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Learners' Experience of Presence in Virtual Worlds

by

Mark Childs

**A thesis submitted in partial fulfilment of the
requirements for the degree of**

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Publications

The study has generated several publications. These are:

Text-based

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Childs, M. (2009) The role of presence in learning in telematic environments, in M. Childs, L. Schnieders, P. van Parreeren and J. Oomen (eds), *DIVERSE Conference Proceedings 2007 & 2008*, Haarlem; InHolland University, 73 -85

Childs, M. and Kuksa, I. (2009) “Why are we in the floor?” Learning about theatre design in Second Life™, *Proceedings of the Edulearn 09 International Conference on Education and New Learning Technologies*, Barcelona, Spain, 6th to 8th July 2009, 1134 - 1145

Steventon, G., Grove, P. and Childs, M. (2008) Shared spaces and ‘safe’ urban jungles: juggling pedagogical goals and student needs and expectations in a Second Life virtual community, *Proceedings of the ASCILITE Conference 2008*, Melbourne, Deakin University, 1st to 3rd December

Chafer, J. and Childs, M. (2008) The impact of the characteristics of a virtual environment on performance: concepts, constraints and complications, *Proceedings of the ReLIVE 08 conference*, 20th and 21st November, 2008, Open University , 94 - 105

Childs, M. (2008) Using a Mediated Environments Reference Model to evaluate learners’ experiences of Second Life, in Hodgson, V., Jones, C., Kargidis, T., McConnell, D., Retalis, S., Stamatis, D. and Zenios, M. (eds) *Proceedings of the Sixth International Conference on Networked Learning*, 5th & 6th May, 2008, Halkidiki, Greece., 38 - 45

Childs, M. (2007) Real Learning in Virtual Worlds. *Warwick Interactions Journal* **30** (2). Available at: <http://www2.warwick.ac.uk/services/ldc/resource/interactions/current/abchilds/childs>

Conference presentations

- Traxler, J., Bell, F., Black, A., Childs, M., Royle, K. and Wheeler, S. (2010) "New bottles, old wine? A debate on the ethics of educational interventions in popular digital technologies", Association for Learning Technology Conference "Into something rich and strange" - making sense of the sea-change Nottingham, UK, 7-9 September 2010
- Childs, M. (2010) "Becoming virtual: presence and embodiment as prerequisites to learning in virtual worlds", Association for Learning Technology Conference "Into something rich and strange" - making sense of the sea-change, Nottingham, UK, 7-9, September 2010
- Childs, M. and Peachey, A. (2010) Fur and Loathing in Second Life: Students' concerns and resistance to learning in virtual worlds, Plymouth Elearning Conference: Learning Without Limits, 8 – 9 April, 2010
- Childs, M. and Rowe, K. (2009) Virtual Theater History: Teaching with Theatron, Modern Languages Association Convention, Philadelphia, Monday, 28 December 2009
- Childs, M. and Kuksa, I. (2009) "Why are we in the floor?" Learning about Theatre Design in Second LifeTM, EDULEARN09 International Conference on Education and New Learning Technologies, Barcelona (Spain), 6th to 8th of July, 2009
- Childs, M. (2009) "I just don't get it!" Structuring Learning in Virtual worlds, Ninth International DIVERSE Conference, Aberystwyth University, June 24th to 26th, 2009
- Chafer, J. and Childs, M. (2008) Rosencrantz and Guildenstern are Derezzed, ReLIVE 08 conference, 20th and 21st November, 2008, Open University,
- Childs, M. (2008) Using a Mediated Environments Reference Model to evaluate learners' experiences of Second Life, Sixth International Conference on Networked Learning, 5th & 6th May, 2008,
- Childs, M. (2007) Do Virtual Worlds Count as Narrative Learning Environments?, 1st Online Working Conference on Narrative Learning Environments, September 27-October 2, 2007
- Stevens, J. Childs, M., Lint, F. and Eversmann, P. (2007) Streaming Theatres in a Virtual Classroom, 7th International DIVERSE Conference, Lillehammer University College, Norway, 27th to 29th June, 2007

Abstract

This thesis explores participants' experiences of presence in virtual worlds as a specific case of mediated environments, and the factors that support that experience of presence, with the aim of developing practice when using these technologies in learning and teaching. The thesis begins with a framework that was created to bring together concepts from a range of disciplines that describe presence and factors that contribute to presence. Organising categories within the framework were drawn from a blend of Activity Theory and Communities of Practice.

Five case studies in Second Life (preceded by a pilot study employing webconferencing) were conducted in order to investigate learners' experiences in these environments. Qualitative and quantitative data were gathered from these cases. The data from the separate cases were analysed using a cross-case synthesis and the role of presence, and the factors that support it, were identified. An additional strand of investigation established a typology of different forms of resistance by students to learning in virtual worlds.

The findings of the study were that an experience of presence is strongly linked to students' satisfaction with the learning activity. This experience of presence was more linked to students' preparedness or ability to engage with the environment than with technological limitations. Some students' resistance to learning in virtual worlds were informed by values they held about technology, but others appeared to display an inability to experience embodiment through their avatar.

The experience of presence appeared to develop over time. This can be interpreted as stages in students' development of a virtual body image, body schema and virtual identity. Different learning activities are more appropriate to different stages in this development. The thesis concludes with a suggested model for supporting students' development of presence. The implications of these findings for educators and for further research are discussed.

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1. Introduction

1.1 Outline of the thesis

This study began as a development of my research into effective techniques for learning and teaching using webconferencing and developed to incorporate newer work with virtual worlds. The study was originally intended to be a synthesis of a range of technologies under the collective term of mediated environments; however the cases in the main study all employed the immersive virtual world *Second Life*TM (a trademark of Linden Research, Inc.) and so the study became one of the role of presence in virtual worlds specifically, although the aims of the conceptual framework remain that of synthesising all forms of mediated environment.

The term “mediated environment” was employed as a means to bring together the technologies in which I was interested, and exclude others, and is defined in the work of Steuer (1995). Bringing together the separate literatures describing the experience of these technologies enabled a wider range of concepts to be considered than looking at a literature for a single technology would have allowed. However, these fields appeared to have been developed in isolation from the others; each having a separate literature, a lack of systematic terminology and drawing on different concepts. This led me to develop a single conceptual framework for the literature I was reading. Bringing together these separate literatures into one framework enabled the concepts to be synthesised, and thereby reinforcing and complementing each other.

As part of this process of identifying frameworks to organise the concepts, two models appeared to be the most comprehensive. These were Activity Theory (Engeström, 1997) and Communities of Practice (Wenger, 1998). Merging these two models therefore enabled the strengths of both to inform the conceptual framework for this study. The eight categories thus produced formed sections that were then elaborated through the various classifications, taxonomies and lists encountered in the various literatures.

As the conceptual framework grew, links between the disciplines of technology and education and others such as anthropology, sociology, psychology and drama and performance became apparent. These parallels led to the observation that at its most successful, engagement with

mediated environments is an embodied experience, in which participants develop an online “body” and identity. Viewing these interactions in this way can help educators understand the prerequisites, the nature of the interactions and the barriers some students may face in learning within these environments. This conceptual framework is developed in chapter two.

I would identify this conceptual framework, its systematisation of the terminology describing mediated environments and its synthesis of various disciplines as a contribution to research made by this thesis.

The research was initially intended to analyse learners’ experiences of mediated environments in a variety of learning activities in order to identify effective strategies for teaching in these environments. This was planned to be achieved through analysing transcripts of classroom interactions, focus group discussions and one-to-one interviews and a pilot study was conducted to identify whether this approach seemed practicable. It became apparent from the literature on the subject that an essential element in understanding interaction with these environments was presence; in fact, Biocca (1997) stated that presence is a prerequisite for cognitive development in these environments, and the study is this experience of presence as perceived by learners. At this time it was also discovered that other research projects were also aiming to identify effective strategies for teaching in virtual worlds. It also became evident that the range of learning activities that were available to be investigated was limited. In addition, the results of the pilot study indicated that presence *was* a key factor, as Biocca had indicated. During the main study, therefore, this qualitative study was altered to focus specifically on the experience of presence in these environments and the factors that supported this experience. In addition, a parallel quantitative study was added that investigated the role of presence further through using a questionnaire about the students’ perceptions of presence, their opinion of the effectiveness of the learning experience and about some of the factors identified in the literature as supporting presence. The methodology and case studies are described in chapter three.

The quantitative and qualitative analyses of the students’ experience are reported in chapter four. During the case studies another dimension was identified as being of value to study. This was the students’ resistance to the use of virtual worlds. An additional analysis was therefore conducted

of the focus groups and interview transcripts to look for common elements in the resistance displayed by students and develop a typology of students' responses.

The relationship between the experience of presence and the value placed on the learning activity was strong enough, even from a small sample, to indicate that Biocca's statement of the importance of presence to the effectiveness of learning is correct. However, although the initial plan was for the study to examine different forms of mediated environment, including webconferencing and more than one virtual world, the main study only had the opportunity to use one technology, that of virtual worlds. The conclusions of the study can therefore only be applied specifically to virtual worlds, although further work may find them to be generalisable across all mediated environments. I would identify the account of students' experiences of virtual worlds, the confirmation of Biocca's statement relating presence to cognitive development and the typology of students' resistance as further contributions this thesis makes to the field of learning and teaching in virtual worlds.

The analysis of transcripts and interviews suggested a range of factors in the experience of students in virtual worlds, one of which was that presence increases progressively over time through particular stages. The literature indicates that familiarity with the technology being used increases through several stages (Salmon, 2004) and that participants' identity in a virtual world also goes through stages (Warburton, 2008). Drawing on these models, and the data from the studies, enabled the creation of a model drawing together presence, identity and familiarity with technology. This model of progressive development of presence and virtual bodies is related in chapter five. It is followed by my general conclusions about the study and my views on the further development of the field and my own research.

This model of progressive stages in the development of presence, and the role of the development of virtual bodies to this experience of presence, are further contributions to the field.

The originality of this research is the use made of the range of different literatures from a range of subject disciplines and drawn together into a single framework to describe mediated environments, and the identification of the role of virtual bodies and virtual identities as prerequisites for, and potential barriers to, effective learning in virtual worlds. These ideas have been published and presented to various audiences.

Of the various mediated environments, that of virtual worlds has been the most productive as a research focus, since several, notably Second Life, have come to prominence over the period of the study. Conducting this study has enabled me to become part of the community of academics researching in this field, and to contribute to some of the developing concepts in the field. Once the doctoral process is completed, I anticipate being able to further these investigations, building on the work developed here.

1.2 Context

1.2.1 Mediated environments

The term “mediated” requires clarification, since it is used in different ways within the educational literature. In one usage of the word, all learning is mediated to some extent using tools, since learning occurs “not only inside the person, but in his or her ability to use a particular set of tools in particular ways and for particular purposes” (Littleton, Toates and Braisby, 2007; 202). This act of mediation through the employment of an external artefact is the basis of Activity Theory, formulated by authors such as Leon’tev and Engeström, and drawing chiefly on the work of Vygotsky in the 1920s (fig.1.1) (Edwards, 2004; 88 - 89).

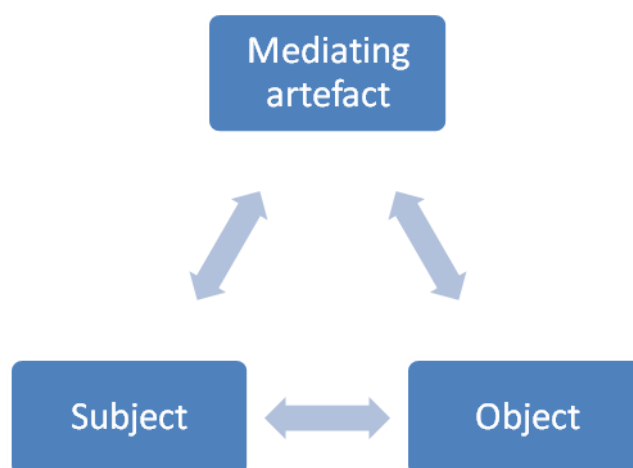


Figure 1.1 The basis of Activity Theory (Center for Research on Activity, Development and Learning, 2004)

However, the term “mediated communication” is also used with a different meaning in parts of the literature, particularly those concerned with presence and technology, illustrated in figures 1.2

and 1.3 (Steuer, 1995; 38). Figure 1.2, refers to a traditional view of communication occurring between two people, A and B, either proximal or remote, where the communication is directly between them. *Mediated* communication is shown in the next figure. This form of communication differs from traditional forms of communication in that, with these communication systems, “information is not transmitted from sender to receiver; rather mediated environments are created and then experienced” (Steuer, 1995; 37). In this study, the term “mediated environments” is used in this sense, i.e. that the platform is the *only* means by which communication occurs between two *remote* locations (Wilson, 2000; 7) and in which participants interact with the environment rather than directly with other participants.

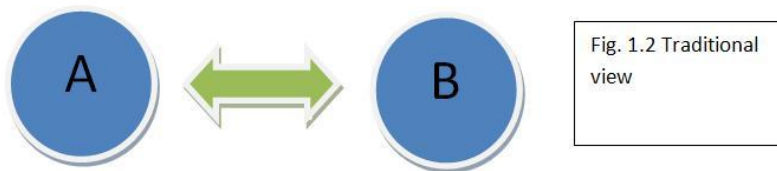


Fig. 1.2 Traditional view

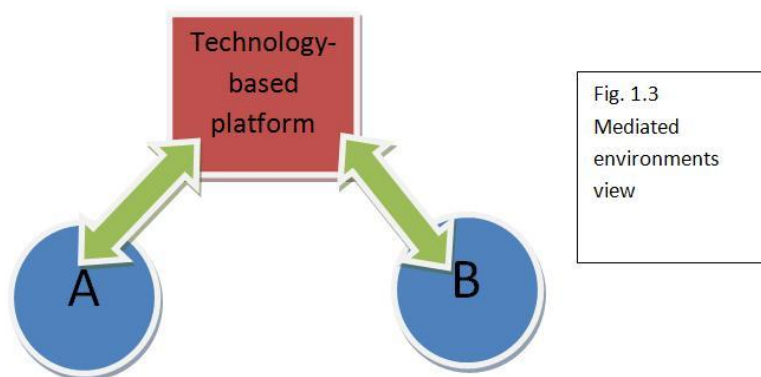


Fig. 1.3 Mediated environments view

The essential features of mediated environments are that they enable users to interact within a shared digital environment (Zhao, 2003; 445) and communicate via this interaction. Communication that is simply at a distance, but does not create an environment within which the participants interact (for example a telephone conversation or a video call) does not usually fall within the definition of a mediated environment.

The elements from which the environment is constructed may be simply text (as in a chat room), or may use multiple media. The environments in which only text is shared are often called MUDs (multi-user dungeons or multi-user domains) and opinions differ as to whether these are mediated

environments. For Towell and Towell (1997; 592) they are, for other commentators there must be a visual representation of the space and the participants for it to fall within the definition (Schroeder, 2002a; ix - xi). The two types of environment considered in this study are webconferencing (in which image, audio, text-chat and documents are shared) and virtual worlds.

1.2.2 Webconferencing

Webconferencing differs from videoconferencing in that, rather than having only a direct exchange of image and sound (as in fig 1.4) participants share video, text and other information within an environment where multiple channels are used to communicate and where a spatial arrangement of information can be used to convey the sense of an intermediate digital space in which participants can interact (fig 1.5). *Videoconferencing* would therefore usually not fall into the definition of a mediated environment, whereas webconferencing would. The technologies used for either can be simple desktop computers and webcams over a standard internet connection, although meetings held via videoconferencing often use larger technologies built into rooms using ISDN (dedicated telephone lines).



Figure 1.4 A tutorial conducted via videoconferencing

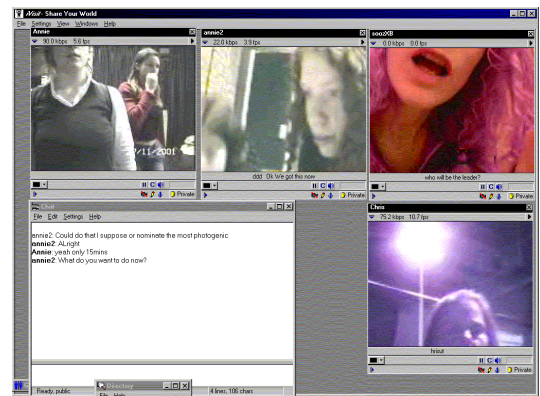


Figure 1.5 A telematic performance workshop conducted using webconferencing

Webconferencing and virtual worlds are the two dominant mediated environments (Schroeder, 2010) and are distinct in that the former is distal i.e. it links the user to a distant but real location, whereas virtual worlds are simulacral, i.e. they link users to a computer-generated environment (Goldberg, 2000; 5). Schroeder (2010) also distinguishes them as primarily “facial” and “spatial”

respectively, i.e. webconferencing enables the user to see the expressions and body language of the other, but with little freedom to move within a world, whereas virtual worlds enable much freedom of movement, but with little non-verbal communication.

1.2.3 Virtual worlds

Virtual worlds have been used since the mid-1980s (Yakal, 1986; 32), primarily for social networking. They are computer-generated environments in which participants adopt an avatar (a computer-generated representation of themselves; an example can be seen in figure 1.6). The word “avatar” refers specifically to instances of human control. If the interaction within the environment is controlled by a computer program this is usually referred to as a bot (Isdale et al, 2002; 530), or occasionally “agent” or NPC (non-player character). These bots may be embodied within the environment, in which case they can be said to be *embodied* autonomous agents (Allbeck and Badler, 2002; 314), and may even be indistinguishable visually from avatars.



Figure 1.6 A seminar in a café in Second Life. The author is furthest left.

The virtual world can be viewed either in first person mode, i.e. from the point of view of the avatar, or in third person mode, viewing the world from a position behind and slightly above the avatar. Interaction with the virtual world, and with the other virtual participants, is then conducted via this digital representation. Avatars can have their movement blocked by objects, can collide with other users, will fall if they step off the edges of buildings and can pick up and drop objects. Avatar names remain constant, conferring a persistent identity upon users.

In 2010 there were between 20 and 30 3D virtual worlds depending on how the term is defined. Second Life is the most popular of those worlds used primarily for social networking (as opposed to primarily for gaming) and was launched in 2003. Second Life is a virtual land space (figure 1.7) consisting of a small number of continents and many small islands. Land can be bought on the continents, or for more privacy (and more prestige) an island can be purchased. Currency consists of Linden dollars, which can be exchanged for US dollars (the exchange rate is about 300 Linden dollars to a US dollar). Residents can create their own objects within the space. These are built from adding together many basic geometric shapes (known as prims – short for primitives). An active economy exists buying and selling these objects.

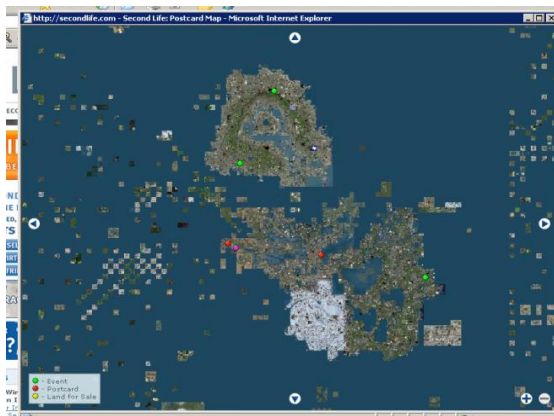


Figure 1.7 a map of Second Life

<http://secondlife.com/>

The basic elements of the technology of Second Life employ three different type of device, these are regional simulators, asset servers and client machines (Drew Baker, David Burden, personal correspondence, 2009) (fig 1.8). Other virtual worlds may use different technologies.

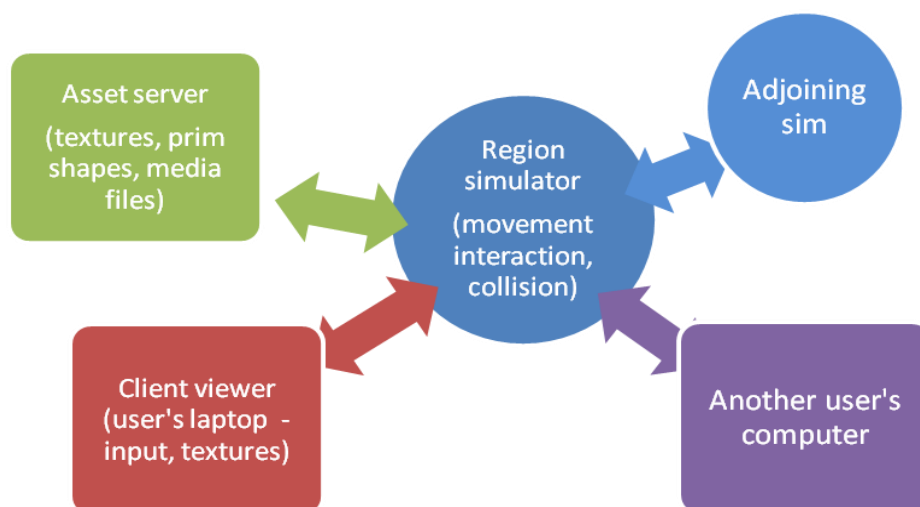


Figure 1.8 The elements of the technology supporting Second Life

Information about the size, shape and texture of prims, how avatars are to be animated, media files and other elements such as visual effects are all stored on a set of asset servers. When an item is bought, created or modified, the information about that object is stored in one's inventory on the asset server. The regional simulator corresponds to a specified area of virtual space within the virtual world, called a sim. Each sim is divided into many packets. The regional simulator records the positions of all of the objects that are placed in the sim and all of the avatars that are present (all referred to as assets) and the corresponding asset identifiers. When a user connects to the virtual world, they connect to one of these regional simulators.

In a typical session a user logs in to the virtual world. The user's machine will either connect to its "home" location, or the last recorded position of the user's avatar. This information is stored on the user's machine and is the equivalent of a geographical location. As they connect, the regional simulator registers that the avatar has appeared in that location and retrieves information about the design of the avatar and other settings, such as animations that govern how the avatar moves, from the asset server. Data concerning the relative positions of objects in that sim, and other users' avatars, are downloaded from the region simulator to the user's computer (i.e. the viewer); data about how those objects appear, their shape and texture, are also downloaded onto the user's computer. If the user presses the arrow keys on their keyboard, this information is also sent to the regional simulator, and used to update the avatar's position. Page up and page down keys tell the avatar to fly up or down.

The viewer (a piece of software running on the user's computer) then processes all these data to create an image on the screen, a process called *rendering*. The viewer can interpret these data from any angle, so the user can move their point of view (called the camera) around the space. A user's inventory appears as a list of object names in a window on their computer. When a user drags one of these object names onto the image of the world on their screen, the viewer sends information to the regional simulator, which then adds that object to the region, drawing information about it from the asset server, so that anyone else who has an avatar in the vicinity can see it. This is a process called *rezzing* (derived from "resolving" and coined by Lisberger and MacBird [1982]).

The regional simulator is therefore keeping track of the relative positions of avatars and objects, calculating how they move through the virtual space, communicating with the asset server for data

on the physical properties of the objects (whether they are subject to collisions, or gravity etc.) downloading this information to client machines, and receiving information from client machines about how the avatars are to be moved, or if additional items are to be rezzed. If avatars move across the boundary between one sim and another, or teleport (i.e. move to a completely different geographical location), the regional simulator passes on the information about that avatar to another simulator.

This requires a large amount of processing, which increases dramatically the more avatars that are present. For this reason, there is a practical limit on the number of avatars that can be present in any one sim, approximately 30 in the case of Second Life. Even with smaller numbers, the increased processing time when many avatars are present can mean delays between pressing a key to move and seeing the visual response, a delay referred to as *lag*.

The demands on the client viewer can exceed the specifications of many computers, and even with higher specification machines, the process of communication between viewer, simulator and asset server can mean delays in receiving the information about the appearance of objects, which leads to long render times, so viewers see the world build slowly around them.

This particularly has an issue for activity that involves larger cohorts of learners as the more students present in the class, the bigger the problem with lag. Lag can be reduced by using avatars with no effects, no special animations and with simple textures (referred to as avatars with low Avatar Rendering Costs). Poor quality equipment can lead to long render times, or even frequent crashes.

1.2.4 Educational uses of virtual worlds

During the period of this study, the educational usage of virtual worlds changed from only a few isolated examples in 2005 to every institution in the higher education sector employing them to some extent by 2009; by far the most common of these virtual worlds being Second Life (Kirriemuir, 2009;2).

The question then arises, why? What are the advantages of connecting students together using a visual representation of space and participants, rather than a purely text-based environment?

One of the answers is the capacity to embed three-dimensional objects within the space, such as buildings and landscapes. These objects can be explored by movement through and around them. In addition, media objects such as jpegs, flash, PowerPoint and QuickTime files can be placed within the environment. Textures, clothing and other designs can be created in CAD (computer-aided design) systems and uploaded (Polvinen, 2007).

This, in itself, does not constitute an important advance in the development of learning platforms, since three-dimensional recreations, and media objects, can be embedded in webpages. Similarly, design students have long been using CAD systems for prototyping and developing products and interaction with other learners can already be integrated with online learning objects by linking them with discussion boards or chat rooms. The extra element that virtual worlds such as Second Life provide is the inclusion of avatars. Because participants can be embodied simultaneously within the same space, this means, in general, that they can feel a greater sense of connectedness with each other and with the material.

The employment of avatars also means that the participants can develop an identity in the virtual world that may or may not correspond to their real world identities and can roleplay. These online identities can be used as a basis for educational experiences. For example, Lee and Hoadley, (2007) addressed issues of diversity and equality with their students through sessions in which their avatars took on different genders and ethnicities, observed the responses of others within the virtual world and reflected on these in classroom discussions.

1.3 Development of the PhD

1.3.1 Prior to the study (2004/2005)

My work in higher education before starting the PhD was based around a series of externally-funded elearning projects, the most interesting and rewarding of which I found to be those that dealt with synchronously linking people together at a distance, using either text-based technologies, videoconferencing or webconferencing (Childs and Dempster, 2003). During the ALT-C conference of 2004, I shared a session with Steve Wheeler (Childs, 2004; Wheeler and Buckingham, 2004). In his symposium, Wheeler described “a number of pedagogical and psychological issues that have been

identified as key areas of challenge in the use of videoconferencing” including “telepresence, social presence, interactive classroom, distance learner support, transactional distance and equivalency theory.” This work showed how a theoretical approach to understanding the use of technology with which I was already engaged could inform my practice, and led me to want to bring a theoretical perspective to my own work. Formative papers for my exploration here were Zhao (2003), Nowak and Biocca (2003) and Sheridan (1992). This led to a PhD proposal based around learning, copresence and interaction in January 2005, looking at their relevance to webconferencing.

1.3.2 First year (2005/2006)

During the literature review in the first year, I discovered that as I read more about the concepts of presence and telepresence, other concepts were introduced that had a bearing on the experience of participants in synchronous interaction at a distance, such as the surrounding community, and the identity of the participants. Also during this year, I was working on a project with my first supervisor on serious games, and many of the concepts involved with that also seemed to be relevant, such as the experiences of Steinkuehler (2005) in which she reported the process of tutoring in a virtual world of an massive multiplayer online role play game.

As the year went on, it became apparent that the various domains I had read while developing the literature review were fragmented and lacking in a systematic approach and terminology. The work published by MIT had dealt mainly with teleoperators and telerobotics. The work by elearning practitioners dealt with webconferencing. The theoretical perspectives in elearning I had encountered were based on computer-mediated communication (mainly the community of inquiry model of Garrison, Anderson and Archer [Arbaugh and Hwang, 2006: 17]). These all had relevance to the work I was interested in yet adopted different meanings for terms, or used the same term in different ways. Where typologies were listed, these had overlaps, yet also had omissions when compared to each other. Understanding the fields I had chosen to explore as a unified whole therefore required me to develop my own systematic terminology and build a concept map that integrated the various domains.

In July 2006, I attended the DIVERSE conference at Glasgow Caledonian University. At that, I attended three sessions that compared working in virtual worlds with webconferencing, (Thomas,

2007; Newman, 2006; Verleur, Verhayen and Arentsen, 2007). The field of virtual worlds seemed to offer an opportunity for the educational world to develop new forms of learning and teaching, extend the work I had already been doing and also incorporate much of the studying I had done of games and education. I decided therefore to expand my thesis to incorporate the examination of virtual worlds as well as webconferencing.

1.3.3 Second year (2006/2007)

My new aim for the PhD was then to extend the study to encompass virtual worlds. The intention was to develop guidance for good practice in using these technologies through a grounded approach, asking explorative questions of users about their experiences of the environments, and identifying teaching techniques that were observed to be particularly useful. This was a methodology that had been successful in previous research, such as the Childs and Dempster (2003) work described above. My rationale was also that at that time it was important that the study be able to inform educators' practice, since these virtual worlds had very little guidance accompanying them for their appropriate use within education. As I was a staff developer at the time, knowledge of how to make best use of virtual worlds would help inform my own practice, as this would be guidance I could incorporate into development programmes I would run.

The examination of both webconferencing and virtual worlds in practice was made possible by the award during the following six months of funding for two research proposals of which I was a co-applicant, one for webconferencing (which formed the pilot study for this thesis) and one for a project in an immersive virtual world (which contributed case studies for the main study).

