

COLLABORATIVE LEARNING IN A 3D VIRTUAL PLACE

Investigating the Role of Place in a Virtual Learning Environment

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Abstract.

This paper reports on an exploratory study of the role of place and evidence of its effect on the activities, discourse and learning of design students in a 3D virtual learning environment that encourages collaboration and constructivism. Using an immersive 3D Virtual World based on *Active Worlds*, we created a virtual learning place for students' enrolled in a Website Design course. The virtual learning place consists of two distinct areas: a classroom-like place surrounded by student galleries. Students can navigate and communicate (synchronous chat) within the environment in the form of an avatar (virtual person). We recorded the conversations and activities of the students in discussions held in the virtual learning place and applied a communication coding scheme to analyse their discussions. In this paper we show how we identified the characteristics of place and specifically how it provides a context for identity and presence for supporting collaborative and constructivist student-centred learning.

Keywords

Virtual Learning Environment, Place, Design, Constructivism, Collaboration

1. Introduction

Institutions of learning have long understood the importance of providing a place for students to be engaged and supported in their learning activities, such as classrooms, conference rooms, laboratories, lecture theatres, and libraries. They are designed to provide students with an environment in which to construct their knowledge and develop a learning community through scholarly and social interaction. In recent years there has been a paradigm shift from the traditional

classroom based approach to learning towards implementing blended eLearning in the form of virtual learning environments. Traditional learning has focused on the distribution of learning materials such as texts and course notes, the presentation of lectures, followed by assignments and examinations. While many of these approaches have been transferred to virtual learning environments, the development of virtual places for learning is not as well developed. In this paper we present our approach to developing an understanding of the role of place and evidence of its effect on the conversations of design students in a 3D virtual learning environment that provides a sense of place. This research will help to inform our understanding of the paradigm shift from physical to virtual places for learning and designing.

2. Background

Places provide “a focus where we experience the meaningful events of our existence” [1]. When discussing the essence of place Relph [2] stated “Places are the contexts or backgrounds for intentionally defined objects or groups of objects or events, or they can be objects of intention in their own right”. These statements are by no means a universal definition of place, but seek to illustrate the significance of place in relation to human action and intention. 3D virtual worlds provide a basis for creating a new kind of place that, similar to place as described above, provides context for human action and intention. The theory underlying these assumptions and the translation from theory into a specification for a virtual place has been explored by Kalay et al., [3]. We have explored the role of place in virtual learning environments [4] and have studied designers collaborating in 3D virtual worlds [5]. Recently educational research has identified that studies into the use of immersive 3D virtual worlds for education can afford learners with opportunities for experiential and

situated learning within a collaborative learning environment [6, 7]. They have shown that 3D virtual environments can lend themselves to supporting a constructivist approach to learning.

In recent years, there has been an increase in the use of 3D collaborative virtual environments (CVEs) for educational purposes [8]. Research studies by Liebrecht [9] and Prasolova-Førland [8] have identified numerous 3D CVEs used for educational purposes that are based on metaphors of place such as DeskTOP, DigitalEE and Viras. These studies focused on the user's perspective and interaction with the CVE. Studies into constructivist 3D learning environments by Di Blas et al., [6] have studied the pedagogical, technical and organizational issues. These studies show that a sense of place is an integral element in the structure of a 3D virtual world. What previous studies do not provide is an understanding into the role of place in a 3D virtual world and how it could support students' learning. In this paper we take an exploratory approach to developing an understanding of the role of place and evidence of its effect on the conversations and learning activities of design students in a 3D virtual learning place.

3. Method

In order to study the role of place we created a virtual learning place for students in a Website Design course using an immersive 3D Virtual World based on *Active Worlds*, see Fig 1. The design and development of our virtual learning place was based on architectural principles [10] and theories of place by Canter [11] and Relph [2].

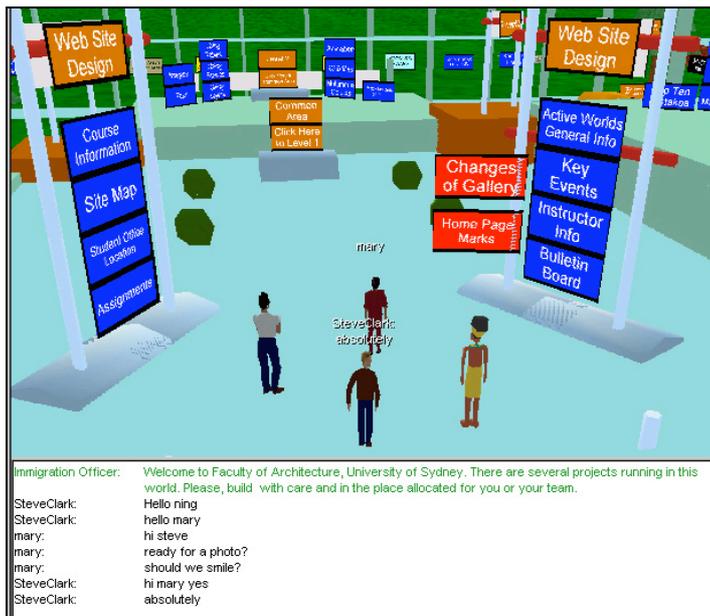


Figure 1 Virtual learning place for students based on *Active Worlds*.

