivism are mutually compatible by their historical connection to cognitive psychology and it is this connection that makes them an appropriate choice in designing a learner-centred virtual learning environment.

Virtual worlds, such as Active Worlds (http://www.activeworlds.com) and VWorlds (http://www.vworlds.org), are networked environments that create a sense of place and a sense of presence of others in the place. They are inherently collaborative especially when populated by other people. Selecting a virtual world as the technology for a virtual learning environment provides the basis for a place, but the place itself needs to be designed. The design of the place can be influenced by architectural design.

3. CONSTRUCTIVISM AND THE ROLE OF PLACE

By understanding the fundamental nature of constructivism, we see how developing a sense of place can enable learners to construct their own learning. Constructivism asserts that we learn through a continual process of building, interpreting and modifying our own representations of reality based upon our experiences with reality (Jonassen, 1994). Three distinct characteristics of constructivism are:

1. Knowledge is not a product to be accumulated, but an active and evolving process in which the learner attempts to make sense out of the world (Gurney, 1989).
2. People conditionalise their knowledge in personal ways (Gurney, 1989). That is knowledge is referenced to a context in which it was encountered, and so can be applied spontaneously in new situations.
3. Learning happens within a social and collaborative context. Conceptual growth comes from sharing perspectives and testing ideas with others, and modifying internal representations in response to the process of negotiation with peers and teachers (Bedner et al, 1991).

All three of these characteristics emphasise the need for an environment, which will allow context, collaboration and communication. The Virtual World is an ideal three dimensional environment to develop a constructivist virtual learning environment where students are provided with a sense of place and context, and are able to explore, build and share their learning experience.

4. IMPLEMENTING PLACE IN A VIRTUAL LEARNING ENVIRONMENT

The development of place for learning environments has resulted in classrooms, laboratories, and studios. The design studio, a critical aspect of education in an architecture curriculum, assumes a place for students and design teachers to come together in a learning context. We take this approach as a basis for establishing place in a virtual learning environment and extend it to take advantage of the possibilities that software technology offers that is not possible in a physical studio.

In developing virtual design studios, the desktop metaphor and the place metaphor are compared in Maher and Simoff (1999). The desktop metaphor refers to the use of collaborative tools as if they were lying on a working desk of a physical office. On the desktop, and nearby, a designer finds tools for drawing (eg. pencils, rulers), communicating (eg. telephone), archiving (eg. folders, filing cabinets), organising (eg. diary), finding information (eg. catalogues, archives), and so on. In general, he has access to all the office resources apt to perform the design task. On the electronic desktop – which is based on a metaphor of the physical one - all the functions are collected on the same interface, in this case, visible on the computer screen. This approach is the most common and is presented as the "toolkit approach" in Lin and Protzen (1997).

Virtual places, which include virtual worlds and virtual reality applications, are *computer-mediated dynamic world models that create a sense of place*. The Internet has been accommodating more than a dozen different technologies supporting multi-user text-based, and two- and three-dimensional graphical virtual worlds. When adopting the place metaphor, preparing a virtual design studio is much like designing a physical studio (Maher et al 2000). The studio is set up to facilitate and support collaborative design activities. A virtual design studio differs from the physical design studio in a significant way: where a virtual studio can automatically react to the people's use and presence, a physical studio is passive and is changed only when people physically change it.

Figure 6 shows a virtual design studio implemented in Active Worlds. The students participate in the studio by going to the virtual place to present, discuss, and develop their designs. In addition to the internet facilities of web pages, bulletin boards, and email, the students have the experience of walking through the studio as avatars and meeting other students. The virtual design studio as a virtual world becomes a place for having a learning experience, in contrast to the use of web pages for managing a learning experience.