During this time I also applied for a transfer from the masters programme to the doctoral programme. In the course of writing the upgrade proposal, and struggling to find a title, I re-read many of the earlier papers and rediscovered the term "mediated environments". This term became very useful for me conceptually, because it brought together, defined and bounded the various technologies with which I was interested.

The work of Newman (2005, 2007) initially, then later de Freitas and Oliver (2006), suggested a series of categories in addition to the three that already been identified at that stage (presence, identity and community). These two frameworks included the characteristics of the technology, the

nature of the activity and the characteristics of the participants. Combining these two frameworks formed the basis of a larger conceptual framework which I called the Mediated Environments Reference Model (MERM), into which many of the other frameworks I then encountered through reading the literature could be incorporated, thereby making sense of how the ideas related to each other. Developing this conceptual framework then became the focus of this stage of the PhD.

Since I then had the umbrella concept of mediated environments to identify, and also establish a boundary for, the literature I wished to include, this enabled me to systematically include or exclude elements of the various domains I had been exploring within the conceptual framework. This framework became a focus for organising the ideas, looking for similar ideas that may be described in different ways in different domains and merging them, and occasionally creating new terms where existing ones were ambiguous. The framework was then used as a basis for the evaluation of the webconferencing project, which formed the pilot study for this research (Childs, 2009). The pilot study in turn enabled the value of the conceptual framework to be tested as a basis for evaluation, and data gathered from the evaluation informed the further development of the conceptual framework.

1.3.4 Third year (2007/2008)

During the third year, the MERM conceptual framework was further developed, particularly the inclusion of categories of learning activities (by the inclusion of the Learning Activities Reference Model [Falconer et al, 2006]). A paper on the framework was presented at the Networked Learning Conference in May 2008 and published in the conference proceedings (Childs, 2008a).

Later in this year I was introduced to activity theory (Engeström, 1999; 31) through the application of this theory to the understanding of early childhood education in the work of Edwards (2004). This paper indicated the usefulness of Activity Theory in describing educational scenarios. The categories included in Activity Theory contained matched those brought together in the MERM at that stage (See table 1.1). The publication of work by Masterman (2008) during that year, in which she described Activity Theory's role in designing an application for creating lesson plans, provided a further example of its value as a descriptive and design tool.

A criticism of the Networked Learning Conference paper was that the set of categories chosen had no provenance; they had simply been spliced together from other models (Charalambos Vrasidas, personal communication, 2008). Adopting Activity Theory as an integrating structure for the framework would answer this criticism by demonstrating precedents for the categories and showing this new model to be an incremental development of a previous model (table 1.1).

<i>Categories in MERM July 2008 (Childs, 2008a)</i>	<i>Categories in Activity Theory (Engeström, 1999; 31)</i>
Presence	No equivalent
Identity	No equivalent
Characteristics of environment	Tools and instruments
Characteristics of participants	Subject
Learning activities (LARM)	Object
Learning activities (context)	Rules and conventions
Community	Community
No equivalent	Division of labour

Table 1.1 A comparison between the categories of the MERM in July 2008 and Activity Theory.

While adapting the MERM to Activity Theory it became apparent that elements such as augmentation and immersion that I had included in the section on “learning activities” really belonged in the section on rules and conventions, since these informed the behaviour of participants within the activities. Considerations of the division of labour were missing from the framework, although were implicit in the framework since the different experiences of students and teachers were referred to. Community had been considered but excluded in order to limit the extent of the thesis. However, within the MERM, but missing from Activity Theory, were two categories the literature had identified as key concepts, and indeed were the two starting concepts of the

development of the model; these were the types of presence in its various forms, and the identity of the participants.

The solution was either to redefine presence and identity in order to include them within Activity Theory, or to extend Activity Theory to include these concepts. Adding the two additional factors provided a more coherent way to proceed, particularly since the diagram representing Activity Theory framework was only 2-dimensional, leaving the third dimension empty and available for expansion. Adding these two factors above and below the Activity Theory model created a rather unbalanced three-dimensional shape (fig 1.9). However, when transformed into a more regular shape, so that the vertices are equidistant, the model forms a cube (fig 1.10).

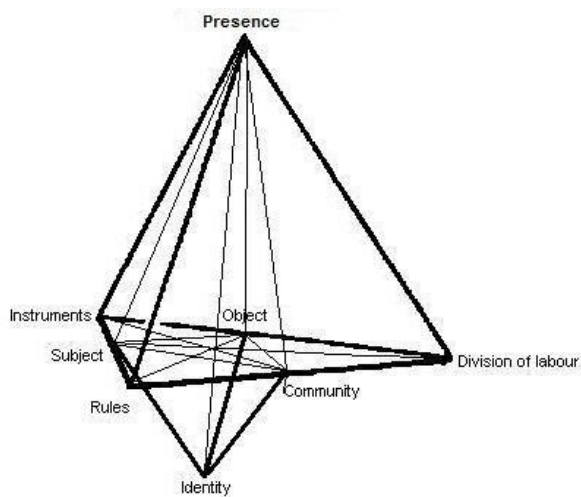


Figure 1.9: Adding presence and identity to activity theory (preliminary representation)

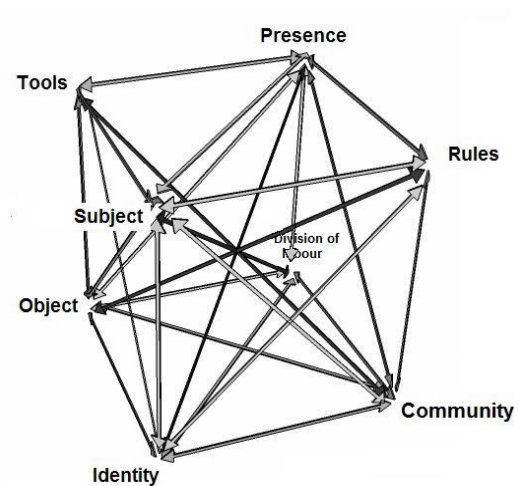


Fig 1.10: Figure 1.9 redrawn to form a regular polygon, maintaining the original relationship between vertices.

1.3.5 Fourth year (2008/2009)

The drawback of being a staff developer, as opposed to a lecturer, means that there are rarely students with whom I have direct access; access must always be negotiated via a lecturer. Throughout the third year, I had not been able to assure access to users from whom I could gather data. These delays had resulted in the development of a coherent conceptual framework and an extensive literature review before any data had been gathered, so the research was no longer as grounded as I had originally planned.

During the fourth year, it became apparent that investigating learners' experiences of mediated environments and developing guidance for staff to conduct learning activities was no longer such a novel area of research. I learned of several projects in which the research questions were very similar to the ones with which I had started my PhD. These studies also focused heavily on the identification of good practice in virtual worlds and were similarly explorative. In addition, these projects could also guarantee larger numbers of users to evaluate and be completed sooner.

These two factors, the creation of a coherent model before any data collection and the need to differentiate my research from a newer and larger projects aimed at addressing similar research questions, meant a redirection of the research was required.

The new direction the research took was prompted by the quote by Biocca about presence being linked to higher cognitive functions. I had written this in a piece for Anglia Ruskin University's learning and teaching newsletter earlier in the year (Childs, 2008b) and the piece had just been published at the time I was looking to refocus, which brought the quote to mind, i.e.

As with other forms of presence, designers share the assumption that increases in self-presence are correlated with higher levels of cognitive performance, and, possibly, emotional development." (Biocca, 1997).

Presence had been at the core of the original research proposal and defining the various elements of presence had been the start of the development of the conceptual framework. It had also emerged as an important contributor to the students' experiences in the pilot study. The diagram of the model incorporating Activity Theory strengthened visually the interconnectedness of the various elements of the model to presence. These factors led to a decision to focus on the role of *presence* in the experience of learning, and the contributory factors to this experience. Looking at the role of presence in these environments would then be a more bounded study and also less likely to be pre-empted by someone else's work.

In addition, a new tactic presented itself for gaining access to user groups at the start of the fourth year. Instead of asking for access to other academics' teaching sessions, I became a guest lecturer on a series of different courses, introducing students to Second Life. The *quid pro quo* for this free lecturing was the opportunity to gather feedback from the students. Since there were no

initiatives requiring my support in the area of webconferencing, it was not possible to include case studies using this technology. All of the case studies therefore used only Second Life as a platform.

The potential to obtain data was still limited however. After a few initial attempts at running sessions, most educators with whom I was collaborating came to the opinion that using the platform was too high-risk to include as a compulsory part of a taught module. This was because there were many technical barriers to overcome, and a failure in the platform would have meant lost weeks in the teaching schedule and put the students' education (and the lecturer's credibility) at risk. Even when the technology was reliable, the time taken to train students in using the interface was felt to make too large an intrusion into the contact time in a regular course. This meant that all of the case studies ran over a short time period. In addition, to ensure the ethics approval for the data collection was classified as "low risk" at the various institutions where the learning activity was a mandatory part of the course, taking part in the survey questionnaire and the interviews was optional. This reduced the numbers of respondents considerably in some of the cases.

During the first case study, it was found that even for those students that did engage with the virtual world, there were limits to the extent to which they experienced presence, and this determined which of the learning activities they could successfully respond to. This led to the formulation of the idea that presence is a progressive phenomenon that learners develop through certain stages and that particular degrees of presence are appropriate to different learning activities. This possibility became an element I looked for when analysing further case studies. This model was published in 2009 (Childs and Kuksa, 2009) in a paper recounting the first of the case studies. In this paper, I contributed the model and analysis of the students' experiences in the virtual world, my colleague Iryna Kuksa contributed the sections discussing the pedagogical goals of the learning session. A subsequent remark by another colleague (Katherine Rowe, personal communication, 2009) about students' perceptions of their virtual bodies forming over time led me to link this progressive degrees of presence to concepts of body image and body schema in the physical world. At the suggestion of another academic (Hilary Cremin, personal communication, 2009) I explored the field of embodiment in the physical world, and discovered the work of de Vignemont (2007). This corresponded closely to the descriptions of virtual embodiment, and the idea of the

development of a virtual body image and schema to aid the sense of presence became a core part of the model.

Two subsequent planned case studies, one at “Yellow” University, and one at “Cyan” University, met with such strong opposition from students that the proposed sessions were abandoned. Although anxieties were anticipated, what was not anticipated was that students felt these anxieties so strongly that this led to a refusal to participate. Investigating the reasons for students’ resistance led to a further strand of the PhD study.

During this period, I reviewed a paper based on Wenger’s Community of Practice model. This had direct relevance to this study in that the model explored aspects of social groups that are concerned with learning; how people learn to be part of the group and how the group learns. As such, it has at its centre social theories of learning (Wenger, 1998; 12) which Wenger relates to theories of social structure, theories of identity, theories of practice and theories of situated experience. Within the specific context of this thesis, “social structure” is equivalent to “the rules and conventions that govern the activity”, the “practice” is the learning task, and the “situated experience” is the different forms of presence that occur. Within the MERM as it stood at that time, community had already been linked to these other factors (table 1.2). The MERM therefore had already (unwittingly) synthesised Activity Theory and the Communities of Practice model. Because Wenger’s linking of community to identity and situated experience (1998; 12) provided further provenance for these additional categories, the final version of the conceptual framework for the thesis (explained further in the following chapter) is therefore presented as a merger of these two separate frameworks.

<i>Mediated Environments Reference Model</i>	<i>Activity Theory</i>	<i>Communities of Practice Model</i>
Presence		Situated Experience
Tools and instruments	Tools and Instruments	
Learning Task	Object	Practice
Division of labour	Division of labour	Social structure
Rules and Conventions	Rules and Conventions	Social structure
Learner	Subject	
Identity		Identity
Community	Community	Social theory of learning

Table 1.2: conceptual elements of the Mediated Environments Reference Model, Activity Theory and Communities of Practice Model

1.3.6 Fifth year (2009/2010)

The fifth year of the PhD study was focused on writing the thesis. No further changes were made to the conceptual framework or the findings. However, the findings of the study were employed in further work, in order to further test the models. Findings were presented at various conferences and shared amongst the community. The feedback from these is discussed in the conclusions chapter.

1.4 Research questions

In developing research questions for the study, an important criterion for it to fulfil from a personal expectation is that the study has catalytic, or outcome, validity (Groundwater-Smith and Mockler, 2005; 5) In this respect, the aim of the study was to provide participants, both teachers and students, with information that would inform their practice in mediated environments. As such the nature of the research questions were intended to be utilisation-focused (Patton, 1997).

Making mediated environments the focus of the study was due to the combined intention to build on my previous experience with webconferencing and text-based synchronous communication (Childs and Dempster, 2003; Childs and Wignall, 2004; Childs and Dempster, forthcoming) and to investigate the new field opened up by virtual worlds. This was also a pragmatic decision due to my management and evaluation of projects that took place concurrently with the PhD involving webconferencing and virtual worlds. Identifying the unifying term “mediated environments” provided a basis for drawing these two aspects together.

HEFCE, in its strategic plan for 2006 to 2011, states that to meet the needs of students, society and the economy, Higher Education must continue the “exploration and integration of new technology to support learning and teaching” (2009; 21). This study does not share this assumption that integrating new technology is automatically of value to learning and teaching. Its goal was not to promote the use of mediated environments, but given that these environments were being used, and that educational benefits were being realised from their use, then understanding how to use them as effectively as possible was thought to be a useful contribution to education.

My experience of the literature supporting webconferencing was that this tended to look at how to set up the technology, but there was very little on how best to make use of the technology in learning and teaching. What staff development guidance there was did not link to any of the theories about communication through technology, such as transactional distance. Guidance on the use of virtual worlds was particularly lacking since their use was, in 2005, relatively rare. My goal at the start of the research for the PhD was therefore to identify strategies for implementing mediated environments in learning and teaching, specifically answering the questions:

- What learning activities are these environments effective in supporting?
- What learning and teaching techniques can be employed to make effective use of these environments?

Since these were still largely unexplored at that time, the answers to these questions would have been of value to the educational community.

However, by the time the study was at the half-way stage, I became aware of a large increase in research in this field that would make the answers to these questions of less value to the community, since they would be addressed by larger studies (later published as Savin-Baden et al,

2009; Warburton et al, 2009; Bignell and Parson, 2010) that would pre-empt this study. It was decided to focus particularly on the role of presence in the learners' experience and explore this in depth. The opportunities for assessing changes brought about in the learning of the students would not arise through the study, since I would not be granted access to the students' results; however, surveying the students' *perceptions* of their own learning was possible within the study. The research questions for the study therefore became:

- What are learners' experiences of presence in mediated environments? and
- What effect does presence have on their satisfaction with the learning activities?

Informing this question of presence was

- What factors contribute to, or detract from, the experience of presence?

As the study continued, other questions presented themselves, i.e.

- How does presence develop within mediated environments?
- How do educational activities develop presence?
- Is the development of an inworld identity linked to presence?

The reflections on the study would also include an assessment of the effectiveness of the conceptual framework in structuring the data gathering and analysis.

It was anticipated that these questions would still have a practical application in advising teachers on developing courses of study, would be different enough from others' lines of enquiry to offer a unique contribution to work in the field and potentially could provide a specific theoretical basis to the guidance.

The study undertaken was therefore a result of a combination of factors. These include the adoption of virtual worlds by the academic community during the period of the study, the opportunities available due to personal circumstances, the continual need to differentiate the research from other work in the field and the goal to produce research of practical value to the educational community. The first step in the development of the study was the creation of a conceptual framework. The principles, design and content of this framework are discussed in the following chapter.

2 Conceptual Framework

2.1 The construction of the conceptual framework

2.1.1 The role of a reference model in developing research

Constructing the model

One of the original aims of the study was to provide educators with guidance for activities conducted in webconferencing activities, and to underpin this with a theoretical perspective. Theories identified early on in the study that related to the experience of communication at a distance were those of transactional distance and presence and so these were investigated in more detail. Standard strategies for conducting a literature review were not productive. A print-based approach, accessing materials available in libraries, proved fruitless. The library electronic resources were also accessed, specifically the educational print journals available through JSTOR and Informaworld. These proved limited and so the search of academic databases was expanded to include the experience of presence from any discipline and to search for education-based materials outside of the academic databases. Most of the educational resources found were concerned with web- and video-conferencing, since these technologies were more mature, but initial views of the literature indicated that these were guidance materials that rarely linked their recommendations to theory. As guidance materials for virtual worlds emerged during the study had the omission.

The other aim was to explore learners' individual experiences in order to identify what strategies might be effective in learning. There were few materials covering the student experience. When the study expanded to include virtual worlds, guidance materials for educators using these environments were even fewer. The research questions for the study were therefore selected to bridge this gap between guidance for educators and theories of students' experience of (technologies that were later defined as) mediated environments.

In exploring the literature, therefore, a range of different literatures were read, the criteria for including them being only that they discussed presence and technology in some way. As the literature review continued, other linked concepts were discovered, such as the role of embodiment,

realism, narrative and participants' individual traits, for example, and then these concepts too linked to further ones. Although many sources were discovered as the search criteria expanded, one of the shortcomings of the domain as a whole was that there was insufficient clarity in how the concepts contained within them linked to each other, that terminology was used inconsistently and that the frameworks that did exist were incomplete. In order to make sense of the ideas and definitions in the literature, the various concepts were organised within a hierarchy of categories and sub-categories, the aim being to create a tool through which the domain could be made more understandable, originally only to inform this study, then later the work of other practitioners.

The first goal of the research therefore became to create a model synthesising existing frameworks and enable as encompassing and consistent a description of mediated environments to be conducted as possible. In the creation of the framework, more than thirty separate classification systems, lists and frameworks were drawn upon and blended. Additional categories were added based on the responses of participants engaged in the pilot study and through the various case studies. Feedback from journal reviewers and conference delegates as well as discussions with friends and colleagues informed its development. Hence, the framework was formed by:

- Including all of the various concepts encountered during the literature review regarding mediated environments in order to create a framework that incorporates all other frameworks encountered.
- Merging or dividing these concepts, where appropriate, to create clear distinct categories, eliminate redundancy as much as possible. This and the previous criterion conform to the principle in forming categories of "parsimony of variables and formulation and scope in the applicability" (Merriam, 1998; 191).
- Developing a self-consistent nomenclature, adopting existing terms where these are commonly employed or inventing new ones where existing ones were too ambiguous.

The remainder of this section identifies some of the rationales for, and the issues with, developing the conceptual framework.

Models as means to organise concepts

One of the difficulties with finding one's way around a virtual space is that of "wayfinding" (explained later in the chapter). Similarly when learning about a new field, finding one's way and being able to locate oneself within the larger domain, is also important. This a factor often neglected with introductory texts, which simply provide a list and descriptions, and fail to explain the hierarchy of principles and where each concept fits within sets and subsets of the other concepts (for example Robson, 2003; 18 – 29). Creating a framework is thus an important step in describing and explaining a domain.

"Model" in this context means a "mediating form of representation" i.e. "is an abstract representation which helps us understand something we cannot see or experience directly" (Conole et al, 2005; 8) and is an example of what Wenger (1998; 58) calls *reification*, which he defines as 'the process of giving form to our experience by producing objects that congeal this experience into "thingness"'. Once an idea is given form in this way it "then becomes a focus for the negotiation of meaning". Wenger also notes that reification is interlinked with participation (1998; 62-63); participation helps reify the concepts further, reification facilitates the participation in the practice.

Smyth (2004) describes some of the functions of a conceptual framework to be "a tool to scaffold research and, therefore, to assist a researcher to make meaning of subsequent findings" and also that the framework "forms part of the *agenda for negotiation* to be scrutinised and tested, reviewed and reformed as a result of investigation". At any stage, therefore, a framework should only be seen as a snapshot of a developing work, and as a means of communicating the various elements of any analysis, not an attempt to accurately portray the entirety of the field. Although there may be gaps in a framework, attempting to organise these aspects into a single model is an important step in identifying those gaps.

In summary then, a framework can further research through:

- Providing a basis from which to interpret and form a coherent whole from further literature.
- Structuring evaluation activities.
- Integrating various factors involved in the design of technologies.
- Enabling the articulation of the findings.
- Organising the inclusion of any emergent categories.

- Providing a shared ground with other researchers for them to reflect upon and challenge the structure of the research.

Models as means to make sense of new information

Models are helpful in that they enable new information to be made sense of easily and elements of other models to be incorporated. For example, reading the following typology of presence from the perspective of the framework it can be seen that Heeter's "personal presence" equates to "mediated presence", her "social presence" equates to "copresence" and her "environmental presence" equates to "reciprocation":

Heeter, (1992) divides the concept presence into three dimensions; personal presence, social presence and environmental presence. Personal presence, according to Heeter, is a measure of the extent to which, and the reasons why, persons feel as if they are in a virtual world. Social presence refers to the extent to which other beings, both living and synthetic, exist in the virtual world and appear to react to you. Environmental presence refers to which the environment itself appears to know that you are there and reacts to you. (Sallnäs, 2002; 174)

Through this process, Heeter's ideas can then be blended with the existing concepts, without adding to the complexity of that body of knowledge or multiplicity of terms.

2.1.2 The principles underlying the construction of this conceptual framework

Conceptual framework and literature review

The conceptual framework and the literature review were developed in parallel; one informing the other. The literature selections that were chosen for the study were those that could contribute to the conceptual framework in that they already structured, to some extent, the domain they covered and provided definitions or further elaborations of categories already within the framework. The framework was then developed and further expanded from these selections. Because of the wide-ranging nature of the conceptual framework there is little detail on some of the individual sub- and sub-sub-categories. The category "Division of labour" is particularly lacking in detail. Future iterations of the framework will therefore expand upon these where necessary.

At this stage too there are few empirical examples and critiques of the literature. This is in part because of the aim to create a broadly encompassing overview of all of the factors that influence the experience of presence in all mediated environments, which leaves little room for descriptions of empirical studies. Critiques are few due to the limited contradictory evidence in the literature in many of the areas. As the separate features of the framework are expanded and confirmed by research there may arise examples of literature that conflict with it, requiring the assessment of, and either rejection or acceptance of, parts of the literature.

Synthesising theories

An additional principle underlying the selections of the literature was that where there were alternative theories, the theory that aimed to blend other pre-existing theories was chosen. This principle is informed by a series of educational research programmes with which I have been engaged. These programmes were funded by a variety of agencies, predominantly the Joint Information Systems Committee of which the Design for Learning Programme (Childs et al, 2007) was the most informative. An outcome of this programme was the development of taxonomies of various teaching approaches and learning activities, for example developing the Learning Activities Reference Model (Falconer et al, 2006). This model presents the various educational theories (grouped into associative, cognitive and situative by Mayes and de Freitas [2004; 7 – 9]) as complementary, not competing, theories. Another example of a synthesising concept adopted during the thesis are Stets and Burke's (2008) theory of identity that combines pre-existing ideas of role identities, social identities and personal identities. Rather than attempt to argue the case for one model over the other, in their paper these authors identify commonalities between the theories, map one against the other, and create an overarching theory that subsumes the others within it.

Rhizomatic knowledge

The process by which the conceptual framework was expanded through reference to the literature is best described as rhizomatic. The idea of a rhizome as a metaphor for a form of creation of knowledge was introduced by Deleuze and Guattari in *A Thousand Plateaus (sic)* (Cormier, 2008). This metaphor draws attention to the idea of knowledge being formed in a series of nodes,

developing incrementally and independently, and without a recognisable centre or boundaries. This sets it as different from traditional forms of knowledge, which are divided into defined disciplines with a commonly-agreed canon and expert leaders. Drawing eclectically, and serendipitously, upon a variety of resources rather than deferring to the key texts was appropriate for this study for the following reasons:

- The multidisciplinary nature of the work. Although the focus of this study is education, to understand this many other disciplines have been drawn upon. The original sources from which the study began were largely from the field of engineering. The role of identity and experience of presence is informed by psychology. The semiotics of movement and space has its roots in anthropology, but can also be made sense of through performance studies. As the search across these disciplines expanded, it became possible to identify parallels between them, and the different perspectives informed each other. Using the rhizome metaphor, these became different linked nodes.
- The web-based nature of the literature. The move from print to electronic copies means that concepts such as the classmark have been replaced by the keyword. Rather than identifying a discipline and selecting important texts within it, the act of searching online with keywords reveals sources from any discipline. For example, a keyword search for “presence” will find resources across all of the disciplines listed in the previous paragraph. A literature review conducted in this way will inevitably be multi-disciplinary.
- The community of practice. The practitioners working in these fields tend to use many other digital technologies. A consequence of this is that much of the work is published to the web and various web 2.0 technologies. Concepts filter through and become established through people’s blogs and twitter feeds as much as through publication in journals. Furthermore, as mediated environments are social tools, the academic community tends to draw in academics that are particularly social. Inclusion in this community, and sharing experiences directly with many of the leading practitioners, has meant that the study has been informed through conversation and direct exchange of documents as much as through accessing research journals.

- The novel nature of the field. Telepresence as a term dates back only to 1980 (Minsky, 1980); virtual worlds only to 1986 (Britt, 2008). In addition to the two references in the preceding sentence, only one other reference in this thesis pre-dates 1990. Approximately 90% of the references for this study are post-2000, and more than 60% of them were published while the study was being undertaken. The most popular of current virtual worlds, Second Life, dates from 2003. The field is therefore in a state of constant change, which also means that the social networking described above is particularly important for remaining current.
- Personal experiences as data. Since the study is one of learners' *experiences* of mediated environments, an understanding of what form the contact with these environments can take is very important. Presence and embodiment are lived experiences, and require people's personal testimonies in order to be appreciated, particularly when trying to understand the implications of long-term engagement with the technologies. In this regard, the blogs of residents of virtual worlds carries as much weight as the journal publications of academic researchers. For this reason all are included since these inform the developing nodes of knowledge within the field.

The conceptual model

The conceptual framework presented here is therefore a literature review informed by a variety of types of resource, many formal, some informal. It aims to touch upon every aspect related to mediated environments and to be as comprehensive as possible. It is, however, still a work in progress, but forms a grounding upon which further development can be based. The constituent parts of the framework are described in the following section.

2.1.3 Overview of the framework

The conceptual framework comprises eight categories, which are:

- The experience of presence within the environment (presence).
- The environment itself (tools and instruments).
- The task that is the focus of the activity (object).
- The various roles participants take, or are assigned, in the activity (division of labour).
- The rules and conventions that inform the interaction in the environment (rules).

- The participants taking part in the activity (subject).
- The individuals' conceptualisation of self within the environment (identity).
- The community that takes part in the activities (community).

The interconnection between these elements is shown in figure 2.1. Each of these aspects is explored in more detail within the remainder of this chapter.

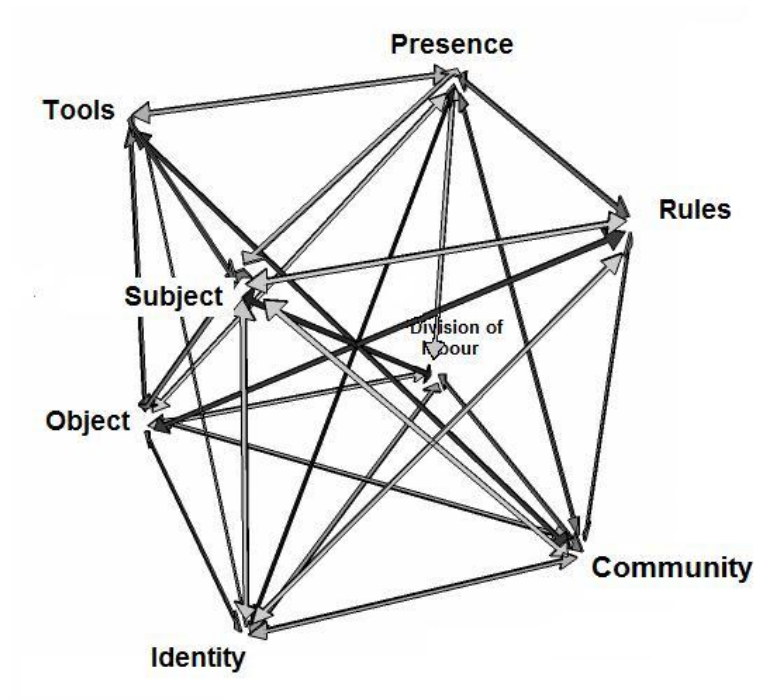


Figure 2.1 The categories of the Mediated Environments Reference Model

This choice of categories and the interconnection between them is largely modelled on Activity Theory. The original version of Activity Theory draws on the work of Vygotsky and has already been discussed in section 1.2.1. Engeström additionally considers the settings for these activities and “the dynamic relationships that exist within settings between, for example, traditions, responsibilities, how resources are used and the outcomes of interactions” (Edwards, 2004; 89). These are graphically illustrated by Engeström (1999; 31) and depicted in figure 2.2.