3.1 Active Worlds

Active Worlds is a 3D virtual world located on a server, much like a web site, and students use a client-side program on their computer to access the 3D world. Students enter their details in the client-side program such as name and email address, and their chosen name is displayed when they enter *Active Worlds*. Displaying the name helps other students to reference, identify and differentiate one student from another, see Fig 1. Initially, students are registered as *tourists*, but can choose to immigrate as *Citizens* status to add greater functionality and tracking facilities such as changing their avatar and ownership of building objects. *Active Worlds* provides various tools for communication and collaboration. Students represented by an avatar explore, navigate and gather information in the virtual world by walking, flying or teleporting. Students change the shape, colour and texture of their world by adding new objects or modifying existing ones. In the virtual learning place students communicate by "talking by typing" and utilize expression of emotion in the form of facial and bodily

gestures through the use of their avatar. They can also change their virtual persona (different types and genders of avatar are available to choose from a drop down menu) to suit their mood or tone. The ability for students to establish an identity through other students recognizing them and communicating helps students to engage and establish a presence within the virtual learning place.

3.2 Sample and Timing

This research studied a group of 8 students enrolled in DESC9123 Web Site Design, an intensive 6 week summer school course in the Faculty of Architecture, University of Sydney. The course was designed to be fully online and accessible 24/7. Students attended a weekly meeting in the virtual learning place, with two 1 hour sessions in the morning and afternoon. This sample gives us 12 hours of chat among 8 students. The lecturer acting as a participant observer, observed the behaviour of the students in the virtual learning place, which allowed the students to work unhindered and without interference or bias in their learning process. The participant observer gathered data in the form of conversations and screen shots from the students' learning sessions. The conversations were logged in real time automatically using the client software *Active Worlds* and stored as text files. The log files identify the time logging commences, participants' names and the chat text.

A key aspect of the virtual learning place is the use of visualisation. The visualisation of students represented as avatars and their embedded objects (artefacts) affords an additional method for gathering data and studying the effects of a sense of place. During the sessions we took time stamped screen grabs of the students activities at various key moments. These visualizations were used as a cross reference against the students' conversations. Both sets of data provide a characterisation of the

patterns of place occurring in the virtual learning environment and their relationship to the students' learning experiences.

3.3 Communication Coding Scheme

The analysis of communication in the virtual learning environment was conducted by adapting a coding scheme developed for studies of computer-mediated communication and cognitive studies of designers for analysing design communication by Gabriel [12]. The communication coding scheme used in this research consisted of five major classifications. Four categories were adapted from Gabriel [12]: Technology, Control, Social, and Learning communication. The fifth category Place communication was developed from themes of place which were formed from a synthesis and interpretation of definitions of place by Aristotle, Heidegger, Norbert-Shultz, Alexander, Relph, Canter, Malpas, Kalay and Marx, in a study by Clark [13]. The coding categories were used to code the communication of students' learning experiences and therefore their articulation of their awareness of the aspects of the virtual learning environment that are associated with place.

The coding process involved applying the codes from the coding scheme that best described the students' chat statement and then conducting an arbitration process between the two coders. The arbitration process acknowledged the differences in subjectivity between the coders and allowed for consensus of coding and re-adjustment to reflect the meaning of the data. Using two inter-rater coders to code the transcripts of conversations helped maintain reliability and validity of the research. Once the arbitration process was completed the results were entered into spreadsheets to generate charts and graphs for the quantitative analysis of the coding.

4. Results

In this section we present our findings on the analysis of communication for the web site design course. The quantitative analysis of the coded transcripts of students' conversation using the communication coding scheme produces statistical results in the form of charts and tables. The qualitative analysis cross references the students' coded conversations with captured screen shots of learning activities that occur in the virtual learning environment. The result produces a characterisation of the relationship between the students' learning experiences and a sense of place in the virtual learning environment.

4.1 Major Communication

The quantitative measurements of coded utterances for each of the five major categories help to identify the dominant categories of communication and provide an overall statistical perspective on the communication that occurred in the virtual learning place. The results showed a dominance of learning (62%) and place (32%) communication over the other three categories: Control (2%), Technology (1%) and Social (3%). The dominance of learning and place communication characterises the student's engagement in these two key areas. The results for the other three categories: control, social and technology were comparative to findings by Gabriel [21] in the study of computer-mediated collaborative design. There was minimal social communication and when it occurred was often brief. The stability and intuitive nature of the virtual environment resulted in very little communication in relation to technical problems. Control communication was at a minimum as the nature of text based communication allows participants to engage openly and unrestricted with

others resulting in very little floor holding communication. The high proportion of learning and place communication prompted us to focus further on these two major communication categories.