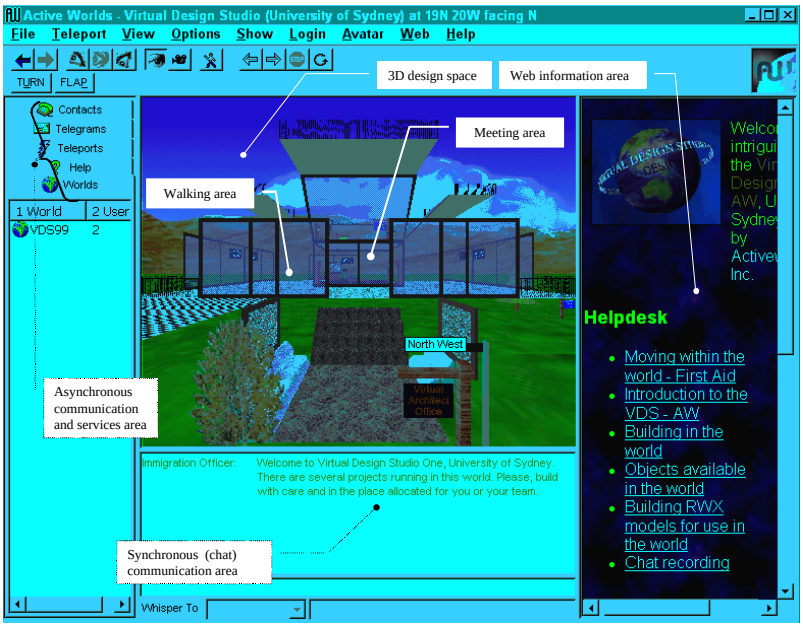

Figure 6. A virtual design studio as a learning place.

More generally, we have developed a virtual campus approach to virtual learning environments, where the emphasis is on collaboration and the learning experience (Maher, 1999), shown in Figure 7. There are 4 parts to the interface:

1. The representation of the place as words or 3D models.
2. The icons for access to information or other learning environments specific to a learning task.
3. The text of the conversation and activities in the room.
4. The typing area for commands or discussion.

The current implementation structure of the Virtual Campus is shown in Figure 8 (Maher, Clark and Simoff, 2001). It is based on two separate servers: place server and course server. The *place server* is based on a lambdaMOO server with the BioGate interface between the MOO database and the web server. In the MOO server every participant is represented by a *character*. The *course server*, where the course materials reside, is based on WebCT courseware server. The bridging data interface passes the information about the character and current location in the place to the course server. In the user interface this is reflected as an additional icon on the toolbar. Thus, to access the course materials corresponding to a room in the learning space of the Virtual Campus, a student selects a "book" icon in the toolbar.