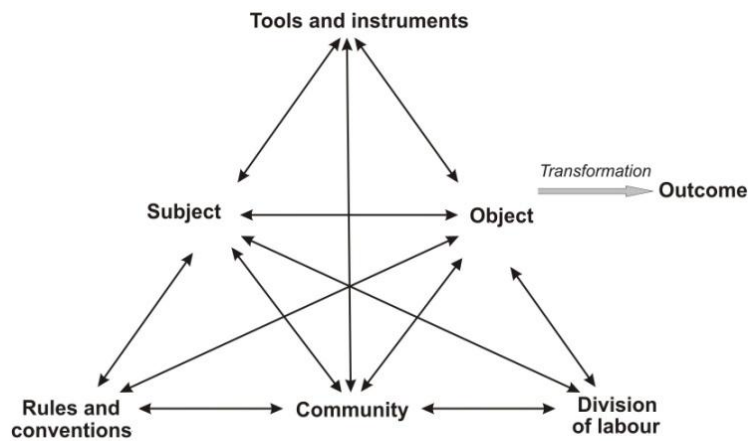


Figure 2.2. The essential elements of Activity Theory and their inter-relationships (Engeström, 1999, 31)

In the study by Edwards, these separate categories are applied to that of two early education activities, one in each of two nursery schools. Edwards states that analysing the activities according to the activity system developed by Engeström “particularly allows access to relationships between activity, actions and operations in settings” (Edwards, 2002; 98) although she recognises that the analysis “has many limitations, not the least of which is the extent to which it can appear at first glance to ignore wider political, social and cultural matters. (Edwards, 2002; 98). Nevertheless, her analysis demonstrates the practicability of applying Activity Theory to analysing complex educational activities and accounting for a range of influencing factors.

Another study, that by Masterman, also applies Activity Theory to an analysis of practice but in this case to analyse the “design and deployment of pedagogic planning tools and their acceptance by practitioners” (2009; 210). Masterman employs Activity Theory as an analytical system both because of its

function as ‘a philosophical and cross-disciplinary framework for studying different forms of human practice as developmental processes, with both individual and social levels linked at the same time’ (Masterman, 2009; 212)

and also because of “the notion of historicity inherent in activity theory” (Masterman, 2009; 212). Masterman analyses the relationships between the different constituent parts of activity theory as a series of dyads (2009; 217 – 221) and concludes that:

Using activity theory as a lens through which to capture the contextual features of a multiplicity of settings has thrown into relief the contradictions and enabling aspects of practitioners’ relationships with their tools and the communities with which they share the problem-space of pedagogic planning. (Masterman, 2009; 224)

The intent of Activity Theory is to provide a means to describe an activity through the division of the activity into its constituent parts, thereby making that activity more susceptible to analysis. However, although Activity Theory provides a structure for examining many of the factors that describe the experience of mediated environments, it does not take into account the individual's situated experience of that activity. This is essential to a consideration of mediated environments, since in mediated environments the situated experience (i.e. the experience of presence) has a large bearing on the activity. Identity, too, has an important role (discussed later in this chapter). The Communities of Practice model, on the other hand, relates the theories of social learning within a community to four other groups of theories (Wenger, 1998; 12, figure 2.4) including situated experience and identity, but does not separately consider the tools and artefacts that mediate the community interactions. In the specific application of Communities of Practice to mediated environments, Wenger's categories equate to the categories shown in figure 2.5; all of which are contained in the MERM. The eight categories used in this model therefore combine the features of both Activity Theory and Communities of Practice.

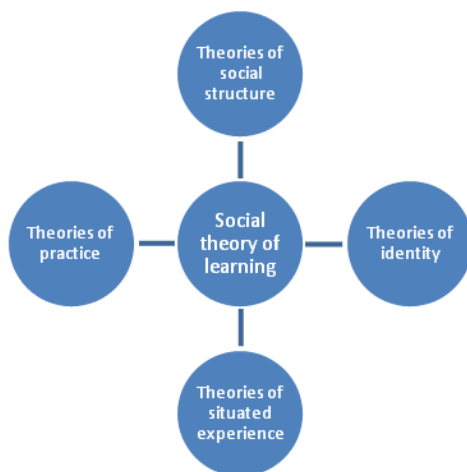


Figure 2.4 Relationships of various theoretical traditions within the Communities of Practice model.

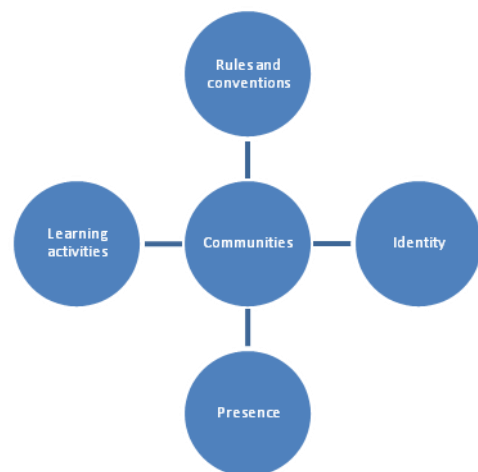
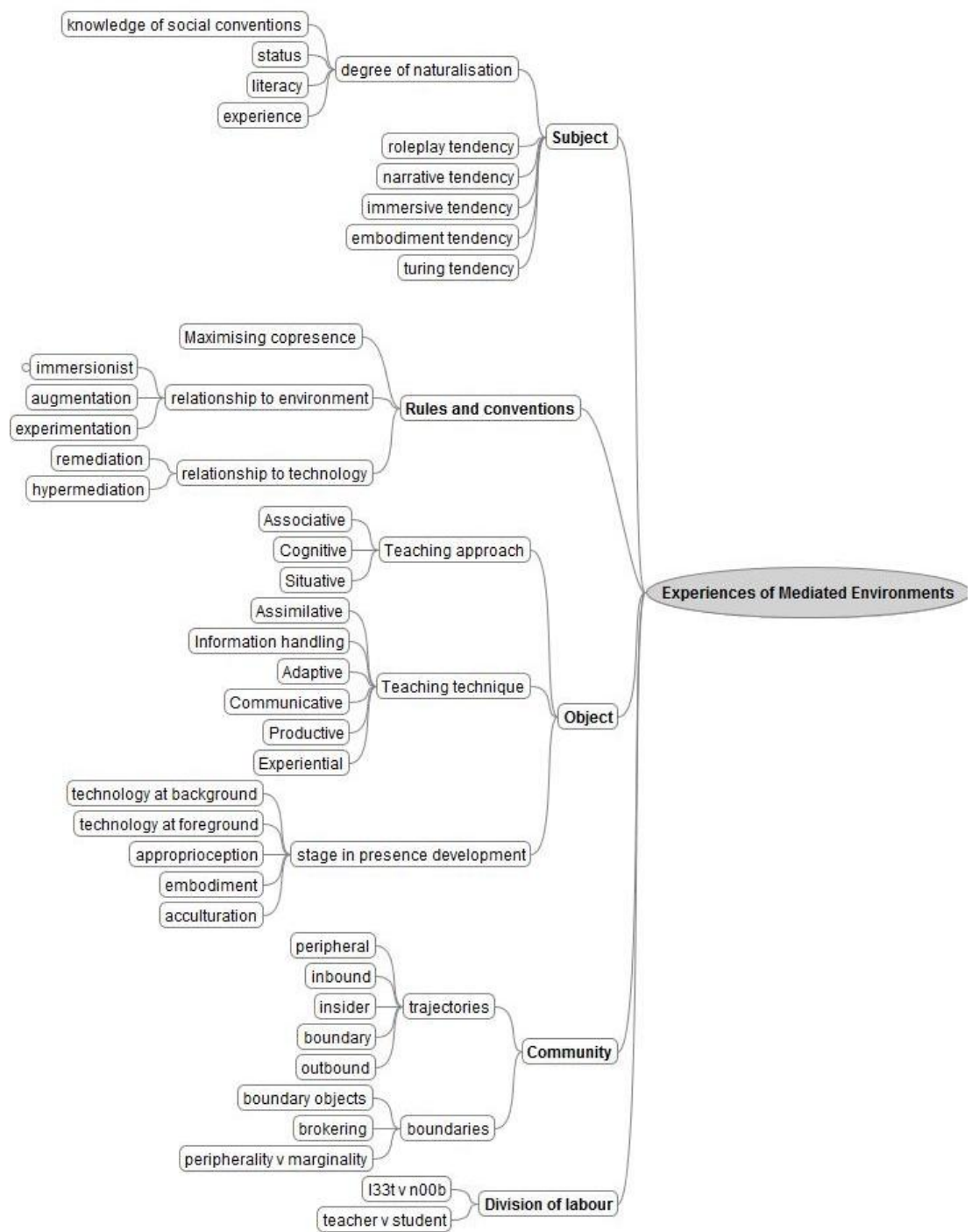


Figure 2.5: How the theoretical traditions in fig 2.4 relate to experiences of learning in mediated environments

Within the conceptual framework, each of these eight categories is further broken down into separate elements, each affecting the experience of mediated environments. These sub-categories are formed by drawing on, and combining where necessary, existing typologies in the literature. The collection of categories and sub-categories are shown in figure 2.6.



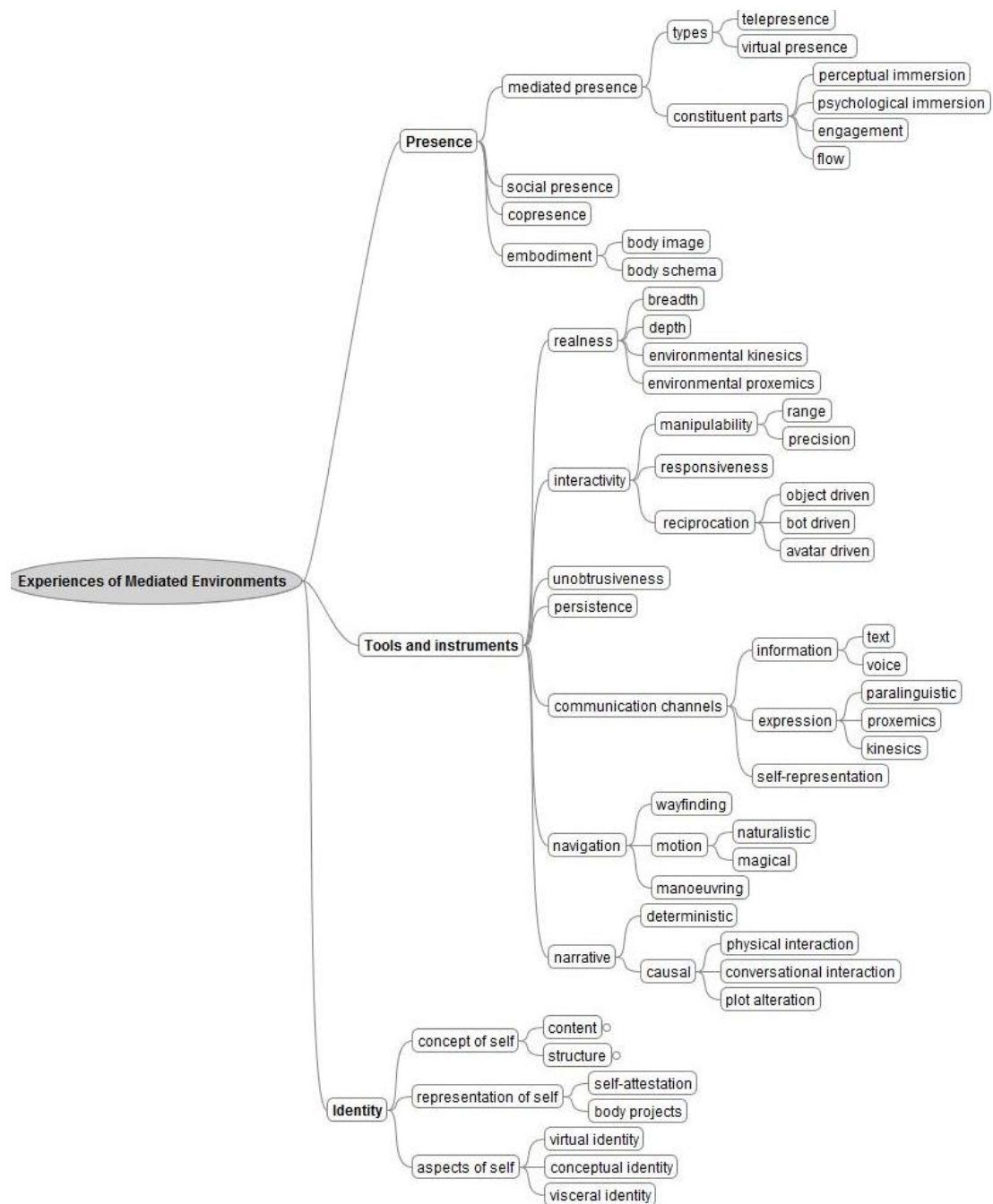


Figure 2.6 The Mediated Environments Reference Model

The remainder of this chapter details the separate elements of the framework, beginning with the concept of presence; establishing a typology and nomenclature to describe this experience. The subsequent sections expand upon the other factors that influence the experience of presence.

2.2 Experience of presence within mediated environments

2.2.1 Defining presence

Presence within this framework derives from Wenger's notion of the situated experience of practice having a bearing on the nature of the activities. Within the practice of traditional teaching, presence is usually taken to mean "bearing" or "rapport with the audience" (Carlson, 1997). Thus we have "classroom presence" and, in the theatre, "stage presence". Within studies of the media, "presence" is also used in the sense of *being somewhere else* and "literature, the graphic arts, the theater arts, film and TV have long been concerned with the observer's sense of presence." (Sheridan, 1992; 120). The literature of technology-mediated interaction and communication also use this meaning of presence and introduce the additional terms of "telepresence" and "virtual presence". However, these terms are not used consistently. In order to make sense of these different meanings the following discussion attempts to categorise and systematise these different definitions.

"Telepresence" is a term first used by Marvin Minsky (1980) to describe the experience of the operator in remotely-operating devices. Telepresence is defined, for example, variously as:

- *The perceptual illusion of non-mediation*
- *Suspension of disbelief experienced by users while being in a remote world and not in the physical one.*
- *A shift of focus of consciousness from the local environment to a remote one (Sas and O'Hare, 2003; 523 - 524).*

Although some writers use the word "presence" as a contraction of telepresence, for example the International Society for Presence Research (Floridi, 2005: 4), Steuer offers these various definitions:

- Presence is the "experience of one's physical environment" (1995; 35).
- Telepresence is "the mediated perception of an environment. This environment can be either a temporally or spatially distant 'real' environment (for instance, a distant space viewed through a video camera) or an animated but nonexistent virtual world synthesized by a computer" (1995; 36).

Conversely, Sheridan (1992) distinguishes between telepresence and virtual presence as telepresence being the sense of being present at a remote site and virtual presence as the sense of being present with visual, auditory or force displays generated by a computer. IJsselstein (2005; 8) adopts this distinction, using “presence” to encompass both telepresence and virtual presence.

In this study, to avoid (or at least reduce) confusion, the use of the word “presence” without qualification has been avoided, except where all forms of presence (mediated, social, co-, and self-) are being discussed. The phrase “mediated presence” has been adopted to stand for Sheridan’s meaning of “presence” and Steuer’s of “telepresence”. The term “proximal presence” rather than just “presence” is used to describe unmediated presence (i.e. Steuer’s meaning of “presence”). Sheridan’s and IJsselsteijn’s nomenclature of “virtual presence” and “telepresence” has been adopted, rather than Steuer’s for reasons of consistency, since this enables “virtual” to be used exclusively in relation to computer-generated environments, and the prefix “tele-” to refer to links with remote, but physically real, environments, or in the formulation of Goldberg (2000; 5) “VR (virtual reality) is simulacral, TR (telerobotics) is distal”. Since “mediated presence” then represents “telepresence” and “virtual presence” considered together, this is congruent with Zhao’s use of “mediated environment” to encompass both “telematic environment” and “virtual environment” (Zhao, 2003; 445). These terms are laid out in table 2.1.

Definition	MERM terminology	Steuer (1995)	Sheridan (1992)	IJsselsteijn (2005)
The feeling of “being there” in any mediated environment	Mediated presence	Telepresence	Presence	Physical presence
The feeling of “being there” in a telematic environment specifically	Telepresence	No specific term	Telepresence	Telepresence
The feeling of “being there” in a virtual environment specifically	Virtual presence	No specific term	Virtual presence	Virtual presence
Actually being there in a physical location	Proximal presence	Presence	No specific term	No specific term

Table 2.1 The various terminologies in this study and three key texts

2.2.2 Mediated presence

North, North and Coble observe that “the sense of presence in virtual and physical environments is constant and subjects have to give up the sense of presence in one environment (e.g. physical environment) to achieve a stronger sense of presence in the other one (e.g. virtual world)” (2002; 1075). This is based on subjective reports of presence by the participants in North, North and Coble’s studies, in which it was found that:

The subjective measures of sense of presence in the VE (virtual environment) increased gradually during each session. The subjective measures of sense of presence of the physical environment while attending the VE decreased gradually within and between sessions ... This supports the theory that the total sense of presence is constant, and subjects have to divide their overall sense of presence between the virtual and real worlds (North, North and Coble, 2002; 1075)

Kim and Biocca classify these two processes, that of engaging with the virtual environment and disengagement from the physical environment as “arrival” and “departure” (Sadowski and Stanney, 2002; 792).

Immersion and engagement

One of the ways in which “mediated presence” has been conceptualised is as “immersion” (Carr, 2006; 54). Carr (2006; 53) refers to Lombard and Ditton’s division of this term into “perceptual immersion” and “psychological immersion”, where perceptual immersion is “the degree to which a technology or experience monopolises the senses of a user” and psychological immersion is the ‘mental absorption into the world’ (Carr, 2006; 54). Carr notes that in literature studies, this absorption into the world is seen as an uncritical stance associated with undemanding literature, whereas *engagement* “involves those portions of a text where extra effort or interpretive skills are called for, where external referents are sought”. Carr therefore considers both immersion and engagement as being important parts of interaction with games and states that they are mutually dependent. It is when a player moves constantly between these two states that are when games are at their most compelling (Carr, 2006; 55) and contribute to the experience of “flow” (Carr, 2006; 56).

Flow

Flow is a concept originated by Csíkszentmihályi and describes a state in which attention is heightened, and goals, action and the environment are all aligned. Csíkszentmihályi describes flow as an optimal experience and as both enjoyable and productive (Järvinen, Heliö and Mäyrä, 2002; 20). Järvinen, Heliö and Mäyrä applied Csíkszentmihályi's concepts to those of digital environments, particularly digital games (2002; 20 – 27) and listed the following from Csíkszentmihályi's work as elements that are part of the experience of flow when interacting with games:

1) a challenging activity that requires skills, 2) the merging of action and awareness, 3) clear goals and feedback, 4) concentration on the task at hand, 5) the paradox of control, 6) the loss of self-consciousness and 7) the transformation of time (Järvinen, Heliö and Mäyrä, 2002; 21)

Not all of these factors apply to virtual worlds (unless they have a predominant gaming element). The “challenging activity that requires skills” only produces flow when the skills required develop in concert with the tasks demanded of the player/user; if the challenges are too great, the player will become frustrated, if too simple then the player will become bored (Järvinen, Heliö and Mäyrä, 2002; 22). Successful commercial games are carefully constructed to ensure that players are only asked to do that which is just within their skill range, whereas the case studies in this thesis indicate that virtual worlds demand much of their users from the start, and often the challenge exceeds their skill level. Similarly non-game virtual worlds lack the clear goals and feedback that are a defining characteristic of games (Begg et al, 2007), and this lack of clear instruction concerning what to do when in a non-game virtual world is a common complaint of gamers (White, 2008a). The paradox of control, i.e. the tension between game rules and genre conventions and the freedom to participate within those rules and conventions, is also an element that figures specifically within games.

The remaining characteristics identified by Järvinen, Heliö and Mäyrä (2002; 20 - 27) are relevant to the experiences of participants in both virtual worlds and games.

The merging of action and awareness

This is the aspect of flow in which the participant becomes so absorbed in the activity that they are no longer “aware of themselves as separate from the actions they are performing” Järvinen, Heliö

and Mäyrä (2002; 22). Järvinen, Heliö and Mäyrä (2002; 22 - 23) give the following characteristics of a game as prerequisites for the experience of flow. These are:

- The structure and tempo of the game,
- The aesthetic enjoyment of images and sound,
- The consistency of the game world,
- Enjoyable social interaction,
- Usability of the technology.

Another prerequisite suggested by this study is the extension of the body schema of the participant to incorporate that of the technology they are using so that there is no separation in the mind of the user between thinking of, and enacting, an action.

Concentration on the task at hand

For flow to occur the participant must be able to concentrate on the task at hand; other external distracting factors must be excluded. These disruptions can include:

- Inconsistency in the game world,
- Usability issues with the technology,
- An imbalance of risks and rewards,
- Poor camera control or views offered to players (Järvinen, Heliö and Mäyrä, 2002; 24).

To this could be added the avoidance of intrusions from the physical world surrounding the participant. Immersion requires not just involvement with the virtual world but also removal of attention from the physical (see above). Denying the participant the opportunity to ignore the physical will therefore reduce immersion.

The loss of self-consciousness

This refers not to loss of self, but the loss of the concept of who we are (Järvinen, Heliö and Mäyrä, 2002; 26). The prerequisite for this is a “feeling of union with the environment”, where the environment is not only the technological platform but also the other participants. This therefore includes communal practices especially the communicative and collaborative rituals that emerge within the user cultures of a multi-user environment” (Järvinen, Heliö and Mäyrä, 2002; 26).

The transformation of time

The transformation of time is not only a prerequisite for flow, but a consequence of it. Game structures often do not adhere to the normal temporal structures of narrative (Järvinen, Heliö and Mäyrä, 2002; 27). This together with the other factors mentioned above, (the loss of self-consciousness, the merging of action and awareness and the pleasurable nature of optimal experience) means that the participants' awareness of time passing is also changed. Users of virtual worlds also often report losing track of time (Gilbert, 2009).

Flow and presence

The relationship between flow, immersion, engagement and presence is blurred, in that immersion is given as a constituent of a single part of flow by Järvinen, Heliö and Mäyrä (related to the concentration of the task at hand) and disruption of concentration reduces flow. For Carr disruption gives rise to engagement, and it is alternation between engagement and immersion that gives rise to flow. These are all factors to be considered, however, when examining the experience of virtual worlds, and these will be revisited at points throughout this chapter.

2.2.3 Copresence

On observing that telepresence has long been part of our experience Sheridan then asks "what do the new interfaces add, and how do they affect this sense (of mediated presence), beyond the ways in which our imagination (mental models) have been stimulated by authors and artists for centuries?" (Sheridan, 1992; 120).

An answer to Sheridan's questions is that these environments provide an additional experience, that of the impression of *being together with others*, labelled as "copresence". Zhao (2003: 445) provides a detailed review of the various definitions of copresence as:

either the sense of being together with other people in a remote physical environment ... or the sense of being together with other people in a technology-generated environment ... Copresence has also been called social presence ... which refers to the sense of being together with others in a mediated—either remote or virtual—environment.

The phrase “social presence” is, however, also used in the sense of *the ability to project oneself socially and emotionally*, for example, within the Community of Inquiry model (Arbaugh and Hwang, 2006: 10). Although “projecting oneself” and “creating the impression of being with others” may have some factors in common, these two can also occur independently. Since it will aid clarity to use different terms to describe different concepts, throughout the study the phrase “copresence” is used in the sense of “being *with* another person in a remote physical or technologically-generated environment”, and “social presence” is the ability to project oneself socially and emotionally within that environment.

Copresence is dependent on a series of factors. These are:

- The ability of participants to send and read social cues (Kehrwald, 2008; 96).
- The opportunity for participants to interact (Kehrwald, 2008; 97).
- The subjective quality of the medium (Caspi and Blau, 2008; 324).
- The identification with the group with whom one is interacting (Caspi and Blau, 2008; 326).

As an aside, it is worth mentioning another term that is used to describe the degree of “closeness” between participants when either communicating online, or through written dialogue, or face-to-face is “transactional distance”, which is defined as “the psychological distance that exists between” people when communicating (Barrett, 2002; 36). The phrase is therefore antonymous to copresence.

2.2.4 Social presence

As stated previously, within the Community of Inquiry model, social presence has been defined as *the ability to project oneself socially and emotionally in an online community* (Arbaugh and Hwang, 2006: 10; Caspi and Blau, 2008; 324). Becker and Mark (2002; 29) define social presence as “a perception of others that is enabled by a particular technology”. These would not seem to be conflicting definitions, since the potential to project oneself to others and the ability to perceive others’ projections could be seen as the two halves of the same process. In a study of three different communication platforms (two virtual worlds and one text-based environment) Becker and Mark found that different social conventions arose, but that in all cases these conventions were those that most quickly or fully enabled social presence or copresence to be established (2002; 33). Some of

this experience is of a purely technical nature, such as knowing how to change fonts, or how to navigate between different views; others are about codes of behaviour or establishing commonly understood gestures and phrases. In the study by Becker and Mark discussed above, the social conventions acquired did not only mark social status, but also were important for a feeling of presence. A person unfamiliar with these conventions will be quite disadvantaged in their ability to interact and make their presence felt within the environment.

IJsselsteijn (2005; 9) clarifies the distinction between mediated presence, copresence and social presence through the following:

The obvious difference is that of communication which is central to social presence, but unnecessary to establish a sense of physical presence. Indeed, a medium can provide a high degree of physical presence without having the capacity for transmitting reciprocal communicative signals at all. Conversely one can experience a certain amount of social presence ... using applications that supply only a minimum physical representation, as is the case, for example with telephone or internet chat. (IJsselsteijn, 2005; 9)

Here IJsselsteijn also here uses the phrase “physical presence” to mean the sense of presence conveyed by a medium (“mediated presence” in the nomenclature of this study) not in the sense used by Steuer (1995; 35).

2.2.5 The confusion surrounding the “personal” in the literature

Studies of social presence in online communication in learning and teaching have tended to look at asynchronous computer-mediated conferencing (CMC). IJsselsteijn’s observation that “several studies have shown that as technology increasingly conveys non-verbal communicative cues, such as facial expression, gaze direction, gestures or posture, social presence will increase” raises doubts about the level of interaction within text-based technologies, yet he lists email, MUDs and online chat amongst social presence technologies. The question then arises of what personal interaction can mean in the absence of non-verbal communicative cues.

Much of the literature would claim that this is not possible. When Short, Williams, and Christie examined asynchronous telecommunications technologies (both text-based and audio) they argued that interaction and communication would be impaired by the inability of the technology to transmit non-verbal cues such as facial expression, eye gaze, gestures and proximity (Rourke et al, 1999; 51;

Becker and Mark, 2002; 29). The lack of non-verbal cues has been noted to increase misunderstandings, although others have surmised that the heated nature of debates that often occur within CMC is not due to misunderstandings, but due to the impersonal nature of the medium resulting in less social restraint (Barrett, 2002; 39). It was in order to develop a substitute for these non-verbal cues in text-based communication that the emoticon was invented. Barrett (2002; 36) states that:

The need to transmit large quantities of socio-emotional information to strangers over an impersonal mode of communication can make people feel vulnerable and open to personal attacks. So they limit the amount of this type of information ... which in turn creates a barrier to communication. (Barrett, 2002, 35)

Newman, in his research with children communicating through text, videoconferencing and a shared virtual environment with Albert (a teddy bear puppet) found that:

the greatest trust may be gained in the video-based environment, which suggests that the extra communication cues of hearing Albert's voice and seeing him on video have contributed to greater trust. This interpretation has resonance with the findings of Eklundh et al (2003) who found that informal communication and willingness to share personal anecdotes between professional teams were increased in a video communication environment compared with a pure text-based environment. (Newman, 2007; 109)

When Rourke et al (1999) reviewed a series of studies of computer-mediated communication (CMC), they reported that "the literature suggests that CMC does not have the capacity to support social and affective interaction" (Rourke et al, 1999; 52) and yet, in other studies, they note that *experienced* users of CMC *prefer* text to face-to-face, for example the study of Walther, (Rourke et al, 1999, 52). Two other studies reviewed by Rourke et al also contradict this, in that they record that social cues do take place in CMC:

Angeli, Bonk, and Hara (1998) conducted a content analysis of a course conducted entirely through CMC. They found that 27% of the total message content consisted of expressions of feeling, self introductions, jokes, compliments, greetings, and closures. McDonald (1998) studied the development of group dynamics in educational computer conference settings and found that expressions of openness and solidarity were significant elements, rising from 18% and 40% of the total, respectively, when the conference commenced, to 36% and 54% at its conclusion. (Rourke et al, 1999, 52-53)

The use of personal example, anecdotes and self-disclosure in CMC has also been found to improve learning in various studies (Rourke et al, 1999, 56). For example:

Cutler (1995) explains that "the more one discloses personal information, the more others will reciprocate, and the more individuals know about each other the more likely they are to establish trust, seek support, and thus find satisfaction (p. 17) (Rourke et al, 1999, 55).

Reciprocation also improves the degree of interaction in CMC.

Short et al., (1976) identify "evidence that the other is attending" as a critical feature in the promotion of socially meaningful interaction. (Rourke, et al, 1999, 56).

Barrett (2002; 38) makes a generalisation about the impersonality of the medium limiting communication, then states that there was more social disclosure amongst students in the CMC discussions than there were in the classroom, suggesting that it was actually the impersonal nature of CMC that enabled them to open up more.