4.2 Place Communication

The analysis of the coded communication for the six sub-categories of place communication: *Location*, *Identity*, *Exploration*, *Presence*, *Ownership* and *Citizenship*, show the number of coded utterances and provides an overall statistical perspective on the occurrence of place communication in the virtual learning environment for the courses duration, see Fig 2.

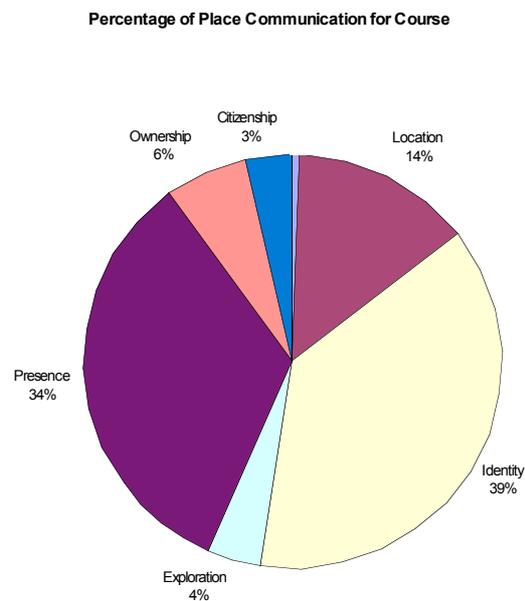


Figure 2 Percentage of Place Communication.

The statistical results for the seven coded categories of place communication were characterised by a dominance of three categories: Identity 39%, Presence 34% and Location 14%. The other three categories show low scores in comparison: Ownership (6%), Exploration (4%) and Citizenship 3%. In this section we present some examples of the relationship between the students' learning experiences and a sense of place in the virtual learning environment.

4.2.1 Establishing Identity and Presence

A key feature of a 3D virtual learning environment as opposed to text-based MUD's and two dimensional virtual learning environments such as Blackboard and LambdaMoo is the ability for lecturer/students to visualise the presence and location of other students. The ability to visualise others creates awareness for students to see who is in the virtual learning environment and where they are located. After becoming a citizen students have the ability to change avatars, build in the environment and create a contact list to easily contact and identify other students in the virtual learning environment. When a student enters the virtual learning environment, their name appears on the contact list which indicates their presence, as shown in Fig 3. Discussions on identity are a significant part of virtual places and contribute to establishing collaboration. The visualization of other students and the use of the contact list can be used to clarify the identity of a student in the virtual learning environment. The following conversation shows a typical discussion about identity where the student has used a different name to log in with. Lecturer: "Student 1 are you a citizen? I have you as a contact on my list. If not can you log in again as a citizen. Thanks". Student 1 replies: "Oh. Hang On". Lecturer: "There you are on my list great". This simple conversation illustrates how the lecturer helps the students to establish their identity through citizenship in the virtual learning environment.

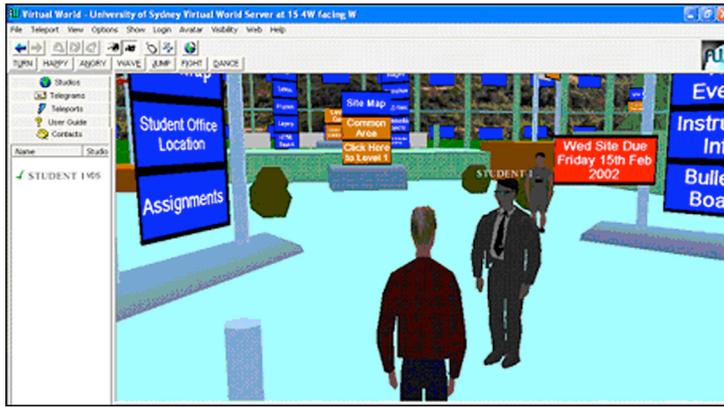


Figure 3 Visualising the presence of others

At the beginning of every session students acknowledge their presence by greeting each other as they would on entering a physical room. This becomes a ritual that both indicates the start of a discussion and acknowledges the names and presence of the participants. Lecturer: “Hi Student 1”. Student 1 replies: “Hi Lecturer”. Student 2 enters the virtual world: “Hi there Lecturer”, Student 1: Are we the only ones here?

As students communicate and develop as a learning community they begin to interact with the virtual learning environment and with each other. Students often congregate and communicate in groups within the virtual learning environment which mimics those found in physical places. We found that students formed two types of groups in the virtual place, small and large, dependent on the discussion taking place.