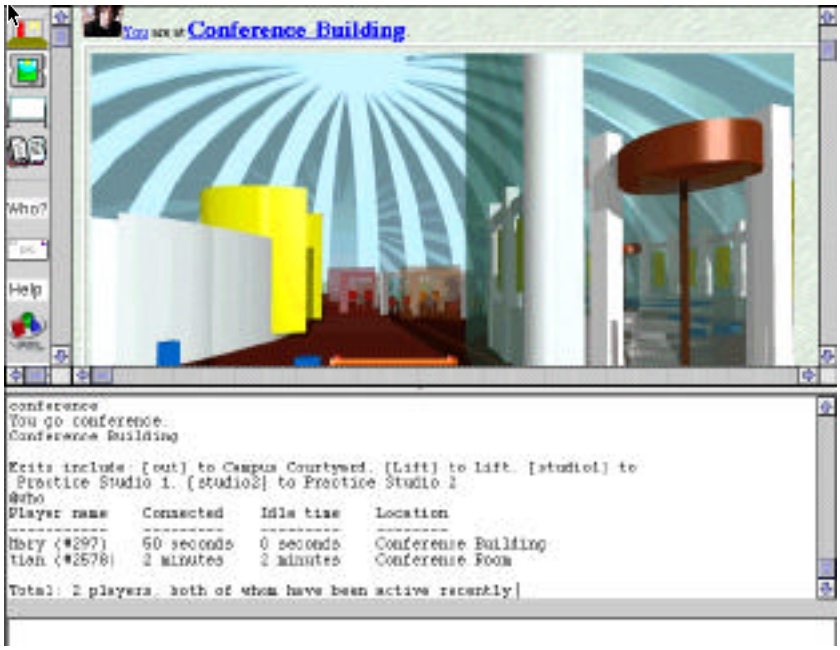

Figure 7. The Virtual Campus as a place

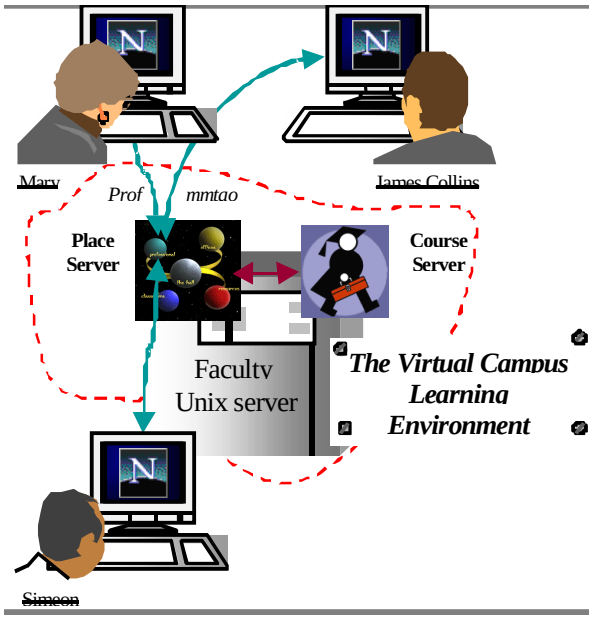

Figure 8. The implementation structure of the virtual campus

The loose integration approach offers an open learning space. The idea of the open learning environment is the incremental addition of technologies to the learning environment in a way that doesn't violate the consistency of existing virtual space organisation and human-computer interaction interface. In terms of implementation, this means the development of a bridging interface and the design of the corresponding icon for the toolbar. For example, we use ActiveWorlds as a virtual place for certain learning activities. Under the "loose integration" framework, the integration with ActiveWorlds requires a similar bridging data interface which passes the information about the character and current location on the place server to the ActiveWorlds server.

We illustrate the role of place further by describing a course on web site design. Previously this course has been taught in a virtual learning environment that provided course materials and an online bulletin board. The course materials were available to each student on web pages with password protection and access to the materials was monitored and available to the instructor.

This year, in addition to the course materials, we prepared a gallery in a virtual world as the place in which the students prepared and presented their assignments. The gallery was designed in Active Worlds and is shown in Figure 9. The gallery area is used as a meeting place for the students and lecturer of the course and in this open forum reminiscent of the acropolis, where philosophical debate takes place. The students and lecturer are able to convene in a common meeting place and share ideas, discuss problems and answers, and work collaboratively giving peer and lecturer support on each others' designs. Each student has their own personal name plate acting as a hyper link to their design web pages. These links enable anyone at any time to review the progress taking place in the students design portfolio. This ability to review and discuss together is an important feature in the process of "learning by designing". The other name plates are hyper links to the course, content and resources. The lecturer's name plate is linked his web page and the course information and notice boards. Another link takes students to the Web-CT site where learning activities and asynchronous discussion boards are available.

The virtual gallery provides a sense of embodiment and students choose an avatar to represent themselves in a virtual learning environment. The response to this type of learning has been very positive with students able to communicate more freely and openly, where they would otherwise have been more reserved and less inclined to give expressive opinion on other students work.

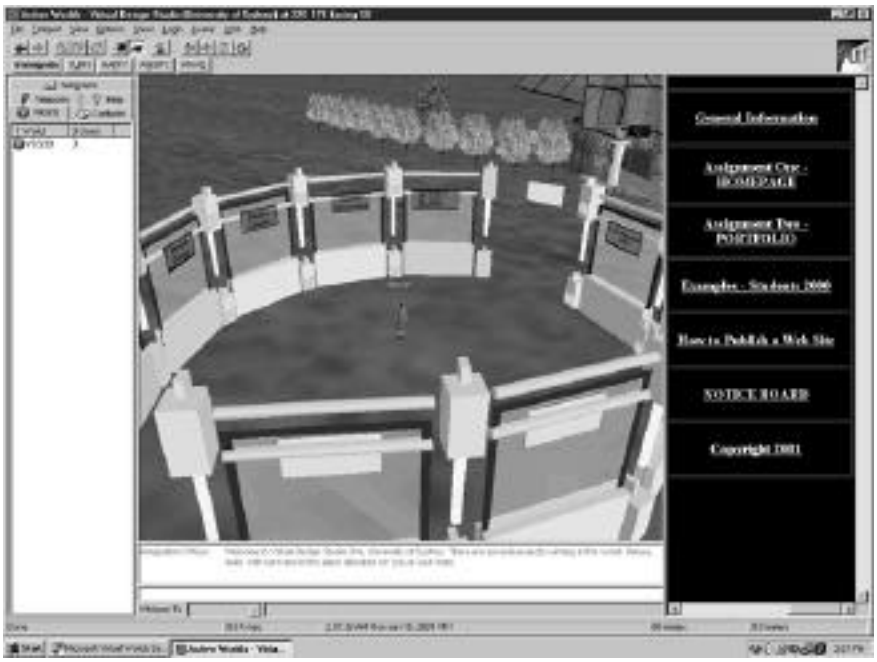

Figure 9. Gallery for meetings and presentation of assignments

5. SUMMARY

Incorporating place in virtual learning environments has pedagogical significance as well as encourages community and collaboration. The development of virtual design studios and virtual campus environments have not emphasised the role of place nor has there been a significant contribution from architectural design. In this paper we highlight the importance of the context or situation in which learning occurs and how a sense of place in a virtual learning environment can provide this context. We have developed place environments for various learning experiences and present a framework in which the design of virtual learning environments can explicitly address the role of place and context

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