It can be seen from the above references to the literature that there are many discrepancies in the statements made by previous investigators. For example, on the one hand, Rourke *et al* state that the literature declares that CMC cannot support social interaction, and yet, several case studies to which they refer demonstrate that social interaction does take place. Similarly Short *et al* state that the technology cannot transmit non-verbal cues, but this conflicts with the undeniable existence and use of the emoticon. Barrett states that CMC enabled students to open up more *because* of its impersonality, which raises the question that if students are opening up to each other more, in what sense can it be said to be impersonal?

A possible answer is that studies of the communication channels available within mediated environments have suffered from the belief that successful media are those that mimic face-to-face communication the most closely; the greater the deficiency in modelling face-to-face communication, the less successful the medium (Jakobsson, 2002; 68). Many earlier studies assumed that communication would be for work-related activity, and participants took part in the studies with little previous exposure to the communication tools and yet, as previously seen in the study by Becker and Mark (2002; 31-32) participants who were more experienced had learned the conventions of the environment and hence could project and perceive greater levels of social

presence. Newcomers would therefore give an unrepresentative performance within that environment. Media Richness Theory, which states that richer media are intrinsically better at conveying communication, is based on work that makes this fundamental oversight (Jakobsson, 2002; 68). However, as Jakobsson (2002; 69) points out the “whole point of a virtual world is that it is different”. Although the lack of non-verbal cues could be a limitation:

nevertheless, the opportunity to present oneself to others as a graphical image of one's own choice is clearly very compelling to many people. The possibility to conceal unwanted cues such as blushing, stuttering or talking with an accent is never considered in quality estimations of mediated interaction, and is therefore lacking from the outside view (Jakobsson, 2002; 69).

Caspi and Blau (2008; 324) note that ‘ a “lean” medium, one that lacks the potential to transmit social cues, does not necessarily restrict interaction relative to a “richer” medium’ and found that the levels of social presence and group identification did not correlate with the perceived “impersonality” of the medium (2008; 336).

The answer then, to the question of the discrepancy of the findings across the literature could therefore be the preconceptions of the investigators, and the relative inexperience of the subjects of the studies. The adherence to the definition of text-based asynchronous environments as “impersonal”, despite clear evidence to the contrary, makes sense if it is the statement of an outsider who possesses these preconceptions. For participants who are used to the social conventions of the environments, and who feel comfortable with exchanging social cues and mutual disclosure within them (and perhaps do not so in face-to-face environments) they are not impersonal.

An alternative explanation for this dichotomy is suggested by the research conducted as part of this study and will be explored in section 2.4.5 of the thesis.

2.2.6 Self-presence and embodiment

A fourth form of presence is that of self-presence, or embodiment, described by Biocca (1997) as “users' mental model of themselves inside the virtual world”. Embodiment is only possible because of the distinction between the phenomenal body and the physical body (Loomis, 1992; Biocca, 1997), the phenomenal body being “the mental representation of the body” (Biocca, 1997).

According to Biocca, therefore, where we locate our “self” is not necessarily in our physical body, but can be within the extended body. This transfer of our phenomenal body on to an external agent gives rise to embodiment (Biocca, 1997).

These distinctions are clarified by Knudsen (2004; 42 - 43) in which she classifies three different types of body:

- Physical body – the physically real body.
- Extended body – the representation of the body as mediated through technology and displayed at a remote site. This can be an image in videoconferencing, or an avatar, although as Knudsen notes “A video mediated extended body is more closely coupled to the physical body than a computer-generated avatar” (Knudsen, 2004; 43). This extended body is also a function of the mediating technology in that it can be deliberately manipulated by the technology, or its representation can be unintentionally curtailed by the constraints of the technology.
- Mental body – “the internal mental representation of a real or imagined body” (Knudsen, 2004; 43). This is equivalent to Biocca’s concept of the phenomenal body.

According to Murray and Sixsmith (1999; 315), embodiment is a function of the sensorial (i.e. the realness of the environment, discussed later in this chapter) and the morphological, (i.e. the plasticity of body boundaries). They state that an understanding of how the “corporeal boundaries” of physical bodies are malleable (through transformation such as amputation and prosthesis use) may inform the degree to which body boundaries may be malleable in mediated environments.

Within the physical world, the sense of the ownership of one’s body has two aspects, that of body image (which emphasises visual aspects [de Vignemont, 2007; 439]) and body schema (which emphasises proprioception, i.e. the body in action [de Vignemont, 2007; 443]) although some authors (e.g. Murray and Sixsmith, 1999) use the term “body image” for both. The body schema of physical bodies is informed by interaction with the world around us, and can be adapted through training (Murray and Sixsmith, 1999; 324). Body schema is related to the spatial representation one has of one’s body, not necessarily the physical limits of it (de Vignemont, 2007; 436) and gives rise to the sense of ownership of the body. For example, tactile sensations can be altered so they appear to belong outside of the physical limits of the body (de Vignemont, 2007; 437), anaesthetised limbs are still experienced as part of the body by most people, even though they cannot be felt (de

Vignemont, 2007; 434), in asomatognosia, parts of the body are felt to not belong to the person (de Vignemont, 2007; 429), amputees can feel the prosthesis to be part of their body (de Vignemont, 2007; 431) or even one can extend the feeling of spatial representation to include that of the tools one uses (de Vignemont, 2007; 441).

Body image is different from body schema in that it “is a set of beliefs, attitudes and perceptions that are about one’s body” (Carruthers, 2009; 124) whereas body schema is “an unconscious functional sensori-motor map of the body based on the information one needs in order to move one’s own body (e.g. bodily posture and position, bodily constraints like size and strength of the limbs, kinematical constraints like the degree of freedom of the joints, etc)” (de Vignemont, 2007; 439). According to de Vignemont, ‘body schema is for action and body image is for identification’ (2007; 439).

Embodiment within one’s physical body is stated by Carruthers (2009; 130) to be “the experience [of] the body as what I am. I experience my body as me. This is the properly self conscious sense of being an embodied self” as opposed to “the experience of the body as a thing that belongs to me. I experience my body as mine.” Carruthers suggests that the sense of embodiment that occurs through a mapping of the body schema to include the object or image (as described above) may be generated through a conscious sense of agency that includes that object or image (Carruthers, 2009; 132) even though tactile information is not fed back to the person.

The potential for being an embodied self within virtual environments is provided by giving the participants a digital representation of themselves within those environments, referred to as avatars. The word “avatar” in this sense means “a graphical representation of a user within the environment which is under his or her direct control” (Allbeck and Badler, 2002; 313), and has been employed in this context since it was employed by Farmer and Morningstar in an immersive virtual world called *Habitat* in 1986 (Britt, 2008). It is derived from the Sanskrit *avatârah*, a compound of *ava*, (“down”), and *tarati*, (“he crosses”). It means therefore “the crossing down” and traditionally refers to the incarnation of a deity within the physical world (Isdale et al, 2002; 530). Taking on the form of an avatar within a virtual world is thus a crossing down from the real into the digital. The avatar is also then visible to other users who may be simultaneously exploring the same area, and, if their avatars are in close proximity to each other, the two participants may communicate (usually

through text, though voice is also possible). Avatars also “provide access points in the creation of identity and social life. The bodies people use in these spaces provide a means to live digitally – to fully inhabit the world” (Taylor, 2002; 40). Through the use of avatars, “users do not simply roam through the space as ‘mind’, but find themselves grounded in the *practice* of the body, and thus in the world” (Taylor, 2002; 42). Some virtual worlds, such as Dreamscape, permit ghosting, that is being able to view the virtual space without having to be represented as an avatar (Taylor, 2002; 47). This means that one has no “body” within the virtual world; one can still feel immersed in that world, but will not feel embodied (Murray and Sixsmith, 1999; 327).

Embodiment can also apply in a telematic environment by the creation of a camera image of oneself and placing it on the screen, or in a telerobotic environment using a personal roving presence device which can act as physical representations for embodiment (Canny and Paulos, 2000; 278).

Although vision is predominant in the sensory realness created in virtual reality, hearing and touch also play a part in supporting this, through the use of sound and haptics (Murray and Sixsmith, 1999; 317). Blocking out sensory input from the real world also adds to the sense of immersion (Murray and Sixsmith, 1999; 318) and conversely the perception of our real bodies can disrupt the sense of virtual presence (Murray and Sixsmith, 1999; 327).

2.2.7 Presence factors in combination

Although distinct as concepts, the experience of mediated presence, copresence and embodiment are mutually reinforcing for participants in mediated environments. For example, Knudsen found that embodiment “was a central factor in the production of a sense of presence” (Knudsen, 2004; 43). Interaction between an extended body and a physical body, for example a handshake, “was seen to have the same importance and validity as a handshake between two physical bodies” (Knudsen, 2004; 44).

A sense of embodiment contributes to a sense of mediated presence in that “it is through a performance of the body, in this case via the avatar, that one is rooted in the virtual environment” (Taylor, 2002; 42). But it is also through copresent activities that a sense of embodiment can be enhanced. “It is through placing one’s avatar in the social setting, having a self mirrored, as well as

mirroring back, that one's presence becomes grounded" (Taylor, 2002; 42). The various aspects of presence are interlinked and act to reinforce each other.

Caspi and Blau (2008; 339) found that participants' sense of their own social presence and their perception of others' social presence was linked.

The more people are involved in presenting themselves as real people to their virtual audience, the more they perceive the presentation of others. Three alternative explanations may be derived from these correlations: First, it is possible that individuals with a high sense of self projection are also more sensitive to social communication cues transmitted by others. Second, an opposite line of reasoning is possible: Those who are sensitive to others' manifestation of themselves, and perceive the "others", are more highly motivated to project their own self onto the group ... the third alternative suggests that such differing perceptions (i.e. of the nature and purpose of online discussions) may alter the ways students perceive the presence of others and present themselves therein. (Caspi and Blau, 2008; 339).

That is, presence factors may be mutually reinforcing or may be dependent on a third factor, which is the participants' predisposition to working within online environments.

2.2.8 MUDDying the distinctions: Mediated presence through text

As mentioned previously, there is some disagreement within the literature regarding whether purely text-based environments can be mediated environments. However, there seems little doubt that participants may experience virtual presence, and copresence, even when the medium is text only. In a study by Towell and Towell (1997; 593), 69% of participants in a text-based networked virtual environment experienced a sense of mediated presence, even though the only medium through which they interacted was text. The term text-based networked virtual environment (abbreviated to TNVE) is used by Towell and Towell, although these environments are more commonly referred to as MUDs, an acronym for multi-user dungeons. Towell and Towell (1997; 593) also hypothesised that it was the metaphorical use of space in a MUD that contributed to the sense of mediated presence. Towell and Towell (1997; 590) describe how a virtual space is created in a MUD through the information being

organized in such a manner that the person using the client is presented with a textual representation of a room in which there could be other people with whom he or she may "talk." Talking in this context means using the keyboard to communicate with the other person(s) who share the same room with you; likewise, "hearing" means to see textual communication on a monitor. Typically, TNVEs are compartmentalized into

rooms joined by entrances and exits. Hence, there is a topography which can be navigated with simple commands such as: "go south." When people move from one room to another they lose the communication they had with the person(s) in the previous room and can "hear" and "talk" only with those in the new room. This presentation of a virtual space to the TNVE user has been referred to as "imposing a spatial metaphor."

For this hypothesis they draw on research that shows "that readers of narrative scenes of spatial environments construct a spatial mental model that consists of extensions of the three model axes, and they associate objects to it" (Towell and Towell, 1997; 593). However, in their study the participants did not report the employment of a spatial metaphor as a factor in their participation in the MUD (Towell and Towell, 1997; 593).

MUDs also fulfil the criterion of being a world with which one can interact, through manipulation of elements within the world stored as "objects" in the database. These objects can be artefacts, the participants in the environment, or the rooms in which they are located and will be given a location within the metaphorical space (White, 2001; 131). By typing commands, participants of the MOOs can also examine the objects, which have descriptors associated with them. These commands are, for example, "look", "touch" "hold" (White, 2001; 124, 133) thereby recreating aspects of the physical world and enabling the participants to be embodied (White, 2001; 124, 127). Participants create descriptions of their characters which can then be looked at, thereby enabling them to have social presence.

2.3 Identity

2.3.1 Different definitions of identity

Another of the features of the conceptual framework that influences the experience of mediated environments is that of identity. This section defines identity and describes how identity is formed and performed within mediated environments, predominantly virtual environments.

Manders-Huits (2010; 46) identifies two main definitions of identity, these are self-informative and nominal. Nominal identity is the set of attributes assigned to a person by society, for example, names, labels and identification numbers and need to be fixed, so that a person can be identified

and re-identified consistently (Manders-Huits, 2010; 48). Self-informative identity is a person's conceptualisation of their self, which can be fluid. Self-informative identity usually draws on nominal identity, but nominal identity typically omits self-informative identity.

2.3.2 Self-informative identity

Self-informative identities are the results of the collection of a person's self- conceptualisations and attribution of meanings to their self, usually with respect to a certain role or social milieu, (Stets and Burke, 2008; 130). Wenger describes identity as the "social formation of the person, the cultural interpretation of the body, and the creation and use of markers of membership such as rites of passage and social categories" (1998; 13).

In general, the self-concept is the set of meanings based on our observations of ourselves, our inferences about who we are, based on how others act toward us, our wishes and desires, and our evaluations of ourselves (Stets and Burke, 2008; 130).

People have many identities, each one constructed from the various roles or social groups that they encounter within their lives or "the values, attitudes, and behavioural intentions of the social group to which they aspire to belong" (Cabiria, 2008; 3). "The overall self is organized into multiple parts (identities), each of which is tied to aspects of the social structure." (Stets and Burke, 2008; 131).

An individual's self-concept "embodies both content and structure" (Stets and Burke, 2008; 129). The *content* of identity is the collection of meanings associated with particular roles or belonging to different social groups, (Stets and Burke, 2008; 131); these meanings are negotiated through social interaction (Stets and Burke, 2008; 132). Identifying this social interaction in terms of either the role one adopts in the group, or the social group one interacts with, gives rise to role identity theory or social identity theory respectively (Stets and Burke, 2008; 142). This study does not distinguish between these approaches, following Stets and Burke's synthesis of social, role and personal identity theories. The elements of these identities within a role or social group can be subdivided into:

- Those that conform or represent affiliation to the role or group and
- Those personal aspects of identity with which the person individuates him or herself.

These two forms are called “conventional” and “idiosyncratic” by McCall and Simmons in role identity theory (Stets and Burke, 2008; 133) and *Idem* and *Ipse* by Ricoeur in social identity theory (Macfadyen, 2008; 563).

The *structure* of identities provide the internal dynamics by which these various meanings within identities, and the various identities, are brought together (Stets and Burke, 2008; 135) and in which a new identity is formed when a new social group or role is encountered (Stets and Burke, 2008; 142). Furthermore “this self is not a static entity but an entity that is dynamic and can change, it is important to examine how these different identities change over time and come to shape a new self-concept” (Stets and Burke, 2008; 145).

2.3.3 Self-representation

The role of bodies in forming and performing identity is also of importance. Within the literature on the psychological roots of identity it is also stated that “our bodies ... affect our identities through how we feel, what we can do and how other people treat us” (Phoenix, 2007; 49).

Since appearance can often be interpreted by other people, bodies can be used as a way of presenting a particular identity to the world, and for some bodies can become conscious “body projects” to manipulate this means of representing identity to others Foucault describes this process of altering ones body to create an identity as a “technology of self” (Phoenix, 2007; 49 – 50).

In her coda to this discussion on body and identity Phoenix states:

“Of course, no body is entirely malleable.” (2007; 50)

This last statement is, of course, not as applicable when one is considering virtual worlds. Since these environments enable interaction between people to be conducted entirely online, the absence of direct visual and audio contact and the flexibility the technology provides for creating digital representation, enables users to adopt new identities without physical constraints, becoming an idealised “body project”. These are not necessarily entirely unconstrained however:

Users were not involved in progressive explorations of self-construction but instead relied on stereotype and caricature that allowed a kind of unreflective appropriation. Underlying these performances were assumptions about what kinds of bodies and identities were deemed as legitimate. (Taylor, 2002; 58)

A constraint imposed by the technology (as opposed to the self-imposed one described above) is the amount of flexibility some virtual worlds offer participants over their representation, which varies across types of virtual world, or in the types of privileges granted to users. Active Worlds Europe provides citizens (subscribers to the service) with between 10 and 20 avatars from which to select at any one time. As a user moves from space to space within the environment they are given a choice of avatars appropriate to the space which can be male, female or neither. Within the research into Microsoft V-Chat, Cheng, Farnham and Stone were able to group their categories of avatars into human-male, human-female, animal, object abstract and child (2002, 99). Second Life has male or female shapes for all of its users that can be personalised by manipulating approximately 150 different metrics. Clothes can be added and more sophisticated skin and hair to create a more individual look, and also demarcate users as more experienced in (and more prepared to spend money on) their inworld lives. In addition, looks can be more radically adapted by adding extra objects to parts of the avatar's body, and changing the underlying shape, to create appearances that range from simple inanimate objects (such as cardboard boxes) to detailed recreations of figures from mythology or popular culture. However, estimates are that only around 6% of users choose a non-human look (Au, 2007).

Despite some tendencies to apply their own constraints on choices of avatar, allowing flexibility in avatar choice is important for participants in virtual worlds. In the virtual world "Active World", developers found that this was the most common request by users (Schroeder, 2002b; 7). As Taylor (2002; 51), states:

Ultimately, digital bodies tell the world something about your self. They are a public signal of who you are. They also shape and make real how users internally experience their selves.

Limiting the choice, therefore, creates frustration amongst the users, since it denies them the opportunity to inform the community about who they are, and also to fulfil an act of reification of their own conception of self. Annetta, Klesath and Holmes (2008) conducted a study that took place in Active Worlds, in which users can either be "residents" in which case they have a choice of "100 different avatars ranging from humans to abstract objects such as a motorcycle, helicopter, or animal", or "tourists", in which case the choices are just male or female. Half of their students were

given resident status, half were given tourist status. The students in the tourist group reported that their lack of choice reduced their experience of social presence. Those in the residents group changed avatars until they found one they felt suited their mood on the day, the roles they had been assigned within the tasks they had been set and how they wanted to be perceived in those roles. The students were also asked to complete a Jung-Myers-Briggs personality inventory, which attributes personality types to respondents to a questionnaire based on four scales. No correlation between avatar choice and psychological profiles was detected, and indeed the students reported that they saw no correspondence between these psychological profiles and their own perceptions of self.

Performance of self occurs in text-based communication through specific self-attesting statements (Macfadyen, 2008; 563). Macfadyen notes that there are stages through which this self-attestation occurs; the first is demonstrating affiliation or membership of a particular nation, or ethnicity, which Macfadyen labels as *Idem-identities* (2008; 564). This is then followed by a more individuated set of statements in which the participant's *Ipseity* is performed, i.e. the elements that make them an individual (Macfadyen, 2008; 564 - 565). After this, learners will then attest their new *Idem-identities* as part of the new group in which they are taking part (Macfadyen, 2008; 566) and attest to how they may be individuated within this new identity (Macfadyen, 2008; 565).

Participants in MUDs have the ability to label themselves with a set of descriptions regarding their appearance and assign settings to gender, artefacts carried, and movement descriptors (White, 2001; 130). Even though MUDs are purely text-based environments, these labels can be used to create a body image. Gender classifications can be more flexible than in real life, or in virtual worlds. White (2001; 129) reports a MUD with ten genders available for participants to choose from ("neuter, male, female, splat, Spivak which is named after a programmer, royal, plural, second, either and egotistical"). Participants may also attempt to convey gender through the use of language perceived to be stereotypical of that gender (Tompkins, 2003; 202).

Representations can be divided into anthropomorphic and polymorphic (Murray and Sixsmith, 1999; 316). Each may have their advantages. The anthropomorphic argument is that "for a sense of "presence" in virtual environments, the virtual body must closely resemble (both visually and

sensorially) the body of the user” (Murray and Sixsmith, 1999; 325). Anthropomorphism supports presence in two ways:

- "Geometric mappings" of the body from the virtual to the physical (Sheridan, 1992).
- Identification through a similarity in the visual appearance of the person and the virtual body (Held and Durlach 1992).

The argument for polymorphism is that:

the represented body in VR does not have to closely map the person's body in real life. In effect, it is envisaged that people could experience a radically reconfigured body, say from their usual anthropoid experience, to that of a lobster. It is not that you experience yourself through the lobster; rather, you experience the architecture of the body as that of a lobster. (Murray and Sixsmith, 1992; 325 – 326).

Murray and Sixsmith (1992; 328-329) quote Penny regarding his mapping of a virtual body with extra limbs to that of the physical body in that "The mind maps to this new body almost effortlessly... (suggesting) that the mind can quickly draw a new internal body representation to allow control of the new body" (1994:262).

2.3.4 Responses to representation

The choices of some users to represent themselves as a gender other than male or female can be resisted by other members of the online environment, with responses to choices to remain neuter being, for example, “So, r u a male it, or a female it?” (White, 2001; 141). Participants representing themselves as non-human have “been a source of controversy” due to the belief that they are “exhibiting an inauthentic self in a virtual context that expects authenticity” (Boellstorff, 2008; 184 – 185). This clash can be due to different communities within the space coming into contact with each other, or through participants being unfamiliar with the conventions of the environment.

The responses to a particular choice of avatar also can be imported from real world prejudices.

Remarkably, an avatar's design, behaviors, and speech still cause stereotyping, prejudice, and preferential treatment (Kolko, 1999). For example, studies have shown that female characters receive more assistance, freebies, and handouts than male characters (Lee and Hoadley, 2007).

Wallace and Marryott (2009) found that students, given the choice between choosing an ethnicity that matched their own or was different, tended to choose one that looked like them. In their study, students were given a choice of four ethnicities for their avatars (European, Chamorro, Filipino and Micronesian) and were asked a set of questions to identify the closeness of their collaboration with other avatars within Second Life. They found that regional ethnic tensions were reproduced within the environment, with Chamorro students being least willing to collaborate with European avatars, and Filipino students being least willing to collaborate with Micronesian avatars. Also Wallace and Marryott also noted that all participants were willing to collaborate with Filipino avatars, which they attribute to the attractiveness of the appearance of the avatars that had that ethnicity. This does indicate that choice of avatars does have a bearing on virtual world relationships.

2.3.5 The creation of an online identity and the “true self”

The idea stated above that an online identity that differs from an offline identity is not authentic, whereas one that matches the offline identity is authentic, is an over-simplification. As McKenna, Green and Smith (2001; 304) note:

In general, individuals tend to express more aspects of their true selves when they interact with others on the Internet than when they interact in person

McKenna, Green and Smith (2001; 304) define “true self” as:

comprised of those attributes an individual feels he or she possesses and would like for others to perceive but, for whatever reason is generally unable to express and have acknowledged ...

Taylor (2002; 54-55) records that avatars can be truer reflections of a person than their offline selves.

In this (digital) form, users suggest that the corporeal can no longer “corrupt” the truth about who they are and people often say it was through their avatars that they found a “better” version of themselves, one that felt even more right than their offline body.

Hence, these participants may not see the reality of their offline selves to be relevant. Indeed, insisting on participants being “true” to their offline identity may even negate their reason to enter a

virtual world. This is reflected in the comments of Bailey (2007), an active participant within Second Life:

there are people who create an avatar that is completely unlike them ... They basically create a whole new person, so roleplaying is a natural part of their Second Life. Then there are people (including myself), who are staying true to themselves as much as possible, who are maybe even more honest than in First Life, as this world is not as tied up as the one we live in, and it gives us opportunity to become more brave to express ourselves. (Bailey, 2007; 20)

These discrepancies may be due to people suppressing aspects of their identity while offline due to those elements being marginalised or stigmatised within their proximal relationships; the pseudonymous nature of their virtual relationships then enables them to express these aspects of their self (McKenna, Green and Smith, 2001; 303). However, the discrepancies may instead (or also) be due to a difference between their body and their body identity, the virtual world then enables them to express their image of their idealised body and hence reflect how they “truly” see themselves.

Although the development of an identity is informed by one’s physical body (Phoenix; 2007; 49), it is not constrained by it; individuals may have a conceptualisation of self that is quite different from their physical bodies. Examples of these body-identity dichotomies can be minor with people’s conceptualisation of their true self being that of someone taller, or slimmer, or with different coloured eyes. In some cases, people may have an identity that is of a different sex, or of no sex (Roberts et al, 2008); may feel that they are an amputee despite not physically being an amputee (referred to previously in the section on malleable body schema [Lawrence, 2006]); or that they are of a different species, or dead (or even both a different species and dead [Nejad and Toofani, 2005; 250]). Although these latter examples are perhaps more extreme cases of conflicts between self-conceptualisation and physical reality, they do illustrate the problematic nature of identity being associated with physical reality, and that how people conceptualise their identities may be disconnected from their physical appearance.

2.3.6 Re-representation and roleplay

Another reason for differences in online and offline behaviour may be also due to the participants choosing to roleplay. Experimenting with experiencing interaction as a person of different age, race or gender is an activity known as “identity tourism” (Taylor, 2002; 58) or “avibending” (Amdahl, 2007).

The ease of creating and modifying virtual identities encourages players to think of themselves as "fluid, emergent, decentralized, multiplicitous, flexible and ever in process" (Turkle 1995, 263-264)

Lee and Hoadley (2007) also note that this experimentation may be part of an exploration of possible selves; a process by which aspects of identity are tested out before being rejected or incorporated into one’s concept of self.

It has been suggested (Balsamo, 1995; 359) that this tendency to adopt other identities within virtual worlds has its roots in the cultural and political origins of virtual reality. Balsamo notes (1995; 348) that the term ‘virtual reality’ was “first invoked as a speculative construct in cyberpunk science fiction novels” and has “become inextricably bound up with the emergence of cyberpunk as a new youth subculture”. Part of the ideology of this culture is:

transgression against normative forms of social control. To the cyberpunk, the computer is the technological means of disavowing and transcending social determinations. For example, some people believe that, in enabling the adoption of multiple identities, computer-communication networks establish the infrastructure for new forms of social interaction that are free from the traditional markers of identity and status (Balsamo, 1995: 359)

Cyberpunk also has as its roots a form of posthumanism “in which machine augmentations of the human body are commonplace as are mind and body changes brought about by drugs and biological engineering” as well as being “streetwise, aggressive, alienated and offensive to the Establishment” (Nicholls, 1993; 288).

Certain domains within virtual worlds are specifically set aside for roleplaying and in these the roleplaying aspect is made explicit. These domains are often based around science fiction and fantasy worlds from books, television programmes or films. Within these dedicated spaces, participants take on different avatars, act out roles and create narratives. However the in-character

roles and out-of-character roles are kept quite separate (Bailey, 2007, 24). Even though the out-of-character role is still a virtual identity, the implication seems to be that this is the “real” virtual identity, of relevance when considering persistent nominal identity.

Although the purpose of the virtual worlds in general are primarily socialising and meeting people (Becker and Mark, 2002; 29), within roleplaying areas the purpose may be quite different. Newman (2007; 27) notes that

There are some similarities between online role-playing and improvisational theatre. In both activities, participants are collaborating to produce a story in real time. Söderberg, Waern et al (2004; 1) note this similarity but also note that online role-playing is done for the benefit of the participants whereas improvisational theatre is done for an audience. It is not hard to see this distinction becoming less significant in role-playing within an extended online community, where there may indeed be an audience.

In fact, roleplay could be said to always be for an audience, in that the other participants in the roleplay become the audience for one’s own performance.

2.3.7 Persistent identity

Despite the malleability of identity within online worlds, “there exists a social pressure in virtual worlds to maintain a stable primary identity” (Jakobsson, 2002; 74). Participants must maintain a persistent nominal identity in order to build and maintain connections to people and to their communities. This then constrains their behaviour, since a persistent identity will result in social consequences for antisocial behaviour.

We are held responsible for our actions. All societies, physical or virtual, demand that we contribute something in order to benefit from being part of it, and, to keep tabs on our contributions, there have to be identifiers, and without an identifier, and identity, there will be no payback (Jakobsson, 2002; 74)

And these consequences of the actions, even in a virtual world, can be emotionally real.

virtual actions can work as causes of effects on my mental state that are as real as anything I might experience in the physical world. Jakobsson (2002; 70)

Cheng, Farnham and Stone note that this process also “works in the other direction, offering participants the opportunity to retain a persistent identity will encourage them to invest more in their online representation” (2002; 95).