4.2.2 Small Group Collaboration

In Fig 4 (left side), students are can be seen located at a students’ office sign, discussing the web site that is linked to the sign. There are only three students in the discussion group and they form a tight circle close to the student sign. Student-1 states: “the shadows on the writings makes it a bit.. slightly confusing.. only slightly..” Student-3 comments: “The navigation quite clear”. Student-2: “blue writing against black background makes writings hard to read”.

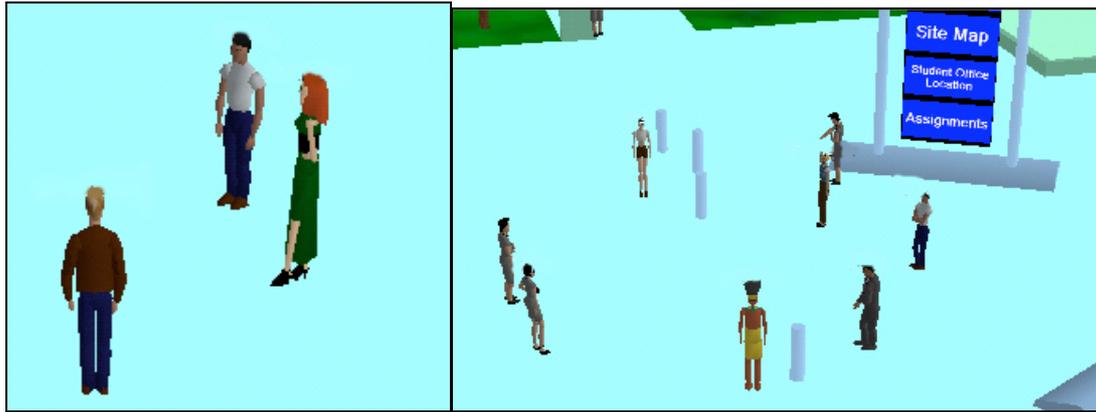


Figure 4 Small and large grouping in the virtual learning environment.

This type of group formation can often be seen in the physical world such as at an art gallery where people are discussing a painting on the wall. This type of small group formation is also illustrated in Fig 1.

4.2.2 Large Group Collaboration

In Fig 4 (right side), students are located in front of the assignments sign at the entrance of the virtual learning place. Students are able to read assignment 2 by linking to a web page, and see each other in the virtual learning environment using the Active World split screen. There are eight students congregated in a large group, but a ninth person can be seen just on the perimeter. Fig 4 shows the large group arrangement of the students as they communicate and collaborate within the virtual learning environment. The group is located at the main entrance area and the assignments sign can be clearly seen on the main signboard. Like the small group students are positioned in a circle similar to those reflected in the physical world. The conversation is located at a specific location and the students' discussion revolves around the topic relative to that place. The following conversation illustrates the collaborative process and how place supports collaborative communication. Lecturer: "I have been busy getting the next assignment on-line so you can take a look".

Student 1 enquires: “Ok where have you put it?” Student 2 replies: “I am on the assignment page at the moment.” Student 1: “Lecturer what do you mean in specification in the next assignment?”

The students continue to develop their focused communication on the key topic of Assignment 2. The conversation continues to unfold with the students’ reflecting and collaborating on the meaning of the content design.

6. Conclusion

Our analysis of students’ conversations using a communication coding scheme highlights that a sense of place can be achieved in a 3D virtual learning environment and that identity and presence can play a role in establishing the context for learning in a place. Based on the results of the quantitative and qualitative analysis we can identify a number of characterizations and observations of place in the virtual learning environment. Statistical observations showed that students were explicitly aware of the place environment for over 30% of their communication, with the majority of the discussion on learning issues.

From a more qualitative analysis of the results, we see different manifestations of the role of place and identity in a 3D virtual environment. When students become citizens they change their representation, called an avatar, which establishes their sense of identity in the virtual place. Students create their own contact lists to help indicate the presence and identity of others entering and exiting the virtual place. As citizens, students are able to add new objects and modify existing objects in the virtual learning environment to create a personalised virtual place and a sense of presence.

The role of the lecturer as a facilitator is supported by the visualisation of students represented as avatars in the virtual place. The visualisation of students in a location helps the lecturer to gather students to specific locations, which provides a context for discourse in the virtual place. Students conducted contextual discussions and collaborated with their peers and lecturer at the student gallery and levels of learning in the virtual place. This supported the lecturer in evaluating students’ understanding

and construction of knowledge. The effectiveness of group feedback enabled students to brainstorm concepts and ideas which supported their knowledge construction. These observations contribute a foundation on which to build further investigations on the role and importance of place in virtual learning environments that encourage collaboration and constructivism.

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Biographies



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