2.3.8 Changing relationship to avatar

Although the avatar one has within a virtual world may remain fixed, the manner in which a participant in a virtual world relates to that avatar changes over time. Drawing on a range of personal experiences recounted by users of virtual worlds through text-based online sources such as blog posts and mailing lists, as well as interviews conducted both inworld and during face-to-face workshops and drawing on his own experiences, Warburton (2008) identified a range of themes and key experiences common to many of these narratives. Warburton mapped these common elements in one of his own blog postings (figure 2.7)

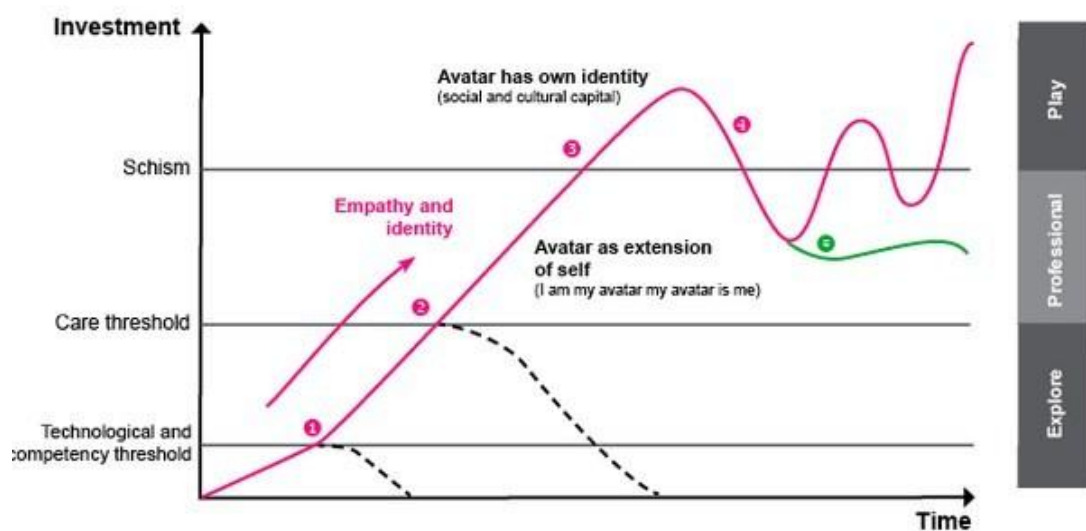


Figure 2.7 Development of avatar identity in virtual worlds (Warburton, 2008)

In these stages, the first stage is one of learning the environment. If this threshold is passed, then users will continue to work within the environment and become more familiar with it, however it is only when the second threshold is passed (the “care threshold”) that users will identify with their avatar and see it as an extension of themselves. There is a third threshold, in which the extended identity may become distinct from the physical identity (using the terminology of Knudsen [2004; 43] and Biocca, [1997]) often in response to social and cultural interactions within the virtual world. Over time, multiple identities, and therefore multiple avatars, may be created.

2.3.9 Identity in relation to community of practice

In *Communities of Practice*, (Wenger, 1998; 149) lists the various ways in which identity is informed by one's relationship to a community or communities. Wenger's characteristics of identity are:

- *Negotiated experience* - the ways in which our conceptualisation of self is negotiated and informed through our experiences of participation with the community. Wenger also includes in this category the reification of our self by ourselves and by others.
- *Community membership* – some parts of the community are familiar and others are unfamiliar.
- *Learning trajectory* – where a person is in the process of becoming a member of the community and whether that is an inbound, outbound or other trajectory through the community.
- *Nexus of multimembership* – people are members of more than one community and these various identities need to be brought together into a single structure. Managing these social relationships and being aware of the various “communicative and collaboration rituals” that exist within the different cultures (Järvinen, Heliö and Mäyrä, 2002; 26), and, furthermore, finding them enjoyable, adds to the sense of flow a participant feels when taking part in a mediated environment, and thereby enhances their sense of presence.
- *A relation between the local and global* – according to Wenger, local ways of belonging to a community need to be negotiated and reconciled with a wider context and the larger community. How definitions of “local” endure when looking at communities built through mediated environments is unclear from the model however.

Identity is built around non-participation in a community as well as participation. Since communities of practice may be subdivided, or a person may be a member of more than one community of practice, this multimembership gives rise to a multiplicity of participation and non-participation in a variety of circumstances (1998; 168 – 171).

2.3.10 Summary

The addition of identity as a separate additional category to Activity Theory has been held to be superfluous by some commentators of this study, since, it is argued, identity is already contained within Activity Theory. The suggestions are that identity is a part of the subject of the activity, or

alternatively, it arises from the community. A stronger argument is that it is a tool or artefact constructed by the subject as a means to mediate interactions. As can be seen from the discussion above, identity derives from, and influences, many different factors within interactions. It is also an ambiguous and sometimes ill-defined concept. The strength of a model such as Activity Theory is that it enables separate elements of interactions to be disentangled and treated separately, and thereby more clearly, while retaining the concept of the interconnection between the different elements. Because of the wealth of literature on the subject, and its interconnection with many other elements in interactions, it has been treated as a separate category within the conceptual framework, but interconnected with all of the other elements of the framework.

2.4 The characteristics of the subjects

2.4.1 Introduction

Leont'ev's diagrammatic representation of the work of Vygotsky includes three elements; that of subject, object and tools and instruments (Edwards, 2004; 89). These categories are defined as in the following way:

the subject refers to the individual or sub-group whose agency is chosen as the point of view in the analysis. The object refers to the 'raw material' or 'problem space' at which the activity is directed and which is molded and transformed into outcomes with the help of physical and symbolic, external and internal mediating instruments, including both tools and signs. (Center for Research on Activity, Development and Learning, 2004)

Thus within this view of action, the subjects act on the object of the activity, employing a range of mediating instruments to produce an outcome. In the context of this study, the subjects are the learners since it is their experiences that are being investigated.

Understanding the factors that the subjects bring to the activity involves understanding those individual characteristics that may influence their response to all of the other elements of the framework. The literature identified for this study focused on the characteristics that were thought to be the characteristics that are unique to interaction within mediated environments, since these would differentiate the learning with mediated environments from other forms of learning and

therefore require a specific exploration. This is reflected in the typology developed here which includes four categories using terms used in the literature (roleplay tendency, embodiment tendency, immersiveness tendency and narrative tendency) and two categories implied by the literature, but not specifically conceived in the form represented here (degree of naturalisation and turing tendency). The characteristics of the subjects that relate to other categories within the model, such as the learning style or personality type for example (which influence how participants relate to learning activities, communities, or different conventions amongst others) have not been explored.

2.4.2 Degree of naturalisation

Users of technology may differ in their interaction with technology due to their previous experience of technology. Prensky (2001; 1) claims that the students who grew up using digital technologies have actually developed different thinking patterns as a result. Users whose early development was in a period before digital technologies, such as personal PCs, were commonplace may therefore be able to adopt some of the techniques and language but in Prensky's term, they will always use those technologies with an "accent" (Prensky, 2001;2). According to Prensky, the students who grew up with digital technologies are therefore digital natives and those from previous generations are digital immigrants. These two generations use a different language, are socialised differently and even have different modes of thinking. Prensky's observation is useful, in that it broadens the nature of interaction with technology from simple 'literacy' and introduces a familiar metaphor with which to consider adoption of technology.

Prensky's division is frequently criticised in that identifies a dichotomy based on age, whereas observations tend to indicate that there are many exceptions, with younger people sometimes struggling with technology (Kennedy et al, 2006; Margaryan and Littlejohn, 2008) or their use of technology having only a minor impact on the manner in which they learn (Bennett, Maton and Kervin, 2008; 779). As Bennett, Maton and Kervin note "It may be that there is as much variation *within* the digital native generation as *between* the generations" (2008; 779). This dichotomy also ignores the digital divide experienced by many students, particularly those of ethnic minorities and low income families (Goode, 2010; 2).

Prensky has since recognised that the dichotomy between natives and immigrants is too simplistic and has replaced the digital natives / digital immigrants polarity with the concept of digital wisdom (Prensky, 2009). This refers “both to wisdom arising from the use of digital technology to access cognitive power beyond our innate capacity and to wisdom in the prudent use of technology to enhance our capabilities”. White (2008b) proposed alternative categories, based not on technological skills sets, but on frequency and purpose of use. White’s categories are “Tourists” and “Residents”; tourists being those who only use technology to achieve specific aims and residents those who spend longer online, use it as a means for socialisation and have a degree of social presence online. White also recognises that this is a continuum and not two discrete categories.

The process of acquiring experience in using technology can be seen as a process of becoming informed or skilled, but an alternative view is that there is a process of internalisation of one’s relationship with that tool. This has been referred to as appropriation; of making something one’s own (Littleton, Toates and Braisby, 2007; 203). This merging of user and tools has been observed to be “(man’s) chief biological characteristic, for considered functionally they are detachable extensions of the forelimb” (Hayles, 1999; 34). Thus Hayles points to an added degree of appropriation of technology, that of the cyborg (Hayles, 1999; 84), where the technology is so integral to a person’s sense of self, that it can be considered to be an extension of their own bodies. This is the sense in which the term cyborg is used in other areas of the literature (eg. Biocca, 1997). This degree of adoption of technology is possible due to the malleability of body schema discussed in section 2.2.6. It is this adoption of tools as prostheses, where they become an integral part of how we perceive and manipulate the world, which Hayles sees as the essential aspect of posthuman experience (Hayles, 1999; 34).

These two metaphors of the learned use of technology, that of it being a place that can be travelled or belonged to, and that of it existing as a natural or unnatural part of being, are drawn upon in this study through the use of the term *naturalisation*, since this has meaning both in terms of citizenship and in biological adaptation. The degree of naturalisation in one’s use of technology therefore means both the degree to which one has become a resident of the “land of technological use” and the degree to which the technology has become a natural part of one’s life.

Naturalisation is a process that goes beyond simply dividing users into those who can or cannot use a technology. One of these added stratifications is that a person with more powerful technology is treated by other participants as a leader (Schroeder, 2002b, 9). The ability with which participants in a virtual world can display unique status characteristics also depends on how familiar the participant is with the virtual world (Schroeder, 2002b; 15) and has been able to acquire the status markers that are specific to the online world.

Instead of money, you need props; instead of a high status job; you need computer skills; and instead of looking good physically, you need to look good on the screen (Jakobsson, 2002; 73)

Cheng, Farnham and Stone found that other status markers in virtual worlds are:

a) hours online (more advanced skills); b) friends online (having popular friends); c) formal club membership ...; d) artistic talent (displayed via avatar creation); e) exploration of the environment (discovering secret places in the 3D spaces)" (2002; 104)

Naturalisation also requires learning the social conventions of the virtual world (Becker and Mark, 2002; 22), which can become complex as more sophisticated groups evolve. The degree to which these social conventions are learned can itself be a marker of status. Axelsson (2002; 199) discusses the categories of users as "insiders" (those who are part of the group and have learnt its social conventions) and "outsiders" (newcomers who have yet to learn the conventions and are therefore marked out as lower status). She notes that this division into insiders and outsiders is more prevalent within roleplaying communities. This is referred to as stratification, "that is that different groups of users develop distinctive behaviours and roles that distinguish them from other groups with a different status or with a different sense of cultural cohesion" (Axelsson, 2002; 199 – 200). Wenger divides the category of outside members into two sub-categories, that of the marginalised, those on a trajectory that remains outside of the community, and the peripheral, in which the existence on the edge of the community is only a transient phase on an inbound trajectory (Wenger, 1999; 100).

In addition, experience of mediated environments increases the sense of mediated presence in those environments. This is true of repeated exposure (North, North and Coble, 2002; 1074) and may be due to factors such as "practice with the VE (virtual environment) tasks, extent of familiarity

within the VE, and sensory adaptation” (Sadowski and Stanney, 2002; 794). A sense of presence may increase during a single session (North, North and Coble, 2002; 1074 – 1075). However, this latter claim is contradicted by the work of Stanney, which found no such increase (Sadowski and Stanney, 2002; 794).

2.4.3 Narrative tendencies

Another trait that, according to the literature, affects participants’ behaviour in mediated environments is their narrative tendency. Narrative tendencies are “the individual’s predisposition for creating and finding narrative” (Newman, 2005; 3). The characteristics of a person with high narrative tendencies are described by Newman as wanting to “gather details about the environment, characters, and events of an encounter”. Conversely a person with a lower narrative tendency will be “satisfied with less detail, and will quickly become overloaded”. There is also an implication that they will have less willingness to suspend disbelief and play (Newman, 2005; 3).

2.4.4 Immersive tendencies

Another trait that may influence behaviour in mediated environments is immersive tendency. One of the factors that Steuer (1995; 40) identifies that promote mediated presence is “the characteristics of the individual experiencing the environment”. Newman describes people with high immersive tendencies as people who:

are able to block external distractions and become very focused, to the point where they become unaware of their immediate environment and the passage of time, Newman (2005; 3).

People who have stronger immersive tendencies will report a higher feeling of presence in virtual environments (Kaber, Draper and Usher, 2002; 392). Immersive tendencies are “thought to be dependent on aspects of human cognition and behaviour, including concentration, imagination, and self-control” (Kaber, Draper and Usher, 2002; 392). Other researchers have found a correlation between daydreaming and becoming lost in novels and immersive tendencies (Kaber, Draper and Usher, 2002; 392).

2.4.5 Embodiment tendencies

Further traits that influence the experience of mediated environments were identified by Heeter (1995; 200). She proposed two characteristics of users, which she stated as being propensities for involvement in virtual worlds; these are the propensity to engage belief in a virtual world (equivalent to Newman's "immersive tendency" [2005; 3]) and the propensity to engage belief in a virtual body (an "embodiment tendency"). Heeter found that this propensity varied from individual to individual.

In her study, participants engaged in a 3D virtual world in which the participants' image was superimposed over computer-generated images projected on a screen. Heeter refers to this as second person virtual reality rather than third person virtual reality since the viewers faced their own image on the screen. The 3D effect was created through the screen being observed through stereoscopic viewers. The participants were asked whether their off-screen physical body, their image on the screen, or both, felt like their real self. Heeter found that 29% to 31 % of respondents "felt as if 'the being on the screen' was their real self", 26% to 29% felt that their physical body was their real self and 40% to 42% felt that both were real (Heeter, 1995; 200). Heeter comments:

"The percentages were surprisingly consistent across different audiences and different virtual experiences. ... About one fourth of the population is so strongly situated in the real world and their real body that they have a difficult time becoming involved in a virtual world." (Heeter, 1995; 200).

2.4.6 Effect of immersive and embodiment tendencies on online interaction

These immersive and embodiment tendencies may explain the difference in experience between participants in online interactions. Towell and Towell (1997; 593) reported that 69% of participants in a text-based networked virtual environment experienced a sense of mediated presence, even though the only medium through which they interacted was text. The participants interacted through a MUD that represented, through textual descriptions, movements of participants and locations of rooms and objects. Towell and Towell hypothesised that it was the metaphorical use of space that contributed to the sense of mediated presence. Several users also reported that their

sense of presence depended on who they were interacting with and the topic under discussion (1997; 593).

Bayne (2004), in direct contrast to Towell and Towell's findings, recounted the experience of participants in an online course who failed to experience mediated presence through their interactions online. Her interviewees' experiences were that the act of seeing body language is so fundamental to communication that without it, the communication fails to seem real. For example;

the fact that things go on that eh you can't see happening, you just hear about it, you just read about it, it's like it's not real. Because there's no actual emotions, because it's just words, you can't see facial expressions so em it's not real...(Interview with "Megan" from Bayne, 2004)

In fact, online communication can be effective at conveying emotions through the use of paratextual devices, such as emoticons, font types and abbreviations (Becker and Mark, 2002; 29). Displaying and reading these paratextual cues requires experience of the communication medium, however, as well as a willingness to use them.

In Bayne's discussion of "Megan", she states:

Communicating online is perceived here as being an interpretive act in a sense that intercorporeal communication is not. The loss of the language of the body leaves 'just words' – a phrase Megan repeats three times – resulting in a communicative act that is 'not real' in the sense that its emotional contexts are purely constructed, a matter of interpretation. (Bayne, 2004)

This lack of sense of reality of the online communication and the absence of the feeling of copresence with the person with whom one is communicating is also reflected in the respondents' failure to experience any embodiment through their text.

*if it's online it's just like it's only words. They don't seem real, it's not you, so it's not too bad.
it's almost like it's not real, they're not seeing you, the only judgement they can make on you is what you've written. (interviewee quotes in Bayne, 2004)*

There are also benefits to this lack of sense of embodiment, in that the students feel a confidence in their online communication which they do not feel in face-to-face communication.

This difference in experiences between those of the participants in the Bayne study and those in the Towell and Towell study indicates that participants' predispositions may influence to a large

extent their ability to experience copresence and embodiment within text-only environments.

Reasons for this are not given in either study, however possible differences may be:

- The privileging of the role of body language and facial expression in communication by the participants in the Bayne study. For example, the quote by the interviewee above fails to recognise that face-to-face communication is interpretive too and prone to misinterpretation.
- The lack of use of paratextual elements in the online communication by the Bayne participants with their consequent feeling of absence of emotional content in the communication.
- The Bayne participants locating phenomenal bodies purely within the physical body (the “Heeter one fourth” [Heeter, 1995; 200]). One of Bayne’s interviewees makes reference to “the other person ... at the other side of the computer” indicating that they are viewing the process of communication entirely as an attempt to communicate through text, and the intervening technology, to a *physical* person at a *physical* remote location. Other users of the environment may engage by relating only to the aspect of that person that is embodied via their text within the mediated space. If the participants in the Towell and Towell study had adopted this latter viewpoint, this may explain the disparity between the experiences.

The differences in ability to experience mediated presence and embodiment may also explain the inconsistency in the accounts of research by Rourke et al (1999) in section 2.2.5. Researchers may be implicitly assuming that online interaction is impersonal because of their own inability to experience immersion and embodiment within the online activities.

2.4.7 Roleplaying tendencies

Not all characteristics of the participants in mediated environments are applicable across all the technologies. Virtual worlds provide an opportunity for participants to adopt an entirely new identity, which webconferencing and other distal (as opposed to simulacral) technologies do not. Since the use of an avatar enables the physical reality of the users at either end to be concealed, one can adopt an avatar of any race, sex or species. This adoption of a new identity is known as “identity tourism” (Taylor 2002; 58). However, many users choose to only be themselves, and some express anxiety about the pseudonymity of the environment. Bennetsen (2006) observed these two

dominant modes in which activities take place within virtual worlds, in his case Second Life, and coined the terms Immersionist and Augmentationist to describe them, discussed in section 2.7.2.

Those participants who wish to remove all forms of pseudonymity are sometimes referred to as “disclosurist” by members of the virtual world communities (Amdahl, 2007). This is defined as: “A person who doesn't want to associate with people who don't say what they're like in First Life. Disclosurists sometimes equate avibending with lying”. This is an issue particularly where participants are forming relationships with other users within these environments.

While some people regard offline gender as unimportant to online attraction ... others speak of the caution, anxiety and trust that must be given over in the hopes of not being “duped”. (Taylor, 2002; 59)

Although many users may be comfortable with revealing their offline identities but would not make this a prerequisite for interaction, other participants refuse to disclose any details about their offline lives completely. This can be seen by the reticence of users to divulge information about their offline selves, in a study by Cheng, Farnham and Stone (2002; 97) it was found that:

often people did not fill in the profile information or filled it in incorrectly. For example, a common response to the “Sex _____” item was “none” or “yes”, rather than “male” or “female”. Often this item was left blank or filled in with false information.”

Many participants choose to play roles within these environments, either continuously or only within dedicated spaces. In an analysis of interactions in within a creative writing group in the virtual world Rose (Thomas, 2004), some participants perceived the role-playing potential of interaction within virtual environments to be such an intrinsic part of the rationale for participation that it did not even occur to them that adopting a different gender, race (or species) could be seen by other participants as being an act of deception, yet other members of the group expected others’ online representation to be congruent with the corporeal self and become anxious at the possibility that it might not be.

The factors that inform the extent to which roles are played include identity tourism (their desire to experiment with different genders, races or ages in order to experience these different roles) and their desire for openness or anonymity (the degree to which they are disclosurist). The need or

desire to maintain a persistent identity within the community also plays a part as does the degree of self-consciousness they experience when roleplaying (Järvinen, Heliö and Mäyrä, 2002; 26) .

Since some participants never roleplay at all, we therefore have four levels of adoption of different identities within a virtual environment;

- Those who do not roleplay at all, and who believe that one's offline nominal identity should match their online one.
- Those for whom the online identity is congruent with their self-reflective identity (but which may not match their nominal one). This is also not roleplaying, but may be perceived as deceptive by those from the first category (for example, a transgender male adopting a female avatar).
- Those for whom their online identity when out-of-character is congruent with their real self, but will play roles within designated domains.
- Those for whom the entire online experience is roleplay.

2.4.8 Turing tendency

Another feature of simulacral mediated environments that is not shared by distal mediated environments is that it is possible that the other participants are not actually real people at all, but are computer programs. Participants respond differently to the possibility of avatars in an environment appearing as avatars but being bots, and this may lead to an additional characteristic of participants within the environment, which is here referred to as a turing tendency.

The Turing test was first proposed by Alan Turing in 1950 (Donath, 2000; 300) as a means to determine whether an artificial intelligence was thinking as a human. The essential element of the test was that a person would communicate through text with either a person or a computer, and if it was not possible to distinguish between the two, then the computer could be displaying intelligence.

As stated in the introduction, within simulacral mediated environments, it is possible that not all actors are avatars (i.e. controlled by humans); some may be bots (controlled by computer programs). Participants then must make judgments about the agency of that with which they are interacting. In some studies, bots taking part in online conversations have successfully mimicked human behaviour sufficiently to pass as human for a short while (Murray, 1997; 219-226, Donath,

2000; 302). However, in these examples this only occurred when the chatbot was in a conversation where the human participant could be expected to discuss a limited range of topics, such as a widget salesman or an obsessive sports fan. In these situations, some participants may initially attempt to categorise the bot as a socially inept human, as in this quote from a participant in an online chat who had encountered a bot named Julia:

I was basically patient with her for the first little bit when I first met her. She did have a problem with her social skills which I tried to be sympathetic to. I did, however, try to avoid her after the first couple of encounters when all she did was talk hockey. (Donath, 2000; 304)

Some participants, however, may make an inaccurate categorisation in the other direction. In a study reported by Slater and Steed (2002, 153) a participant:

Formed the belief that the cartoon-like avatars were not embodying real people but were "robots", and as a result she cut down her communication with them. It was only when they laughed ("something a robot cannot do") that she believed they were real.

In the studies by Newman (2007; 98) in which participants were asked to converse with a teddy bear named Albert (actually Newman's research assistant) through a variety of media, several of the participants believed that they were interacting with a computer program.

An unexpected result of the sophistication of this environment was that many of the subjects in this environment initially assumed that they were playing some kind of game and registered surprise when they realised that Albert was responding to them with human intelligence. Typical of this group was Matthew, who immediately became obsessed with trying to work out whether it was a real person or not. His initial assumption was that it was not, but that it was a very good system (Newman, 2007; 98).

Another participant doubted that Albert was a real person because of a pun that the participant used that Newman's research assistant failed to understand, and only gradually became reassured that there was a human at the other end.

It seems from reading the transcripts of these interactions that participants were employing a form of Turing test, to varying degrees of accuracy. These Turing tests differed from that originally proposed by Turing, however, in that the purpose was not to demonstrate that a program had been created that was sophisticated enough to pass as human, but was to determine whether the other participant was human or not. Since during the literature review, no word has been identified that

describes this activity, within the MERM this has been labelled as “turing”. Within this study, therefore, the phrase to “ture” has been coined to describe the act of interrogating the nature of other participants in order to determine whether they are human or artificial. The problematic nature of determining agency in all situations is also the reason why no distinction is made in parts of the mediated environments reference model between feedback given by the platform and responses given by other participants, since making this distinction this might not be accurately made in all circumstances.

Turing is not an activity that participants will undertake in all circumstances, however. Nowak and Biocca (2003; 490) found that whether or not someone interacted with an agent (i.e. an image controlled by a computer) or an avatar (an image controlled by a human) did not affect their feelings of presence within the environment, or their feelings of copresence with the other participant. They relate this to the work of Reeves and Nass (Nowak and Biocca, 2003; 490; Morgan and Morgan, 2007; 334) that “suggest that participants respond to computers socially, or in ways that are similar to their responses to other humans”. This work is also supported by the work of Kiesler, in which it was found that people “keep promises to computer in the same way that they do to real life human beings” (Morgan and Morgan, 2007; 334). The implication of the work by Newman, and Slater and Steed, is that this does not hold true for all participants.

2.4.9 Summary of the “subject” category

The literature that describes the subject of the learning activity has focused on a range of characteristics that govern the relationship between the learners and the features of mediated environments, i.e. their technological nature and the demands the environments specifically make on the user. The literature on these subjects is, however, lacking in tools to determine what these characteristics are. Witmer and Singer (1998; 232 - 235) created questionnaires that attempt to identify some of these characteristics, but not only do these have the problem identified by Sheridan (1992; 121) that “subjective report is the essential basic measurement” but they also assume that participants will understand the concepts being asked about, will report these accurately and that the responses made by participants are really measuring the characteristics they assume they are.

The measurements that focus on the response to the unique elements of the technology may also be overlooking the role that other factors play in experiencing presence that relate to other factors. Personality traits, such as participants' tendency to be inhibited or extrovert, may influence the sense of copresence with other participants. Participants may also respond differently to the learning activities that take place, if the literature on learning styles is accepted. The characteristics of a participant will also have an influence on their identity, which in turn influences their sense of presence inworld. However, personality traits and learning styles too are reliant on subjective reporting and can be highly inaccurate, as the research of Annetta, Klesath and Holmes (2008), described in section 2.3.3, indicates. Identifying correlations between these characteristics and the experience of mediated presence and, consequently, learning in mediated environments is therefore particularly challenging.

2.5 The characteristics of the tools and instruments

2.5.1 Introduction

The category of tools and instruments in activity theory relates to any element that a person brings to bear on the object of the activity. In activity theory this can be the language employed, any tools used, or signs employed. Within this study the tool specific to the experiences being explored are the mediated environment used as a platform for the activity; whether this is webconferencing technology, or a virtual world, every aspect of the activity is mediated via these environments. This section identifies some of the features of the design of mediated environments that may have a bearing on participants' experience.

Where this experience relates specifically to that of presence, or immersion, the technologies can be described as immersive. Immersiveness is the "set of physical properties of the media technology that may give rise to (mediated) presence" (Ijsselstein, 2005:8). So for example, 3D movies may be said to be more immersive than 2D movies because they produce a greater feeling of mediated presence, but it is the *technology* that is immersive, mediated presence is what is experienced by a person as a result of the technology. Despite this distinction, the two are closely

related and “highly immersive systems are likely to engender a high degree of (mediated) presence for the participant” (Ijsselstein, 2005:8).

Sheridan (1992; 120) notes that mediated presence is not a new phenomenon since it is experienced when watching films or reading books. He asks “what do the new technological interfaces add, and how do they affect this sense, beyond the ways in which our imaginations (mental models) have been stimulated by authors and artists for centuries?” Sheridan then answers this question by identifying what he proposes to be the three principal determinants of mediated presence “extent of sensory information, control of relation of sensors to environment and ability to modify environment” (Sheridan, 1992; 121-122). He also suggests combining these latter two into “user interaction” after Zeltzer (Sheridan, 1992; 122).

The experience of other participants within the environment further depends on the available channels of communication and our ability to control those means of communication. Below is a list of elements that have been identified as attributes of mediated environments.

2.5.2 Realness

Steuer (1995; 40), describes the characteristics that give rise to immersiveness as a combination of realness or “vividness” and interactivity (discussed below). “Vividness” is a function of both the range of senses across which the environment carries information (the breadth) and the degree of definition of any of those channels (the depth) (Steuer, 1995; 42). Naimark refers to this same factor as “realness” (Steuer, 1995; 41). Both Naimark and Steuer label the second of these factors as “interactivity”. Steuer further subdivides the types of interaction provided by computer interfaces, and identifies other taxonomies that delineate the aspects of the interface that support vividness or realness.

Biocca (1997) takes issue with Steuer’s concept of vividness, finding it flawed because it defines a feature of the technology through its effect on the person observing it, and so conflates immersion and immersiveness. He prefers to use the term “sensory engagement” i.e. the range and depth of the senses with which a technology is designed to engage. However, this also refers back to the experience of the use, the concept of “perceptual immersion” (described in section 2.2.1), albeit to an aspect of experience that is open to a more objective description.

Ellis (1991; 323) agrees with Biocca in stating that “our sense of physical reality is a construction from the symbolic, geometric, and dynamic information directly presented to our senses”. Our sense of what is real is a combination of what is observed and the interpolations made by processing our observations (Ellis, 1991; 323).

Ellis offers an alternative description of environments and divides their elements into content, geometry and dynamics. These factors, Ellis maintains, are those that determine the successful conveyance of the reality of the environment. Content is a combination of objects and participants (explored later in this section). Geometry is the dimensions of a space and their changing values through time, dynamics are the rules of interaction between the content of the environment (Ellis, 1991; 322). Maintaining a consistent virtual world is essential to maintain the reality of the virtual world. Inconsistency in spatial relationships or behaviour of objects in the virtual environment is one of the factors that can disrupt the experience of flow in participants (Järvinen, Heliö and Mäyrä, 2002; 22 - 23).

Krotoski (2008) also discusses geometry and dynamics to communicate the reality of a virtual world, but instead refers to these in relation to the ideas of proxemics and kinesics. Proxemics usually refers to the spatial relationship between people as a form of semiotics (discussed below) but can also be extended to mean a semiotic reading of everything in a theatrical presentation, the position of stage, scenery etc. Krotoski (2008) furthers this latter use of proxemics to describe the ways in which a virtual world can communicate a variety of meanings; one of these interpretations can be that the space has an integral physical reality, i.e. that objects always maintain the same distance from each other and that space is Euclidean.

In parallel with this extended definition of proxemics, Krotoski also extends the semiotics of movement (that is, kinesics) to the environment. Thus an environment too can convey information through the way it, and objects within it, move. Collision detection, gravity and permanence are all characteristics of a virtual world that are adhering to a physical reality. An environment that has “physics on” will convey a greater realism than one in which the physics is off.

Combining these factors into a single taxonomy suggests realness is divided into:

- Content or sensory engagement, further subdivided into breadth (number of channels) and depth (resolution, fidelity).

- Geometry or environmental proxemics, i.e. the creation of space and the connotation of an integral physical reality.
- Dynamics or environmental kinesics, the adherence to physical laws such as collisions and gravity.

2.5.3 Interactivity

Interactivity is here divided into manipulability, responsiveness and reciprocation.

Manipulability

Manipulability is the extent to which a participant can change the environment, both in terms of the fineness of the changes and the range of elements that can be changed. Dreyfus (2000; 57) states that “What gives us our sense of being in direct touch with reality is that we bring about changes in the world and get perceptual feedback concerning what we have done.”

Manipulability adds to our sense of being within the environment and also supports the extent to which the environment can seem real. The more things we can manipulate (range) and the degree to which we can alter them (fineness) add to this sense of realism. For example, the degree of subtlety in the differences between gestures adds to how real a performance can seem. Gestures within a virtual performance that are all identical appear artificial, since even in a well-rehearsed real life piece there will be individual fluctuations.

Because sometimes the fact that people are doing exactly the same is not quite right. It's those imperfections that make it real. Small little gestures (are) the thing that makes an individual. A little tic. Something. (Interview with Joff Chafer, 13th May 2008)

Reciprocation

Reciprocation is the degree of feedback from the environment about the changes we have made, whether from objects, bots or other users within the environment. When this reciprocation is from other users, it can support the sense of social cohesion reciprocation. Short et al identify “evidence that the other is attending” as a critical feature in the promotion of socially meaningful interaction. (Rourke, et al, 1999, 56).

Responsiveness

Responsiveness is distinct from reciprocation, in that it refers to the speed of the feedback, rather than the degree to which it takes place. Within virtual worlds where the technology will introduce delays in responses (called lag) this will act against sense of copresence with other participants. The importance of responsiveness in enhancing copresence is an effect noted by Wheeler where he lists elements such as access to tutors and the speed of response by them, as well as “paraverbal utterances such as backchannelling and other confirmatory utterances” as all contributing to the sense of connectedness between tutor and student (2007, 111).

In the literature, the use of the word immediacy can sometimes be used to describe the responsiveness of the environment (or of others within the environment), the sense of transparency of the medium between participants and the psychological distance between them (Wheeler, 2007, 111 - 112). This is another example of blurring the division between the characteristics of the environment and the perceptions of the participants of the environment. Within this terminology, the use of the term immediacy is avoided in this context because of this confusion, and replaced by *responsiveness* to describe the technology functions and *copresence* to describe the perceptions of the participants that they are aware of each other. Responsiveness and usability are key elements in promoting the merging of action and awareness that is one of the prerequisites for flow (Järvinen, Heliö and Mäyrä, 2002; 22).

2.5.4 Communication channels

Mediated environments contain a range of different media for communicating. Employing these effectively and being able to switch between them supports the sense of connection between people.

The greater the range of communication channels used, the greater the sense of copresence will be (Becker and Mark, 2002; 29).

Within this conceptual framework these channels have been grouped into those that support *content, expression and self-representation*.

Content

Within most mediated environments, the content of the communication is conveyed through both voice and text, although environments some are text-only.

Expression

Paralinguistics

Expression includes the paralinguistic elements that occur in spoken communication (Farnell, 1999; 351), such as tone and volume (Bailenson, Beall and Turk, 2004; 430) and are important for emotional exchange (Bailenson, Beall and Turk, 2004; 430). Paratextual elements, such as emoticons and typeface stand in for these in text-based communication (Becker and Mark, 2002; 29). Since different emoticons are used in different cultures, these paralinguistic elements constitute an “accent” to text chat, emoticons in Western cultures are read rotated through 270° and use different mouth forms for expression, emoticons in Eastern cultures are not read rotated and use different eye forms to convey expression, for example a western smiley is :-) an eastern one is ^_^ (Popova, 2002).

Kinesics and proxemics

Expressing emotion through gestures and communicating through orientation and position in 3D space are often referred to as kinesics and proxemics, respectively. Kinesics is the study of the “conventionalized vocabularies of gestures/postures” (Farnell, 1999; 351) and analyses how information is conveyed through visible bodily motion. Mehrabian describes the effect of communication behaviours that “enhance closeness to and nonverbal interaction with another” (Rourke et al, 1999; 51) to include “nonverbal cues such as facial expressions, body movements, and eye contact”. Mehrabian’s opinion was that these would “lead to more intense, more affective, more immediate interactions”. Wheeler includes “nodding, smiling and other non-verbal behaviours such as eye contact and gaze” as behaviours that contribute to copresence in face-to-face settings (2007, 111).

Kinesics therefore help to create copresence within mediated environments but are more strongly supported in visual distal environments (such as webconferencing) as opposed to simulacral ones, due to the detail and control of physical movements of physical bodies being greater than that

of avatars (Schroeder's facial as opposed to spatial [2010]). Cheng, Farnham and Stone summarise the role of graphical representation as a communication tool thus:

Graphical environments allow people to communicate non-verbally. Users can express emotions through gestures, and communicate interest and direction of attention through their orientation and position in the 3D space. However, the use of graphical features to communicate non-verbally often interferes with verbal, text communication. (2002; 106).

Other practitioners question the primacy of gestures. For example, a performer with experience of acting in virtual worlds;

When I used to do stuff with masks, the mouth and head never moved as such but people would come up afterwards and had understood exactly what was going on. If you try and do too much it just confuses the issue. I think you have to look at that sense of movement and gestures in terms of a language, and if you're moving and gesturing all the time, it's just a babble. (Interview with Joff Chafer, 13th May 2008)

Social interaction may be further enhanced in virtual environments by selecting which of these non-verbal cues are conveyed, or introducing new non-verbal behaviours, a process called "transformed social interaction" (Bailenson, Beall and Turk, 2004; 429). Examples of transformed social interaction include manipulating the display of an avatar so that all participants see it as maintaining eye contact with them, i.e. non zero sum mutual gaze. This is different from face-to-face conversations in which eye contact can only be maintained with one person at once (zero sum mutual gaze) (Bailenson, Beall and Turk, 2004; 432). In situations where two participants (A and B) have their body movements tracked to inform the motion of avatars A and B, avatar A can have its motions set to follow those of person B instead, resulting in motions that mimic the other person. (Bailenson, Beall and Turk, 2004; 438). Social interactions can also be enhanced by setting an avatar on automatic or setting it to filter out irritating non-verbal behaviours (Bailenson, Beall and Turk, 2004; 434 to 435). In section 2.2.5 it was also noted that some participants feel more comfortable when Mehrabian's "more immediate interactions" are absent (Jakobsson, 2002; 69).

Proxemics concerns the role that space plays in communication. An environment that enables participants to be embodied and contains a spatial dimension therefore provides a means for proxemics to play a part in communication. It is perhaps because of the role that proxemics play in communication that there is an "extent to which a shared space adds to the social component"

(Ijsselsteijn, 2005; 9). This holds for telematic environments as well as virtual, despite Schroeder's facial/spatial distinction, since the separate elements can be positioned to relay information about the relationship between them, through the positioning of, for example, windows on the monitor portraying the mediated environment. This could be the location of different camera images within the display of a telematic environment, or the subdivisions of the display into a person space, in which the participants can interact directly with each other, and a task space, in which collaborative work can be located (Knudsen, 2004; 16).

Self-representation

Information is not only contained in verbal and non-verbal cues, but also the information conveyed through self-representation, such as avatar design. Users report that the avatar they choose to adopt is intended to communicate to other users "like all objects, the artefact of the avatar is located within a system of meanings and values which will have an impact on how it is experienced and received" (Taylor, 2002; 54). Cheng, Farnham and Stone found that:

Most people used the graphic (i.e. design of the avatar) to convey something about their true identity, particularly gender. Others used the information to help identify interesting people to talk to and people to avoid. (2002; 98).

As a communication tool, however, this is open to misinterpretation. As Taylor (2002;56) notes:

The 'understanding' and social context of any given body may turn out to be quite different than that intended by the user. Users may also not anticipate how a particular avatar will be 'read' by the community. Identities and bodies are not constructed in a vacuum but are given meaning, as well as being supported or challenged, in social contexts.

Where the environment uses text only, and ideas about identity are conveyed solely through text, this can also lead to misreading of identity, for example where the text is wrongly read as conforming to a particular stereotype (Tompkins, 2003; 202).

An awareness of the meaning of this avatar design is included in Murray and Sixsmith's notion that embodiment is a function of the sensorial, in that their view of the sensorial body in virtual reality is not limited to the reproduction of sensory input, but also requires accounting for sociocultural, gendered and technological contexts (1999; 315), i.e. the avatar one chooses effects the feel of being embodied in the environment.

2.5.5 Navigation

Navigation through the space is made up of various elements; wayfinding, motion and travel, including motion control of one's viewpoint (Darken and Peterson, 2002; 494; Bowman, 2002; 281), and manoeuvring. Wayfinding is the cognitive element of navigation, an essential part of which "is the development and use of a cognitive map, also called a mental map" (Darken and Peterson, 2002; 494). Motion is the act of movement through the space. Locomotion techniques can be divided into naturalistic (walking, vehicular etc.) or magical (flying, telekinesis, teleportation) (Bowman, 2002; 283). These each separately require the user to learn and practice how to read these elements and manipulate their avatar through interaction with the software and learning these techniques presents another barrier. Manoeuvring is the smaller set of movements such as "changing the orientation or perspective, as in rotating the body or sidestepping" (Darken and Peterson, 2002; 494) and requires the environment to provide information enabling spatial awareness (Bowman, 2002; 282).

2.5.6 Unobtrusiveness and persistence

Obtrusiveness is where the technology "interferes with the user's ability to focus on the task" (Bowman, 2002, p. 282). A completely unobtrusive technology would give the illusion of non-mediation or transparency described by Sas and O'Hare, (2003; 523 - 524). As with other elements of the tools and instruments described in this section, the functioning of the technology is important in maintaining the experience of flow. Interfering with the user's ability to concentrate on the task at hand is one of the factors identified by Järvinen, Heliö and Mäyrä (2002; 24) as disrupting the experience of flow.

Unobtrusiveness is not only a cause of greater feelings of presence, it is also an effect. As Becker and Mark state (2002; 29) "A high degree of presence suggests the illusion that one is directly interacting with another, and the medium becomes less apparent." Obtrusiveness is therefore also a subjective quality of the environment, not an objective description. Murray and Sixsmith (1999; 324) state that "It is only with the transparency of visual, kinesthetic, aural, and other displays that a sense of virtual embodiment can be engendered" but this does not necessarily mean that the

technology has to be unobtrusive for this transparency to occur. They refer to the tool withdrawing “into the architecture of the body”, so that rather than it not being obtrusive, it is instead “not separate, but part of bodily experience”. This process would require the act of appropriation of technology as described earlier in the chapter.

In the pilot study discussed later, two experiences of the technology were remarked on as being important for supporting the experience of telepresence one of these is obtrusiveness of the microphone, the other is the lack of continuity of the connection.

Student A; It was frustrating when the connection hung up and the illusion of being in the same room was broken.

Student A: Passing a microphone around broke the illusion too.

The importance of the persistency of the connection to maintain the feeling of mediated presence is not described in the literature (perhaps because failures in the technology are not as often encountered in specialist technological research as in those by practitioners in a typical university).

2.5.7 Narrative

Narrative within an environment can be the story in a book, or the degree of coherence in CMC chat. In some environments, such as World of Warcraft, players are set specific tasks within a ready-made world. In other environments, such as Second Life, participants create their own roleplay entirely. Newman (2007; 16) notes that “narrative is important for interactive systems because narrative is fundamental to human cognition and understanding” therefore “The designer of interactive systems should take our narrative predisposition into account in the same way the designer of physical tools makes affordances for our opposable thumbs”. However, narrative is also absent from many mediated environments and can be unnecessary (Ralph Schroeder, personal communication, 2008). To varying extents then, the degree of narrative within an environment is brought to the environment by the other participants or to the designers of the environment.

Where narrative is designed in to the environment, Badique *et al* (2002; 1155) divide the elements of the narrative into those that are deterministic, i.e. are not within the control of the user, and those that are causal, i.e. with which the user can interact. The level of the interaction with the

narrative can also be subdivided. If the user can interact with conversations, then s/he can become a participant in the narrative as well as simply a spectator. However, if the storytelling is adaptive, then user-controlled nonlinear storytelling is possible. Badique *et al* (2002; 1157) therefore subdivide causal story telling into:

- *Physical interaction with the world of the narrative.*
- *Conversational interaction with one of the characters, at its simplest level this is a series of decision branches through a series of dialogues, at its most sophisticated this can be information exchange with autonomous agents within the environment.*
- *High level plot alteration. In more complex environments, the entire environment will be altered (e.g. villages and towns prosper or decay) as a direct consequences of one's actions.*

2.5.8 Summary of the “tools and instruments” category

Although the design of mediated environments is a factor in shaping the experience of learners, describing this design is problematic, since factors such as realness, vividness, sensory engagement and unobtrusiveness are all defined in terms of the users' perceptions, which introduces a degree of subjectivity to the description. Although mediated environments vary enormously in their design and their constituent parts, they share the common feature of having a shared space in which the various features can be blended together, so that in combination their impact on the experience of the user is greater than the sum of the individual characteristics. As Newman (2007; 43) notes

Virtual environments capitalize on the biologically innate ability of humans to make sense of physical space and perceptual phenomena. There are complex relationships between the virtual environment's affordances and other experiential factors such as the user's individual characteristics, social experience, and interaction experience, and introducing narrative elements in virtual environments has been found to promote good interplay between user and environment

2.6 The characteristics of the object category

The third of the three factors in Leont'ev's representation of Vygotsky's work is the *object* of the activity, i.e. the task that is acted upon. Identifying specifically what to associate with the “raw material” or “problem space” within these learning experiences is not immediately obvious. Applying Activity Theory helps make explicit the distinction between “problem space” and “activity”. Within the formulation of Engeström (1999; 31) the material set by the teacher and acted upon by

the learner is not, in itself, the activity, the activity is actually the entire process incorporating students, tools, community, and the transformation and moulding of these materials to create an outcome (hopefully the outcome being learning by the student). The material or task set is, within Activity Theory, simply the “object”. However, in the literature, this task is usually referred to as a learning activity. To maintain consistency with the literature, the terms *learning tasks* and *learning activities* will be employed synonymously, and will refer to the tasks the students are set within the learning and teaching sessions, not extrapolate from these to include the learning transformations experienced by the students.

Many different typologies already exist for describing learning tasks, for example the DialogPlus learning activities taxonomy (Conole et al 2005; 31), the Candle pedagogical taxonomy and the 8 Learning Events Model (Conole et al 2005; 13). The taxonomies are extensive and provide an effective means for communicating learning and teaching practice and experience to practitioners (Childs et al, 2007; 3).

A conceptual framework that incorporates these models as well as other models, including Salmon (2004) and Mayes and de Freitas (2004) is the Learning Activities Reference Model (Falconer et al, 2006). This model provides a comprehensive taxonomy of teaching approaches and learning and teaching activities and has therefore been adopted here.

The LARM’s groups teaching approaches into three main categories. These are:

- Associative. Associative approaches are those that set tasks that require the “acquisition of external knowledge or skills” (Falconer et al, 2006; 16). Behaviourism, elaboration theory and instructional design are all examples of associative approaches.
- Cognitive. Cognitive approaches are those which view learning as a development of the learner’s own internal thought processes, and set students tasks requiring them to synthesise knowledge gained from the learning activities they undertake with their existing knowledge (Falconer et al., 2006; 17). Experiential learning, problem-based learning and activity-led learning fall within this category.
- Situative approaches all involve tasks that aim to develop learning through social participation (Falconer et al., 2006, p. 17) and in which knowledge is constructed jointly through discussion

and collaboration (Bromage, 2004; 144). Possibly the earliest form of teaching, apprenticeship, is a situative approach to teaching.

The model identifies particular teaching techniques that correspond to these approaches, and hence learning activities undertaken by students when these techniques are employed, although this is not a precise correspondence.

The range of different activities specific to virtual environments has been catalogued by Scopes (2009) and Ryan (2008). These two authors have identified discrete types of activity including treasure hunts, guided tours, roleplay, simulation and co-creation, all of which make specific uses of the affordances of virtual worlds. Girvan and Savage (forthcoming) identify the types of activity that most suit the affordances of virtual worlds as that of social and communal constructivism, in which learners co-create virtual objects for themselves, other learners in their group and subsequent learners in the environment.

2.7 Rules and conventions informing activity

2.7.1 Introduction

The expansion of the original activity theory model, to place that activity within its setting, included three additional factors that influence the activity and result from activities being collective actions, one of which is the rules and conventions that exist within the group performing the activity. Wenger also included the rules and conventions of a practice as part of his Communities of Practice model, considering how theories of social structure would influence learning in a community (figure 2.4).

It has already been noted that various social codes arise within mediated environments concerning behaviour that act to maximise social presence within these environments (section 2.2.5) and that the employment of particular codes and language, or the display of competences indicate the degree of naturalisation within the environment are markers of social status (section 2.4.2). Below are other factors that may influence the rules and conventions that govern activities within mediated environments and may affect the experience of learners.

2.7.2 Augmentationist versus immersionist

Virtual worlds provide an opportunity for participants to adopt an entirely new identity, through the creation of an avatar of any race, sex or species; an activity known as “identity tourism” (Taylor 2002; 58). However, many users choose to only be themselves, and some express anxiety about the pseudonymity of the environment, a tendency sometimes referred to as “discosurist” by members of the virtual world communities (Amdahl 2007). Bennetsen (2006) observed the two dominant modes in which activities take place within virtual worlds, in his case Second Life. He refers to these two modes as Immersion and Augmentation. These two modes have quite different rules and conventions that govern behaviour within virtual worlds.

When used as an environment for augmentation activities, the virtual world is a platform for conducting real world communication. In this mode, people’s real world identities tend to be known, and there is no sense of roleplay, or adopting the conventions of a separate self-contained space. The rules and conventions within these activities are those of the physical world counterparts.

Participants who conduct immersionist activities, however, emphasise the role-play nature of the environment. Bennetsen notes that they rarely reveal their real life identities, not disclosing personal information within their profile and using text rather than voice to communicate. They see the virtual worlds as a self-contained space separate from the real world.

Overall there is a sense that “What happens in SL stays in SL” ... Your SL and RL identity are two different sides of you that should not mix; indeed the name Second Life more than hints at this. This separation of the two gives you the freedom to live your second life in a way that you might not feel able to do in your first life. (Bennetsen, 2006).

Bennetsen is using the term “immersion” differently than the literature on presence uses it. Immersion there means the “set of physical properties of the media technology that may give rise to (mediated) presence” (Ijsselstein, 2005:8). Bennetsen uses it to mean that someone has taken on the prerequisites for entering the play-sphere, i.e. adopting the behaviours and conventions that exist within it. To differentiate the two, the former will be described as sensory immersion, the latter as ludic immersion.

The concept of the environment as a separate self-contained space has its equivalent in the literature on play and gaming; a seminal work in this field is the book *Homo Ludens* by Johan Huizinga (Rodriguez, 2006). Huizinga’s idea of a play-sphere in which different notions of what is real

and what is not are played out, is part of his idea of a “magic circle” existing as part of a game.

Rodriguez (2006) summarises this argument as:

the consciousness of play as a separate and self-contained sphere is often reinforced by the pervasive tendency to enclose the players within a spatiotemporal frame, the so-called "magic circle", which isolates their game from the more serious tasks of daily living. The separation often consists in a literal physical precinct: a chessboard, ring, arena, field, stadium, stage, altar, etc. There are also sharp temporal boundaries, a clear beginning and an end, which clearly mark the game off as a temporary interruption of ordinary life. The game unfolds within a temporarily closed world. Moreover, the existence of the magic circle is closely related to the existence of artificial rules or conventions that hold only within this enclosure.

This idea of a self-contained space also has parallels in the study of film, in which the world of the film is considered as a self-consistent “story world” or “internal representational world” (de Freitas and Oliver 2006; 252). The diegesis of a game, or film, or roleplay within a mediated environment extends beyond the immediate experience of the participants. Reflecting on the shared diegesis can therefore provide additional opportunities for learning.

In educational contexts, there is a need not only to enter into the ‘other world’ of the game or simulation, but also to be critical about that process in order to support reflective processes of learning as distinct from mere immersion into a virtual space. This ‘double’ identification approach to the game may in part explain why the use of ‘other worlds’ can indeed accelerate learning, allowing the learner to at once participate within the ‘world’ and to reflect upon their relationship when viewed from outside of it” (de Freitas and Oliver 2007; 255)

For example, in the Teatrix virtual world (Machado, Paiva and Prado 2001; 6) children have avatars based on the Little Red Riding Hood story. After roleplaying within the world, the children reflect on the interaction, drawing on their knowledge of the characters’ background and emotions that exist beyond the immediate interaction that took place. This then gives them the opportunity to explore different attitudes and behaviours. Involving students in a ludic immersionist activity may therefore provide a different learning opportunity than providing an augmentationist activity.

2.7.3 Logic of immediacy v the logic of hypermediacy

Activities differ as to the role the technology plays within the activity; whether the technology is part of the rationale for the activity, or simply the means by which the activity is to take place. This

distinction is made in the concepts of immediacy and hypermediacy (Dobson, 2009; 2). Immediacy is used to describe a variety of aspects of mediated environment (as discussed earlier in section 2.5.3). In this context, immediacy is used to describe the lack of perception that technology is being used to mediate the activity. The logic of immediacy when an activity is displayed is that the technology is merely a means to experience the activity, and, ideally it should not be noticeable. In hypermediacy, on the other hand, the medium is always apparent. The logic of hypermediacy is that the medium, too, is part of the experience, and is noticeable and of value. Dobson typifies these as “window through” and “window at” respectively and notes that “total immediacy is never possible because a trace of the media remains, nor is total hypermediacy possible or desirable” and that “these two logics are not necessarily mutually exclusive”. In an act of remediation i.e. placing something within a new medium (Dobson, 2009; 3), an activity can either aim to use the medium to provide a window through to the original activity or make the changes in perception caused by the new medium an integral part of the experience.

To illustrate this distinction using an example from performances in virtual worlds: the troupe of performers known as the Second Life Shakespeare Company (<http://slshakespeare.com/>) perform scenes from plays such as *Hamlet* and *Twelfth Night* within a virtual recreation of The Globe theatre. Although these take place within a virtual world these are traditional performances of Shakespeare’s plays so for the company to achieve their aims the virtual performance has to resemble the real world one. The challenge is to find a means by which the virtual space can be used to accurately remediate the form. Where the technology is intrusive, this detracts from the performance.

However, activities that employ the logic of hypermediacy, for example, the Avatar Repertory Theatre’s performance of *The Tempest*, which is located on an island and in which characters fly and metamorphose using the affordances of the medium, deliberately play with and explore the features of the new environment and are therefore subject to a different set of criteria for success. In these, if the technology is invasive (or fails) then that becomes part of that which is to be explored.

we find some way of mixing the two (real and virtual) together, but without worrying about a particular narrative or whatever, but essentially treating it like a drama game that we play with but is also a technical game at the same time. Interview with Joff Chafer, 13 May 2008

This distinction holds true for telematic performances as well as virtual ones. In a comparison between telematic performance workshops designed specifically for webconferencing, and a performance workshop that originally took place in a face-to-face environment but was being transferred to a videoconferencing medium, Childs and Dempster note:

The telematic performance workshops had an intrinsic advantage over the (originally face-to-face) performance workshop in their suitability for remote delivery. In the telematic workshops, problems with the technology provided different environments in which to explore these relationships, rather than preventing them from occurring. When techniques for running these workshops are employed such as working through disconnections and slowing and simplifying movement to adapt to the slow frame rates, the frustrations with dealing with the limitations of the technology ... are lessened (Childs and Dempster, forthcoming).

Learning activities are subject to very different rules, therefore, depending on whether the medium is there to be looked at, or looked through, i.e. whether the technology is part of that which is to be explored, or a device through which to explore a subject. A learning activity subject to the logic of immediacy can be more demanding, and more prone to failure, than an activity subject to the logic of hypermediacy, since the challenges of the technology can be part of the learning process, rather than impeding it.

2.7.4 Summary of the “rules and conventions” category

The rules and conventions that influence activity in mediated environments are a combination of the influence of community and the influence of the technology. Awareness of social conventions can help students become more accomplished in learning in these environments, for example, a student unaware of the conventions of emoticons may be tempted not to use them, and so limit their social presence, and also feel excluded from conversations. With mediated environments that are public, for example MUDs and virtual worlds, a lack of awareness even that there *are* social conventions specific to those environments may cause conflict. Hostility from those who are resident users of the technology can result from those new users who do not follow the rules and conventions. Resident users draw a distinction between “newbs”, a term for those who are new to an environment but learn the conventions before engaging, and “noobs”, who crassly disregard conventions or are unaware that conventions exist (<http://www.urbandictionary.com/define.php?term=newb>).

For learning activities, it would appear that clarity regarding which conventions apply is important. An activity employing the logic of immediacy could be quite different than one employing the logic of hypermediacy, as would an immersionist activity as opposed to an augmentationist, and consequently not being precise about the nature of the activity may lead to the expectations and experience of the students not being met.

2.8 Community

Another of the categories of collective influence on activity incorporated in the expansion of activity theory is community, and this, of course, is also at the core of Wenger's model of Communities of Practice (Wenger, 1998; 6 – 7). In the case of the experience of learning activities, this community is typically the institution in which it is embedded, for example the department, the university or the subject interest group (Masterman, 2008; 214). Within mediated environments, however, the participants' interaction will have been informed by the social conventions of the communities to which they have been exposed (if they have been). If they have a well-formed online identity, this too may have been informed by the general community standards.

Wenger describes belonging to a community of practice as a learning process in which individuals learn how to engage in and contribute to their community; the community learns to refine its practice (Wenger, 1998; 7). From an analytical point of view, the concept of practice is generic enough to be able to be applied to a range of cases; working within an organisation, functioning within a family, performing together in a play, and Wenger emphasises that learning occurs in all of these situations (Wenger, 1999; 6-8). Within the field of online interaction, this has meant Wenger's model has found applicability in not only looking at learners' interactions within a formal subject-orientated setting, but also to analyse and categorise the social, informal learning that occurs outside of the formal settings. Oliver and Carr (2009), for example, have applied the framework to describe the process by which gamers learn to be members of the community of World of Warcraft.

Central to the communities of practice model is the concept of reification, defined as "the process of giving form to our experience by producing objects that congeal this experience into 'thingness'" (Wenger, 1999; 58). Reification may produce terminology, tools, procedures, systems,

etc., for example this conceptual framework is an attempt at reification. These reified experiences then inform the community identity, and the practice, of the community of practice.

Although, highly important for forming a community of practice, these acts of reification also form a boundary between participants of a community and non-participants. They are thus boundary objects. Other boundary objects can be skills and knowledge, personal narratives, shared experiences, terminology, anything that the community produces and uses to define itself. In order to connect to a community, those outside need to acquire understanding of these boundary objects, and can be helped to do so through a process of brokering i.e. by being introduced to these through a member of the community (Wenger, 1999; 105). A person at this boundary will not experience full participation, due to the length of time it can take to adopt these boundary objects, the communities of practice model refers to this stage as legitimate peripheral participation, one is on the edge, but that status has legitimacy within the community (Wenger, 1999; 100). However, for the newcomer, distinguishing between peripherality (the first stage towards full participation) and marginality (exclusion from participation) is not always easy (Wenger, 1999; 164). For example, when acquiring the skills to function within an online learning environment such as an immersive virtual world, those learners with experience of other environments (for example MMORPGs) may not find those skills directly applicable. However, from their experience of other environments they can distinguish between peripherality and marginality, i.e. they know the inability to move their avatar, or know where to go, is simply part of the normal learning process, whereas other students may be permanently dissuaded from further participation by the difficulties.

Wenger also identifies a range of trajectories of participants through communities. These are:

- Peripheral trajectories; the participant never becomes fully participative.
- Inbound trajectories; newcomers become more and more full members of the community.
- Insider trajectories; even when a full participant, the community continues to change, so one's status is constantly being renegotiated.
- Boundary trajectories; some participants stay at the edge of a community and fulfil the role of brokering between various communities of practice.

- Outbound trajectories; leaving a community also requires a negotiation of identity and relationships with respect to that community (Wenger, 1999; 154 – 155).

Also, of course the community itself is changing, a process Wenger describes as a paradigmatic trajectory. The members renegotiate and re-reify meaning within the community.

Within this study, the communities specific to mediated environments may not be particularly relevant, as the majority of the students will have had little exposure to these communities. The community that may be most relevant to the students will be that community that is based in their institution, and the activities presented to them using these technologies will not entail a change in, or influence from, that community. However, longer term interaction within mediated environments, particularly those public ones in which students may form an online connection with some of those communities may influence their learning.

2.8 Division of labour / roles

The final category identified in the expansion of Activity Theory is that of the division of labour within the activity or, more broadly, the division of roles within the activity. This category informs other categories (a person's role helps define their identity according to role identity theory, for example) but this aspect of Activity Theory relates specifically to what a subject does within that activity, how their assigned task relates to other tasks and how their status within the hierarchy affects their task. Within Wenger's Community of Practice model its nearest equivalent can be found in the association of learning with theories of social structure. As Masterman states (2008; 222) "the division of labour can operate at the macro level, by determining subjects' overall function ... and at the micro level, determining the roles taken by subjects as they work in the problem space." Within a learning activity the division of labour is, at the macro level, teacher, student and sometimes technician, evaluator etc. At the micro level, the roles can alter within a particular learning activity. For example, students may present their work to their peers and thereby take on the role of educator for a period. However, within a mediated environment, where it is common to create a new online identity and not reveal one's offline identity, the roles may not always be clear. This ambiguity "has the potential to unsettle or de-naturalise aspects of our roles (as teacher, learner or

researcher)” (Carr, Oliver & Burn, 2008; 89) which educators may either see as a beneficial development (Carr, Oliver & Burn, 2008; 92) or hazardous, raising “significant issues of trust” (Robert, 2008; 28).

Social structure within mediated environments is also determined by degree of naturalisation of the participants and can be signified by ease of use of the technology, design of avatar and employment of appropriate conventions. This may be different from stratification that occurs in the face-to-face class activities, which could influence the experience for the students.

2.9 Summary of the conceptual framework

The conceptual framework developed from a need to organise the various concepts and systematise the terminology in order to make the process of reviewing the literature more coherent. In putting this framework together, this has enabled the synthesis of two separate models, Activity Theory and Communities of Practice, both of which have informed the study.

The framework attempts to comprehensively combine various aspects of learning activities in mediated environments, using the separate headings provided by Activity Theory and Communities of Practice, and within these identifying relevant typologies, terminologies and concepts. Although relevant literature has been found that expands upon these headline categories, the framework varies in the extent to which these separate categories are developed. Some of these discrepancies will, it is hoped, be amended in future iterations.

The focus for this study is the influence the different aspects related here have on the experience of presence, and therefore (although a link is to be shown) on learning. Not all of these aspects may have an influence on presence, or the influence may not be discoverable from the data collection methods delineated in the following chapter. However, this framework has put in place a structure from which to gather any potential data and organise the subsequent analysis. The conclusions will refer back to the various statements in the literature and attempt to identify areas in which the study confirms or contradicts the literature.

3. Methodology

3.1 Introduction

The study was originally intended to be an investigation of the experience of learners in mediated environments. This was to be across a range of learning activities in order to identify effective teaching practices and was to be structured using the conceptual framework described in the preceding chapter. This was adapted due to limitations in the range of learning activities available to observe, due to the cases being limited to one technological platform (Second Life) and due to the instigation of several larger studies with the same aims. The study then became a more focused exploration of the role of *presence* in learning and the factors that supported presence in mediated environments. The leading research question was “what are learners’ experiences of presence in mediated environments?” and in association with this was “what effect does the experience of presence have on students’ satisfaction with the learning activities?” The selection of presence as the direction in which to focus the study was prompted by the predominance of discussions of presence in the literature, the central role that presence appeared to play in the pilot study and partly from Biocca’s statement that increase in presence is related to higher levels of cognitive performance (1997).

Because the study dealt with students’ perceptions of presence and their perceptions of the educational experience it was an interpretivist study involving both a quantitative aspect, in the form of a questionnaire, and a qualitative aspect, analysing the students’ participation in learning activities, and interview and focus group transcripts.

After the case studies were begun, it became apparent that another aspect, that of the opposition by some students to taking part in the learning activities, was valuable to analyse. This analysis became a second strand of the study. The remainder of this chapter discusses the methodology and methods, the pilot study, and the activities conducted for the five case studies as well as examples of the data.

3.2 Construction of the study

3.2.1 Methodological considerations

As the study deals with learners' perceptions of their experience in mediated environments, particularly their experience of presence and the effectiveness of the learning in which they have taken part, the study is an interpretivist one, and specifically, a phenomenological one i.e. "on the essence or structure of an experience" (Merriam, 1998; 15). Sheridan notes the difficulty in measuring mediated presence since:

it is a mental manifestation, not so amenable to objective physiological definition and measurement. Therefore ... subjective report is the essential basic measurement.
(Sheridan, 1992; 121)

The study as originally proposed was to conduct a series of observations of activities, interviews with students and focus groups in order to explore the experiences of the students . A qualitative methodology has the advantage of:

being the speciality of humans and their organizations. Narratives, accounts and other collections of words are variously described as 'rich', 'full' and 'real' (Robson, 2003; 455)

This methodology was chosen as it was the personal experience of these environments that was under investigation. The aim was to gather as wide a range of experiences as possible and identify possible areas for further exploration.

From the pilot study, the conceptual framework was found to be a useful structure for investigating the experience of the students. Also during the pilot study, the importance of presence was identified as key. This, together with the Biocca's (1997) statement that "forms of presence ... are correlated with higher levels of cognitive performance" led to conducting a questionnaire surveying the degree of presence students experienced, their experiences of the learning activity, and the characteristics of the learner, in order to determine if the students' experiences corroborated Biocca's statement. This would produce quantitative data, but was still interpretivist, since the survey asked about the students' own perceptions of their experiences. In addition to providing a secondary set of data, these two methods of analysis enhanced the internal validity of

the study by providing triangulation (Merriam, 1998: 204). Both the conceptual framework and the questionnaire went through many different versions as the study progressed.

The parallel strand of the study, that of categorising the elements of the students' resistance, used largely the same data as the study collected to explore the students' experience of presence, i.e. the focus groups and interviews, but also incorporated several documents written by students. The categories for this study originated solely through analysing the data (Merriam, 1997; 191) rather than identifying them from the literature. This part of the study was therefore a more 'grounded' approach.

The methodology, therefore, is interpretivist, and uses both quantitative and qualitative methods. The focus of the study and the tools used in the study evolved throughout, in order to respond to findings as they occurred. The methods used are explained in more detail in the following section.

3.2.2 The case studies

The five case studies all use the immersive virtual world Second Life, but have several elements that varied:

- The number of sessions that take place in the virtual world.
- Subject discipline.
- Part of a degree programme or part of extra-curricular activity.
- Students physically located at the same place or distanced from each other.
- The stage in the students' experience of Second Life in which the study takes place, i.e. some were the students' initial session, some occurred after the introduction had taken place.
- The methods and tools used for each of the case studies.
- These variations are shown in tables 3.2 and 3.3 and are expanded upon below.

The case studies all took place over the 2008/09 academic year at a range of institutions. These have been anonymised. Some relevant details of each institution are:

- University of Red is a Russell Group university based in the UK Midlands.

- Green College is a Further Education College in the North East of England that offers undergraduate degrees through association with a nearby university.
- University of Magenta is a new Scottish University.
- University of Blue is a US university based in New England.
- Yellow University is a new university in the North East of England.

In addition a sixth case study was attempted at Cyan University, a Million + University based in the UK Midlands. Some data from this are included within this study.

A pilot study was conducted during the 2006/07 academic year. This pilot study was conducted using webconferencing to link two courses, one in Red University and one in a Dutch University. It was part of a project jointly funded by JISC in the UK and SURF in the Netherlands as part of their StreamTeam programme. Both courses focused on the cultural perspectives of theatre and were taught modules. Sessions took place over a semester and involved a webconference link between the two groups for two hours a week, as well as independent group work conducted between the two cohorts using web 2.0 technologies.

Two of the case studies (those at Green College and at Yellow University) were conducted as part of the Theatron project (Childs et al, 2009). Theatron was a two year project (2007 to 2009), funded by Eduserv and led by King's College London, for which I was hired as an evaluator and project manager. My role in these case studies was as the evaluator of the project, not as a lecturer. The Theatron project involved the creation of twenty theatres from different periods of history, including the Globe Theatre, the Theatre of Epidavros, The Odeion of Agrippa, etc. A range of medieval temporary stages were also created. Five institutions were funded to create performance-based activities within these theatres. At Green College and Yellow University these were extra-curricular activities, the Green College activities were aimed at creating a Commedia dell'Arte performance using the medieval stages, evaluating the effectiveness of Second Life as a medium for performance and analysing the adaptations required to stage performances within it. The preparation took place over several months as a series of two-hour sessions of independent study by the students, facilitated by the group's lecturer. The Yellow University engagement was with the Globe theatre. A series of attempts were made to run sessions aimed at giving students experience

of Shakespeare's plays on the Globe stage. The first attempts at running these sessions within the formal taught sessions had not been successful due to technical issues. The session I evaluated as a case study was a one-off session conducted with paid volunteers in order to test the validity of using Second Life as an educational tool and was conducted face-to-face in an IT suite. Students were given guidance in using Second Life, and then took part in a dramatised reading of the final act of Hamlet, while working out the blocking out of the movements of the avatars on the Globe stage.

The remainder were sessions I ran for colleagues who were interested in holding Second Life sessions with their classes. My role in those cases was as a guest lecturer in an informal capacity brought in to teach on modules that were part of undergraduate or graduate curricula. These are therefore not staged experiments, but intended as authentic learning experiences for students, fulfilling requirements for curricula and learning programmes outside of this study. The Red case study and Blue case study were identified through friends and colleagues who were familiar with my research. The Red case study was part of an undergraduate module taught to second year Theatre and Performance students on the subject of Theatre Design. It consisted of a single, two-hour, face-to-face session. The aims of the session were to give students direct experience of Second Life and to introduce them to some of the potential for theatre design in virtual worlds, and identify some of the issues. The Blue case study was a post-graduate course on human behaviour and human development which was partially delivered face-to-face, partially through the institutions' VLE (BlackBoard) and partially through Second Life. I was present as an observer for the students' second session in Second Life, then as a guest lecturer for their third and fourth sessions. The students were predominantly training to be counsellors. The rationale for using Second Life was that the difficulties and anxieties of being a newcomer to Second Life were analogous to issues adolescents faced in the physical world. By introducing students to these experiences, it would be possible to remind students of many of the issues faced by their clients in the physical world. My sessions were on the role of identity in these virtual worlds in the first of my sessions, and in the second we discussed the issues that their clients may present in the future as a consequence of the clients' experiences of virtual worlds. The transcripts and observations are taken from the students' second and third sessions. These sessions consisted of one hour of presentation and class discussions.

In an attempt to identify additional case studies, various communities and mailbases were emailed in an attempt to find teachers who would be willing for me to show students Second Life or take part in their inworld activities, or for me to act as a free evaluator on their projects in exchange for permission to use the data in the PhD study. This only produced one response, from the University of Magenta, to run a single one hour session on a distanced-delivered course on virtual worlds. The students on this course had seen other virtual worlds, but had no experience of Second Life. My brief was to both show the students Second Life, and also demonstrate the potential of virtual worlds as educational platforms. The session activities were a recapitulation of the Red session, followed by a reflection on the effectiveness of the session as an educational activity.

In all of these cases, therefore, no selection criteria were applied to the inclusion of these as educational activities. In order to obtain as many case studies as possible, and as many data as possible for each case study, an opportunistic approach was taken to both the activities conducted and the evaluation methods applied. The learning goals for these sessions were largely determined by the students' regular lecturer, and on my part with little prior knowledge of the students' abilities or prior learning.

In the Red, Blue and Magenta case studies, participation in the activity was a mandatory part of the course and so participation in the evaluation was optional. Response rates were therefore sometimes low. The Green and Yellow activities were optional for students to participate in and included the evaluation as a mandatory part of participation. Participation rates are listed in table 3.4.

Institutions	Number of previously held sessions	Subject discipline	Part of programme / extra-curricular	Location
Red	0	Theatre Design	Part of programme	Same physical space
Green	8 to 10	Performance	Extracurricular	Same physical space
Magenta	0 (in SL) 2 previous sessions held in other virtual worlds	Study of virtual worlds	Extracurricular	Distanced
Blue	1 induction session, 1 learning session	Human Development	Part of programme	Distanced
Yellow	0	Performance	Extracurricular	Same physical space

Table 3.1 The variation in case studies in main phase of study

Institutions	Observation of session	Transcript of chat logs	Recordings of focus groups	Interviews with students	Version of survey used
Red	X	X	X		1
Green				X	2
Magenta	X	X			3
Blue	X	X		X	3
Yellow	X	X			3

Table 3.2 Methods and tools used in each of the case studies

Institutions	Session mandatory or optional	Evaluation mandatory or optional	Number of participants	Questionnaires completed	Students interviewed
Red	Mandatory	Optional	15	14	0
Green	Optional	Optional	12	6	6 face-to-face
Magenta	Mandatory	Optional	8	5	0
Blue	Mandatory	Optional	19	2	2 via Skype
Yellow	Optional	Mandatory	9	9	0

Table 3.3 Participation rates in case studies

3.2.3 Methods

Questionnaires

The survey went through a revision as the factors that may have contributed to learners' experiences of presence were explored, and the suitability of questions was addressed. The three versions of the questionnaires are provided in the appendices.

Version one of the questionnaire (Appendix A1) presented the learners with a series of statements on:

- Prior experience of technologies
- Prior experience of games.
- Immersive tendency.
- Narrative tendency.
- Roleplay tendency.

The final section of the questionnaire contained questions about their experience of the activity, both the ease with which they managed to navigate using the interface, their experience of different forms of presence and their judgment of the effectiveness of the learning activity.

In the second version of the questionnaire (Appendix A2), questions on immersive tendencies were dropped, as these proved ineffectual at differentiating between students. Instead, questions were asked that were aimed at identifying the students' tendencies towards risk-taking, as this was suggested by Michael Hammond (personal communication, 2009) as a possible factor leading to differences in the acceptance of technology. Questions were also asked of the students' experiences of text-based communication and face-to-face communication, as introversion/extroversion was a factor raised by the students in the Green case study as affecting their interaction with the environment.

The third version of the questionnaire (Appendix A3) altered one question to reflect the statements being made by the students' displaying resistance to those of virtual worlds, specifically the value of imaginary worlds. Two of the statements on roleplaying were replaced by questions relating to attitudes to the roles of games in education. The third version was administered online to the third and fourth case studies and on paper in the fifth case study.

Qualitative study of students' experiences

The qualitative study of the role of presence in learning used three sources of data. One of these sources was the transcripts of the teaching sessions. The activities took place using mainly text and this chat text was logged. These transcripts are reproduced within the thesis as typed, with all the typographical errors, spelling mistakes and textspeak retained, in order to convey as accurately as possible the language of the students. These errors have not been given accompanying “*sic*”s, since these would be so frequent it would disrupt the text. Where possible, recordings were made by capturing the images appearing on one of the computer screens. These screen recordings also captured audio taking place in the classroom. Transcripts were produced of these recordings. Observations of the activities in class (both the activities of the students in the physical room and the avatars in the virtual spaces) were also noted.

A second source of data was recordings of interviews conducted with students. The interviews were semi-structured interviews; questions were drawn from six of the eight main categories of the conceptual framework (rules and conventions and division of labour were omitted since at that point these categories were underdeveloped in the conceptual framework) and were modified *ad hoc* so that they fitted naturally into the conversation. These were preceded by an opening generic question on what activities they had carried out in the environment (Appendix B). Follow-up questions to these were to add extra detail or clarification, or were in response to information offered by the students. The form the interviews took therefore differed from student to student.

A third source of data was a focus group conducted with the students in the first case study. A video recording was made of this focus group and was transcribed.

Qualitative study of students' resistance

An aspect of the students' responses to the activities was the strong degree of disapproval of, and resistance to, the use of virtual worlds in their education. The sources of data for this were in the form of emails and written documents from students objecting to taking part in, or refusing to take part in, the scheduled activities (although still agreeing to have their comments used in this research). Other evidence came from revisiting the transcripts of focus groups and interviews already gathered.

3.2.4 Data analysis methods

Quantitative data of learners' experiences of virtual worlds

The quantitative data gathered from the questionnaires are contained in the appendices and the analysis is contained in section 5.1. When analysing the set of quantitative data from the first case study, it was noted that those students who tended to confirm that they had experienced presence tended to also be those students who claimed to find the learning activity useful, and those who reported few experiences of presence reported dissatisfaction with the learning activity. In order to analyse the correspondence between these two factors, the students were grouped across two dimensions, dissatisfaction/satisfaction with learning activity and experience/lack of experience of presence. In order to create the groupings, marks were assigned to the four statements to which students responded regarding their experience of the learning activity, these statements were:

- I felt I learnt something about the theatrical spaces.
- It was a fun experience.
- I'd like to try it again.
- I couldn't see the point of it.

Giving a mark of 1 to the first three statements if agreed with and 1 to the fourth statement if disagreed with would indicate the most satisfied students. Students were scored 0 for each of the responses that were opposite to those above and students that ticked the dividing line between the "yes" and "no" boxes were scored 0.5. These were then divided into two groups according to the scores they gave the activity; the criterion for dividing the groups was chosen to give as equal a division between these two groups as possible. Grouping those students who gave a total of 3 or 4 marks for these questions as "satisfied" and those who gave 0, 1, or 2 as "dissatisfied" gave groups of nine satisfied students and five dissatisfied ones for those students in the first case study.

In order to ascertain whether there was a correlation between this and experience of presence the responses to the statements on presence were also given marks. These statements were:

- I just felt too detached from the space.
- I didn't feel like I could relate to my avatar.

- I felt like I was there.
- I felt like I was sharing a space with other people in the virtual world.

Responses were scored 1 for a “no” for the first two statements and 1 for a “yes” for the latter two statements. This resulted in scores of 0 to 4 for each respondent. Respondents with scores of 2 to 4 were classified as high presence; those with 0 or 1 as low presence. These divisions also were chosen to give as evenly a distributed grouping as possible (i.e. a division of eight students with high presence and six students with low presence) in the first case study. This initial analysis gave groupings as shown in table 3.1, shown here because, although these are findings, these informed the methodology of the overall study.

	High presence (2-4)	Low presence (0-1)
Satisfied (3-4)	8	1
Dissatisfied (0-2)	0	5

Table 3.4:
Preliminary
groupings of
students from
first case study

Although these numbers were too small to provide a legitimate chi squared test (John Goodband, personal correspondence, 2008) when a chi squared test was conducted in order to indicate whether there may be some correlation between these variables, a p value of less than 0.001 was produced. This suggested a strong enough correlation to adopt this as a data analysis method. The numbers of students were too small to do any legitimate statistical analyses comparing satisfaction with presence for separate case studies. However, when added together, this gave a total of 35 respondents across all five case studies. The result of this analysis is given in section 5.2.

The data from the remaining statements in the questionnaires were also grouped into these two categories of satisfied students (scoring 3 or 4) and dissatisfied (scoring 0, 1 or 2) and differences identified between these two groups. The questionnaire was modified twice during the study and the breakdown of responses for each version, divided into satisfied and dissatisfied groups, are also given in section 5.2.

Qualitative data of learners' experience of virtual worlds

The qualitative data on the student experience were obtained by going through transcripts of sessions, focus groups and interviews and coding the data. These codes were revised using a constant comparative method; the transcripts were then recoded according to these revised codes. The codes were then grouped into common themes to form categories and subcategories and the relevant quotes against these codes were placed within these groupings. This process was conducted separately in each of the "primary" case studies (i.e. Red, Green and Blue) to form a different "grounded" set of categories for each case study. The remaining case studies (Magenta and Yellow) did not produce enough data to justify this process. These data are presented in sections 4.2 to 4.6.

The data from these case studies were then drawn together and analysed in a cross-case synthesis (as described in Yin [2003; 133-134]) using the categories from the conceptual framework. Correspondences and differences between case studies and with the literature were noted. Other factors, not in the framework, such as the students' difficulties with articulating aspects of the experience were also identified and included. This synthesis is presented in section 5.3.

Qualitative data of learners' resistance to virtual worlds

The data for the analysis of the resistance of students, where this is derived from data collected in the case studies, are included in the relevant case studies. Other data, obtained from students who would not take part in case studies, or from planned learning activities that were only partially completed, are given in section 5.4, where these data are analysed.

For the first case study, these data were analysed by coding the data from the focus group. Codes were assigned based around whether the statement was positive or negative with respect to the virtual world, then a constant comparative method was used to develop subsidiary categories within these groupings that included all the data, but were distinct (Merriam, 1998; 18). These are shown in table 4.2. From this initial analysis two groups of categories of student resistance were identified, a value-based one concerning the appropriateness of virtual experience, and an experiential one concerning the experience of presence, which also manifested itself in an opinion about design.

Further sets of responses of resistance were analysed with respect to these. Where the existing categories did not describe these responses, the constant comparative method was used to add additional categories. In total, three additional categories were added throughout the study.

3.2.5 Validity and reliability of the study

This is a case-study based enquiry in that it “investigates a contemporary phenomenon within its real-life context” (Yin, 2003, p.13). A multiple case study approach was chosen with the unit of analysis (Yin, 2003; 22-23) for each case being a single activity, or short sequence of learning activities, undertaken by a fixed cohort of students. These cases were treated separately to enable comparisons to be made between cases, both by repeating the same learning activity with different groups, and by attempting different learning activities. It was also hoped to analyse how the experiences of learners differed for those that had been engaged in the mediated environments for a short time and those who had more exposure. Merriam (1998; 40) states that “the inclusion of multiple case studies is ... a common strategy for enhancing the external validity or generalizability of your findings”. Treating each individual learning activity as a separate case also enabled interim analyses and findings to be made during the study. These analyses fed back into the design of the qualitative and quantitative tools during the study, changed the focus of the study and prompted the parallel investigation of students’ resistance.

The multiple case studies offered some variety, there were three different subject disciplines amongst the case studies (drama, counselling and technology) and the students had different degrees of experience of virtual worlds in an educational context (none, three to four hours, eight to ten hours). The observations of students in three case studies with no previous experience of the virtual world enabled literal replication to be conducted (Yin, 2003; 47). A framework proposing the idea of progressive presence was developed after the first case study, which was then used to predict the experiences of students that had spent more time in virtual worlds (i.e. a theoretical replication [Yin, 2003; 47]). A major revision of the framework incorporated the concept of virtual body image and virtual body schema, and this was used to incorporate the findings of the fourth case study. Therefore, although the cases could not be planned or selected to fulfil the replication approach for multiple case studies (Yin, 2003; 50) in effect they did conform to the replication model

to some extent. A larger number of cases with students with longer term experience of the virtual worlds would have been required to fully conform to this approach, but could not take place due to insufficient availability of cases with more experienced students.

Of the five case studies, the Red, Magenta and Blue studies were a mandatory part of the course, so there was no selection of participants. However, for these sessions, involvement in the evaluation was optional, due to the ethical constraints on the research study. This may have led to a response bias in the data. In one of these three cases (Red) the response rate for the questionnaire was high (14 responses out of 15 participants), so has more reliability. Of the two remaining cases, participation was optional; these were set up as extra-curricular activities, so the sessions ran with self-selected participants.

Internal validity

The study is interpretivist throughout. Most of the data come from the students' perceptions of their experience, and are reliant on their ability to articulate those experiences and to do so accurately. The remainder are observations of the sessions.

Elements intended to improve the degree of internal validity of the study include the development of a conceptual framework to systematise the process of gathering and analysing the data. This enables points of correspondence with the literature and with other data to be identified and organised. The use of conceptual frameworks has the disadvantage, however, of being self-fulfilling, in that the data that fit within it will be recognised, and that which does not will be excluded (Smyth, 2004). The internal validity of the study is also reinforced by conducting both a qualitative and a quantitative element. This provides triangulation, particularly on the role of presence in the experience of learning (Merriam, 1998; 204).

The process of developing categories of resistance through a grounded approach also has limitations in its validity in that "the category scheme does not tell the whole story" (Merriam, 1998; 188). The validity of these categories is given more validity through linking the categories together in "a meaningful way" (Merriam, 1998; 188) and by identifying the equivalents to these categories in the literature. The models developed offer an interpretation of factors that may influence learning in these environments; but these models need to be further tested in the future and there may well be

alternative explanations to the observations. More cases and more data are required to provide greater validity.

Reliability

Reliability of the findings is demonstrated by employing a replication approach across the case studies (Yin, 2003; 46). Similar questions were asked both in the qualitative and the quantitative studies in each study and the data gathering methods were repeated as much as possible. The case studies differed in the subject disciplines involved, the universities at which they were conducted, and whether the students had self-selected themselves to be part of the study. These differences meant that the numerical breakdown of different responses varied (for example the proportion of students who were dissatisfied with the learning experience), but the nature and range of the experiences were repeated across the case studies.

External validity

External validity, or generalisability, is the degree to which the findings of a study can be generalised to other situations (Merriam, 1998; 207). The conceptual framework could be applied to a range of different activities using mediated environments, since the main categories draw on two models (Activity Theory and Communities of Practice) that are themselves applied in a range of situations, although details may change in different environments, for example the role of identity may not be as strong in environments that are distal rather than simulacral.

Originally the aim of the study was to examine experiences across a variety of mediated environments. Due to a lack of available opportunities for case studies, a case study employing telepresence was only available for the pilot study, and for the main study only cases employing a single virtual worlds platform (Second Life) were available. This limits the demonstration of external validity across different platforms and hence, although the conceptual framework is applicable to mediated environments, the conclusions made are only applied to virtual worlds.

The experiences of students when first exposed to Second Life remained consistent across the cases, and this indicates that these are generalisable to other cases involving the initial sessions of students in Second Life. The functionality of most virtual worlds have, by definition, the same

essential elements (navigation, creation of an avatar, communication, etc.) and the experiences of using Second Life in this study are therefore likely to be similar in the use of other virtual worlds too.

The experiences of those students with longer term involvement with a virtual world may have not been shown to be generalisable, since these were not replicated within the study. Different subject disciplines or different student cohorts may lead to different results. The general applicability of the final model developed is therefore conjectural when the effect of longer term involvement in virtual worlds is considered.

3.3 Ethical considerations

3.3.1 Risk to students

In webconferencing, the technology links one site to another in a bounded and managed environment. In virtual worlds the learning takes place in a larger social networking environment in which a range of cultures and communities, with a range of behaviours, interact. Bringing students into these worlds therefore runs the risk of exposing students to these behaviours, and also in exposing members of that world to students, some of whom may not be aware of the rules and conventions of that space. Although the learning activities took place largely within educational areas, part of the ethics of teaching within these environments is to inform students of the potential for being exposed to people other than the students on their course, and for their responsibilities with regard to the people they may meet there. The participants in virtual worlds assume different sets of social rules depending on whether they see the world as a social one with real relationships and a sense of embodiment, or whether they see it as simply a game-space with no consequences (Ryan and Childs, forthcoming). This can lead to experiences of grieving and abuse, perhaps without the abusers being aware that their behaviour may be seen as such.

Other ethical issues are caused by the illusory nature of virtual worlds. Pasquinelli (2010; 201) states that exposing people to the illusion of non-mediation (i.e. virtual presence) and the illusion of being in the virtual world (i.e. embodiment) is ethically problematic in that one is exposing participants to something illusory and therefore intrinsically deceptive.

Grimes et al (2010; 79) also list the “psychological importance and emotional attachment to virtual objects” as an important ethical consideration, for example the identity a student may have built around their avatar, and its appearance and social connections, may have become important to them. There therefore needs to be provision for the student to retain their avatar and any objects acquired for their avatar at the end of the learning activity.

These factors, however, only emerged during the study as elements to be considered and were not included in the original ethical considerations. The area in which this research did require ethical consideration was in regard to the privacy of the participants in the research. In the ethical guidelines published by BERA (2006) the section on privacy states:

The confidential and anonymous treatment of participants’ data is considered the norm for the conduct of research. Researchers must recognize the participants’ entitlement to privacy and accord them their rights to confidentiality and anonymity (BERA, 2006, 8)

Grimes et al (2010; 79) add to this by drawing attention to the “Importance of privacy, confidentiality, anonymity and reputation of users *and their avatars*”, i.e. that a research subject’s online identity requires the same due consideration as their offline one.

However, ethical behaviour also requires that any data be properly attributed to their source, for example, the Association for Institutional Researchers Guidelines (2002) state:

The institutional researcher shall ... follow scholarly norms in the attribution of ideas, methods, and expression and in the sources of data. (Association for Institutional Research, 2002, 2)

These two statements are not in conflict in the real world, since a conversation, or an interview, is not usually public and the content is not considered to have been published. However, within a chat room or discussion board, the divide between personal conversation and public document is blurred, or non-existent, and this holds true for virtual worlds due to the “inconsistencies in the classification of public and private spaces in virtual worlds” (Grimes, et al, 2010; 79).

The decision was to anonymise all the data, and to inform the students that this would be the case. Students were given a consent form to sign, identifying that the data would be used in the form of short quotes from transcripts for the PhD, for evaluation of the Theatron project (where this was applicable) and in any other publications and presentations. Names were removed from all

quotes and replaced by a letter plus the anonymised name of the institution. This anonymisation was also carried out for students' personal avatar names. An ethical approval form was submitted to the Warwick Institute of Education as part of the upgrade process.

3.3.2 Risk to learning

The deployment of virtual worlds in higher education is subject to many barriers, due to lack of reliability of the platform itself, the low specification and lack of availability of computer equipment in many universities and the time taken for students to become accustomed to using the interface. This means that the risk associated with conducting learning in these environments is sufficient that the lecturers participating in this study did not want students' degrees to be adversely affected if the technology could not be implemented effectively or if the environment proved to be one that was not effective for learning. To minimise these risks, sessions were either conducted as extra-curricular activities (the Yellow and Green case studies) or were very few sessions thereby reducing the risk to the overall learning goals if the virtual worlds sessions were not effective (the Blue, Magenta and Red case studies). Pasquinelli (2010; 209) identifies a further risk to learning, which is that the learning activities may not be treated as serious academic activities because they are taking place within a virtual environment, with a consequence of undermining the students' ability to learn.

3.3.3 Risk to inworld communities

Grimes et al (2010; 79) also list "respect for the virtual world and the preservation of the social ecology" as an ethical consideration. Online social worlds have community groups that may be affected by students appearing within their spaces, particularly if those students are not aware of the social conventions that exist. Grimes et al therefore recommend that:

researchers should participate in the virtual world they wish to study to increase and encourage researcher's empathy and understanding of users and their experiences (2010; 88).

The study also anticipated some of the problems that may have occurred through the students' activities while in the virtual world. Students were monitored at all times and private instant messages were sent to virtual world residents with whom the students came in contact explaining

that a class was exploring that part of the virtual world. When the lag in sims became too great because of the number of students present, activities were curtailed to reduce interference with residents' activities.

3.4 Pilot study

3.4.1 Background

The intention of conducting a pilot study was to identify whether the basic premise of the study, that the conceptual framework would form a systematic basis for gathering data about the experience of mediated environments, was feasible. It was also to take the opportunity to identify any particular issues that would be valuable to follow in more depth, or would form a particular barrier to the investigation.

The case used in the pilot study was a module run during the autumn term of 2006, simultaneously at the University of Red and a Dutch university. The subject of the module was an intercultural analysis of post-dramatic theatre, the cultures being British and Dutch theatre. The sessions were co-taught between two lecturers in the Netherlands and one in the UK and consisted of weekly sessions of two hours each conducted via a webconference. There were eight students at the Dutch end and seven at the UK end. Students and staff also stayed in contact via a course blog and forum.

3.4.2 Methodology

Direct observations were made of the sessions. After the completion of the module a series of open-ended questions, based on the conceptual framework, were employed in an interview with the Red lecturer and, in a separate focus group, three of the Red students. The three students formed a self-selected sample and were therefore not representative.

3.4.3 Experience of telepresence

The webconferences were conducted over the Internet and used Macromedia Breeze (now renamed Adobe connect) as their platform. The video elements consisted of two digital cameras at both ends.

Breeze allowed several camera images to be run at once, as well as several chat boxes and also applications such as PowerPoint. Each one of these appears in a separate window, and these windows can then be positioned on the monitor of the computer. The image from the monitor was then projected onto the wall of the teaching room. The various windows and their role within communication are displayed in figures 3.1 and 3.2.

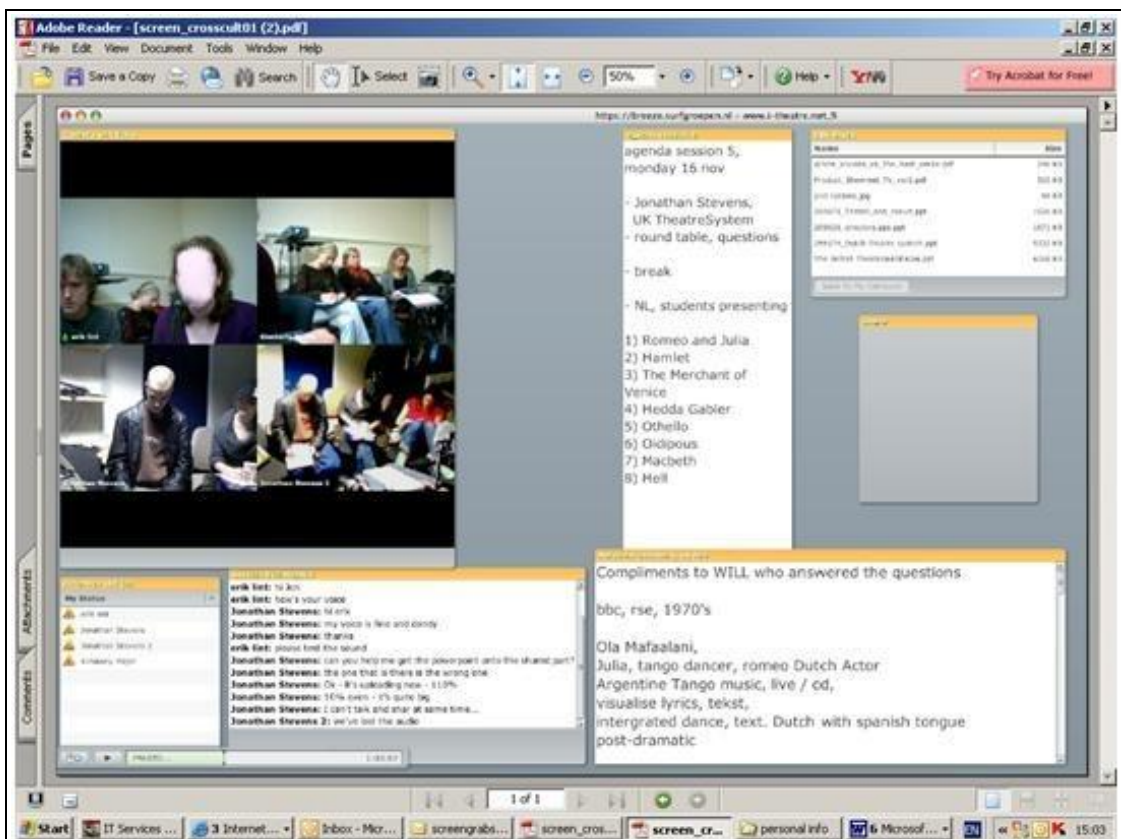
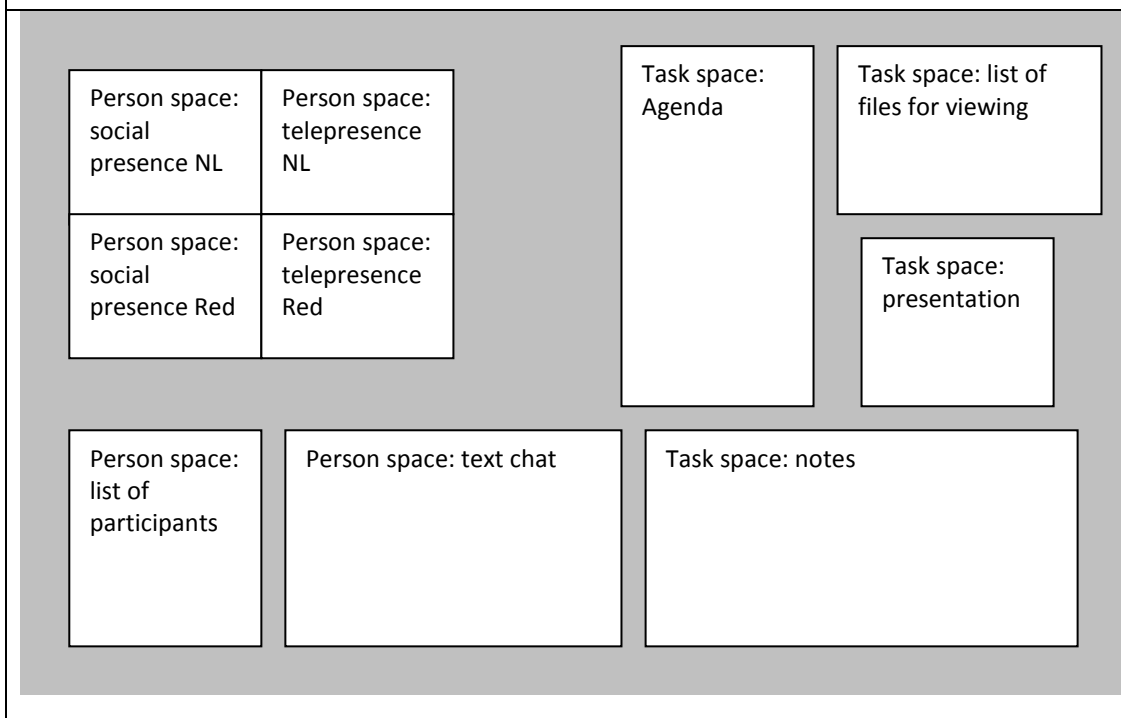


Figure 3.1 (above) the telematic space as it appeared. Screenshot courtesy of Erik Lint.

Figure 3.2 (below) The telematic space with the function of each window explained using Knudsen's categories.



The usual set-up of the Breeze interface chosen for the sessions was to have two camera images of the Amsterdam end, two images of the Red end, a chat box for recording notes for the session, a chat box for dialogue and a PowerPoint window. As with many telematic spaces, therefore, it was subdivided into a person space, in which the participants can interact directly with each other and create social and copresence, and a task space, in which collaborative work can be located (Knudsen, 2004; 16) (see section 2.5.4).

The camera images at both ends consisted of:

- A long-shot establishing the relative position of the various people in the room.
- Either a close-up of the person talking at that moment, or a medium shot of that person plus

the person to their immediate left and/or right, depending on the distance from the camera:

Lecturer: We decided that we needed two cameras – one that gives a general and another of close-up specific students. If we hadn't had that in both venues, I'm fairly sure that the students would have felt much more distanced from their peers on the other side of the water.

Mark: Why?

Lecturer: Because with the wide-shot, you see the various people; the room, the reality. Then if the close-up of the person doing the speaking, you can see their face, their smile.

Interview with Lecturer.

A means to achieve this sense of telepresence is to make it more real. Displaying the entire space at the other end is more real because the viewer has a sense of the spatial reality of the remote site, i.e. it

sets up an environment in which students have a spatial verisimilitude. They can occupy a space that is twice the size that it is, as the other half is on the camera. Anyone who is involved in video conferencing generally; I hope that that's what they'd believe. And as for performance studies, that is important. Bodies and space are assigned a role that is accessible and mutually workable.

Interview with Lecturer.

There were flaws in the hardware that undermined the telepresence experienced by the participants, indicating that telepresence is easily broken:

Student A; It was frustrating when the connection hung up and the illusion of being in the same room was broken.

Student A: Passing a microphone around broke the illusion too.

Telepresence is thus related to the spatial representation in the layout of the images on the screen and to obtrusiveness in the use of the microphone.

3.4.4 Experience of social presence

The second camera image supported social presence within the telematic environment by providing a close-up on the students' faces. Social presence in distanced communication is often constrained due to the lack of the non-verbal cues that help to convey meaning. This misunderstanding in telematic communication is more likely when one set of participants is not using their first language, since the verbal cues are more open to misinterpretation. Therefore when communicating across languages as well as sites, conveying the non-verbal cues is extremely valuable, for example:

Lecturer: The Dutch, sometimes with exhilaration, manage to state things in a fairly jarring way. I don't say that it's 'crikey what have I done wrong?' But you have to ---

Mark: There's a directness if it's not your home language. You can't do the general fluffiness that you sort of wrap around things.

Lecturer: One Dutch student said "I don't agree with you," quite sharply. You could see their smile and eyes as they said it. (So) we're not kind of in an awkward situation. Seeing who you are talking to brings it into a more rational sphere."

Since the students were Theatre Studies students, it could be expected that they would have fewer problems in projecting themselves through the medium than other students might, due to their performance experience. Some students did see the communication as a performance activity:

Student C: To be on camera for two hours is a bit disconcerting because you feel like you're performing but you're not.

As the lecturer interviewed noted:

They all got the camera the first time stuck in their faces and went "augh." But afterwards, it was okay ... generally, they are theatre studies students and so they are extroverts. More so than introverts. It wasn't a problem. Some kind of didn't want the camera in the face as they hadn't done the reading and had nothing to say. But I presume that the camera didn't make them more self-conscious than usual.

It was observed, however, that some participants projected themselves socially and emotionally more than others.

Student B: Any student who runs up to the camera with a sock puppet you're going to remember.

Theorising about what aspects enable social presence to a greater degree was found to be difficult for the respondents but one comment was:

Student B: If you can just have fun with something. It's difficult in a very academic strict controlled environment to do that thing, but just being able to go off topic or to make a joke, that enabled someone to make a presence.

This links to the findings of Rourke et al, (1999, 52-53) concerning the same social cohesive properties of off-topic communications in text-based communication. It seems probable that these off-topic communications would have a similar role to play in telematic exchanges.

3.4.5 Supporting copresence

The most difficult aspect of using Breeze as a videoconferencing platform is its inability to support two-way audio. The system requires the person speaking to press down a button on the interface in order to talk to the other end. While the button is depressed, the other end cannot over-ride the control, so must wait for the button to be turned off to respond. In addition, the software has no echo-cancellation, so if one speaks, one's voice emerges from the speakers at the other end, which is then picked up by the microphone at the other end, and fed back through the speakers at the near end. The result is one's own voice fed back with a split-second delay, making speaking very difficult to continue.

Workarounds were employed to overcome these constraints. To overcome the lack of echo-cancellation, the speakers at the end with the microphone on were turned off. This also meant that people at the other end could not interrupt to ask a question or to let those speaking know if they couldn't be heard. To overcome this, two different workarounds were employed, the chat box was used as a backchannel and questions were typed into it as they arose and a series of hand gestures were developed to communicate with varying success.

Mark: Were there particular gestures that worked?

Lecturer: Well there was the hand cutting across the neck and I was like, are you trying to kill me or ...? The hand to the ear, that means "I can't hear you." Two hands cupped

*to the ear means I haven't heard anything for five minutes so I've just been chilling out!
Big friendly waves, thumbs up to show it's working. All these kind of hand gestures.*

This was a finding of Becker and Mark (2002; 33) in which they found that social conventions were created that had the effect of maximising the degree of copresence experienced within an environment. Despite the inability to have two-way audio, Breeze did support communication well enough for successful exchanges to occur during the discussions.

Webconferencing was said by the students to support discussions better than it did lectures. Lectures were held to be only adequate if held face-to-face whereas discussions held over the webconference medium worked well.

Student A: If they're in the same room they have a presence and you can look at them and read their lips. There's something about lectures that is quintessentially ..."

Student C: It's got to be in the same room. It's not just visual it's being in the same room with someone.

Student A: It's different in a discussion, because there are points you remember. With a lecture where it's just [speaks in a declamatory manner] me delivering what I've got to say now and I'm not going to stop because that's not a lecture you just deliver what you've got to say and there are questions at the end questions at the end and it's [ends declamatory manner] it's just hypnotic.

Student A: It's different being in a seminar. The discursive element seems easier because it's interactive. Without the element of interaction, when it's just a lecture that's being delivered rather than a discussion, then there is a tendency to switch off. I found it very difficult to follow.

Previous research, for example Childs and Dempster (2003), suggests that the limiting factor with teaching through webconferencing is the usually poor backchannel properties of the interface, i.e. while teaching it is often difficult to see, and sometimes impossible to hear, the audience. For this reason, a standard recommendation is for lecturers to frequently stop and actively elicit feedback. When this technique was described to the students the response was:

Student A: That's what I mean. That's a very good idea actually. If the lecture had been broken down into say five topics and at the end of each topic we had paused and had a brief discussion now and from both sides we'd asked questions then we would probably have made more sense of it.

It seems, therefore, that discussions through webconferencing are easier to follow *because* they are interactive and the lack of physical presence of other participants is therefore not as much of a

problem. In lectures, if they are not interactive, then the lack of physical presence of the lecturers will be a problem. In terms of the categories of experience, this could be explained as the social presence of the participants reinforcing the creation of copresence, and this copresence then reinforcing the participants' social presence, represented in figure 3.3.

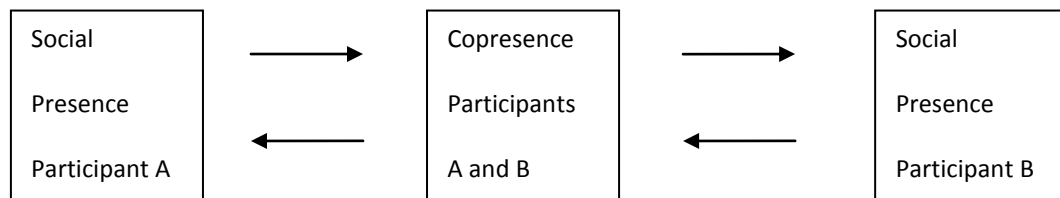


Figure 3.3: Relationship between social presence and copresence of participants

That is, if one is delivering a lecture, then fostering an experience of interaction and involvement amongst the students will make them feel more engaged and hence have more social presence themselves. They will then feel they are together, with the lecturer, in the same space. This will then be an effective means to enhance the lecturer's social presence. In short, letting people talk is the most effective way to get them to listen to you.

3.4.6 Missing bodies: the elements participants did not discuss

Certain aspects of the model, the role of narrative, embodiment and identity were not raised by the participants. Narrative and identity are more aspects of virtual environments, in which pseudonymity and storytelling can play a role. However, the literature on telematic environments contains many references to embodiment and they indicate that this is a key part of the experience. In this study none of the respondents reported this experience despite the lecturer considering embodiment in the construction of the telematic environment.

as for performance studies, that is important. Bodies and space are assigned a role that is accessible and mutually workable.
Interview with Lecturer.

This discrepancy may be because of the small sample size. However, it may also be because of the difficulties in articulating, or even conceptualising, embodiment. A consideration for conducting

future evaluations was that some theoretical background to mediated environments may be required in order to give the respondents the language for describing their experiences.

3.4.7 Lessons learned for main study

The pilot study revealed the following important factors for the main part of the PhD study.

- The conceptual framework, as it stood at that point in the development of the thesis, was an effective tool for organising the various factors that influenced the learning activities of the students. Although the interconnectedness of the various elements led to a degree of repetition in the gathering and analysis of the data, the framework did enable the various aspects to be covered, and those new elements that were revealed from the interviews that were had not been found in the literature at that point (the importance of unobtrusiveness and persistence) were easily identified and incorporated.
- Presence played a central role in the experience of the learners. The aspects of the activities that supported copresence more effectively were felt to be the more rewarding and engaging parts. The students felt that a stronger experience of copresence supported their learning more effectively.
- Describing the nature of the experience in terms of telepresence, social presence and copresence corresponded closely with the descriptions of the experiences of the participants. These concepts also provided a model for explaining why some aspects of the experience were successful and others less so. The need to promote copresence in order to reinforce the lecturers' social presence (and therefore the learning that can take place) indicated that the model would have a practical role in suggesting techniques for learning and teaching in telematic environments.
- Learning design had more influence on the experience of presence than technological design. The students focused on teaching style as an important element, and spoke very little about the design of the software.
- The difficulties in articulating elements of the experience. Students did not mention the experience of embodiment, although this figures strongly in the literature.

As a result of these observations, the main study continued to employ the conceptual framework (although modified as more literature was read) but the study focused more on the role of presence in the experience of learning. In the interviews students were asked more about their experience of presence and the questionnaire was designed with statements exploring the experience of the various forms of presence, together with the degree to which they found the learning activity rewarding.

It was decided not to explain the various concepts of presence and embodiment to students before interviews, but to identify questions that could elicit feedback about these experiences, such as feelings of connection with the image on the screen, or the world on the screen, and senses of being there or being with other people.

The pilot study therefore fulfilled an important part of the preparation for the main study, as it identified research areas on which to focus, and some of the issues with the methods adopted. This was instrumental in directing the case studies from the main study. These are described in the following chapter, together with the qualitative data obtained from them.

4 Case studies

4.1 Introduction

The case studies described in this section were all conducted in the immersive virtual world Second Life, during the 2008/09 academic year at five different institutions. Three of these case studies (Red, Magenta and Yellow) were introductory sessions for the students; the students in the Blue case study had had two previous sessions using Second Life and the students in the Green case study had up to 10 hours experience of the virtual world before being interviewed. The Red and Magenta students were set the same learning task; different learning tasks were set for the students in the other cases (table 3.2). This provided an opportunity to observe some generalisability of observations, but also introduce some variation. Students were surveyed, to obtain quantitative data, and the sessions were evaluated qualitatively by analysing logs of text chat, focus group transcripts and/or transcripts of interviews with the students (table 3.3).

The individual case studies are described below and a selection of qualitative data are included with the description. Quantitative data are included in the appendices. The data have been grouped into categories and subcategories according to themes identified during the coding process for the Red, Green and Blue case studies. The Magenta and Yellow did not produce sufficient qualitative data for this process. The data from these case studies are analysed in a cross-case synthesis in section 5.3.

4.2 University of Red case study

4.2.1 Description of activity

The first of the case studies involved an undergraduate class at the University of Red. This class was a group of 15 undergraduates on the Theatre Studies module “Theatre Design and New Media” one of the aims of which is to “develop a critical understanding of the complex and dynamic relationship between design, new media technologies and theatre, their social and cultural values” (Childs and

Kuksa, 2009; 1135). Since one of the new media technologies investigated was Second Life I was invited to conduct a session on this by the course leader. The session design comprised:

- An introductory section consisting of a presentation and discussion.
- A practice session in which students explored a single theatre as a group.
- Wider explorations by the students of theatres in Second Life.
- A plenary session where the students discussed what they had observed about the theatres.

The students were given a handout which outlined the timings of the session, and the different passwords and avatar names used by the group.

The introductory session included background information on virtual worlds in general, on Second Life in particular, the use of virtual worlds in performance, a description of the Theatron Project and the performances of Hamlet that had taken place in Second Life (Chafer and Childs, 2008). A discussion took place regarding the nature of virtual worlds, their purpose and the role they could play in performance during this section.

For the practice activity, students chose pairs in which to work and were assigned an avatar to the pair. Students were given twenty minutes to accustom themselves to navigating around the environment and familiarise themselves with the communication mechanisms. During this section the students were given landmarks to four theatres to explore, two based on real world theatres and two theatres created specifically for Second Life. At the end of the practice session they were then asked to teleport to these sites in turn.

For the explorative section, the students independently explored the separate sites, teleporting their avatars to the different locations making observations of the theatres and stages. I dropped in at different locations to observe and record the activities. The sites were:

Real life theatres:

- Theatre of Epidavros.
- Globe Theatre.

Second Life theatres:

- Caledon Gaiety Theatre.
- Ballet Pixelle Stage.

For the theatres based on real life theatres the students were asked:

- What would be the challenges for actors and designers working in the virtual theatre in Second Life?
- What do you think the challenges for actors and designers would be in the real theatre this model represents?

For the theatres designed specifically for Second Life, the questions were:

- How do these theatres/ auditoria differ from real life theatrical spaces?
- What can you determine from the stage design (and any other surrounding spaces) are the nature of the performances, and the communities that built the stages?

The intention was that students would discuss their answers to these questions in the final plenary. For the question on the challenges of performing in Second Life it was anticipated that students would discuss the difficulties of performing through an avatar, of being able to move the avatar and of feeling copresent with the audience. The question on the real theatres the spaces represent would require the students to experience the feel of the spaces, for example the real Theatre of Epidavros is a very large theatre, and so connecting to the audience and making one's performance large enough is a problem, and the size of the space can be intimidating. The question on the differences between theatres created solely for Second Life was intended to alert students to the ways in which the design of theatres that exist solely in the virtual world can adapt to the functionality of that world, for example the ability of avatars to fly means that aerial ballets are a possibility within the Ballet Pixelle Stage. The question about stage design drew on the students' experience of the semiotics of virtual spaces; that theatrical spaces are a product of the cultures that created them, drawing on, for example, Aronson (2005; 40):

What distinguishes the theatres of a particular period or culture is the way in which the arrangement of these elements reflects the spatial configuration of the society at large.

The intention here was for the students to observe the detail of the space and of the surroundings of the Caledon Gaiety, to note that the design theme was a steampunk one (a sub-genre of science fiction set in a parallel world in which a high-tech Victorian British Empire exists)

and hence to draw the conclusion that the theatre was created to support roleplay activity with participants from that particular subculture within Second Life.

The students were given a questionnaire, completion of which was optional. Two parts of the session were recorded. The first was part of the explorative part of the exercise when the students were examining and evaluating the theatrical spaces. As the students were exploring the theatres, the inworld activities that took place where my avatar was present were recorded as machinima. The transcripts of local chat that took place where my avatar was present were saved as well as some of the conversation taking place in the physical classroom.

The second part recorded was a video of the plenary. This was to provide a transcript of the responses of the students to the experience and capture evidence of their learning. These recordings provided additional discourses to analyse.

4.2.2 Observations of activities

Observations of activities indicated that the introductory session was far more fragmented than anticipated, due to the laptops crashing and requiring to be rebooted and the students to log on repeatedly. During the twenty minutes allocated to becoming accustomed to the interface the students independently learnt to:

- Use the text to communicate. The students found this quite simple to use, as it is very similar to MSN or other instant messaging and 70% of the students used instant messaging frequently.
- Personalise their avatars. This bore out the observation that customised avatars are one of the most popular features of virtual worlds (Cheng, Farnham and Stone, 2002; 99).
- Animate their avatars and employ gestures.
- Move, manoeuvre and teleport. Manoeuvring proved particularly difficult, with students still struggling to manoeuvre their avatars during the exploration activity.

Although only one of the students had used Second Life before, the students' animated level of communication and the difficulty in moving them on to the following part of the planned learning activity indicated that their engagement with the virtual worlds was high. However, the focus of the students on the learning objectives that had been set for them was limited. Observations and

recordings made of this activity indicate that there were a range of barriers and distractions that drew students' focus away from these tasks, which are listed below:

- *Technical difficulties.* The students faced technical difficulties, due to either the processing power of the laptops, or bandwidth of the internet connection. A recording of the session contains the following comments; "Yeah it suddenly got really really slow" and "OK but it's quite slow" indicating that lag was an element of frustration with the students. There were also glitches with the Second Life platform itself, with avatars appearing inside pillars and one student was heard to complain "Why are we in the floor?" because her avatar had sunk into the ground.
- *Difficulties with interface.* Distractions were also due to the time required to become fully conversant with how the software operates was less than the time allocated in the practice session. Conversations were those such as the following show confusion about how to move the avatar:

Student A: Go backstage.

Student B: (reading from screen) Where is everyone?

Student B: Shall we go backstage from the stage?

Student A: Maybe jump in the pit see if we can play any instruments. You can turn round and maybe jump in it.

Student B: Ooh.

Student A: It's a jump ... forward. Does it not jump forward?

Student B: Oh we just jumped on the stage.

- *Distracted by novelty.* A further level of distraction was that caused by the desire to experiment with the possibilities of the software. Some students found this more of an issue than others, for example this exchange between students in which one student is focusing on the questions set, while the other's avatar continually dances:

Student A: I'm going to try some dancing

Student B: (Reading from worksheet) What do you think the challenges for actors and designers would be in the real theatre this model represents? (pause) Stop dancing.

Student A: Sorry



Figure 4.1: Dancing in the Caledon Gaiety

Other distractions were indicated by the following conversation in which two students have found an object which when attached to their avatar disrupts their viewer and as a result cease to focus on the activities set:

Student D: Are you? Are you in Dundee? What's this? Is it magical toadstools?

Me: Who's got the magical toadstools?

Student D; We have! I think they are magical toadstools.

Student E: Yes they are.

Student A: What the hell's a magical toadstool?

Student D: I think we are actually getting high on 'shrooms. Yes we are, we are.

Student E laughs.

Student D; Look we've just eaten toadstools and we're going crazy. Oh amazing. Awesome.

Student E: Do it again. Do it again.

Student D: OK let's have another one. See what happens. Weeeee. Getting high while flying. That's dose. Weeeeeee.

Me: Can we start move back to Theatron? If you've got a Theatron landmark can you join me back on the stage in Theatron?

- *Processing multiple conversations.* Other issues were the high degree of fragmentation of communication. Conversations were happening inworld between avatars, within pairs in real

life and across the room. It was therefore difficult to maintain a single focus of communication. For example, there is this conversation in which real life and Second Life conversations run in parallel then cross over from Second Life to real life.

Me (inworld text); What do you think of this place?
Avatar 1 (inworld text); nice
Avatar 2 (inworld text); it's nice
Student A: (reading) Rosa Goldrosen. What a strange name.
Avatar B (inworld text); it's really detailed
Student C: Oh do I have bad luck if I break a mirror here?
Student A: It's bad cyberluck.
Me (inworld text): Why do you think they might have wanted to make it so detailed?
Student A: Yeah oh my god it's amazing. Like you could break a mirror.
Student D: (reading) Why do you think they might have wanted to make it so detailed?
Are we supposed to answer that?
Me: Yeah sorry. I'm trying to be intellectual.
Student D: Hah hah I know but I'm confused.
Me: OK something to think about for later then.

- *Play as a stage in the development of embodiment.* The final machinima recorded was of the inworld debrief about the experience (fig. 4.2, table 4.1). The discussion that took place inworld contains one comment concerning the subject matter, a reference to the difficulty with navigation, but this is swamped by discussions about one of the avatars dancing, the clothing of a second avatar and a third having teleported into a pillar. This sequence finishes with a plea from the lecturer to “at least talk about the subject” (the transcript in table 3.5 relates the two conversations taking place in parallel, one in the real world of the classroom, the other via text in the simulation of the Theatre of Epidavros). However, although discussions regarding the subject matter are absent, there is still learning occurring, but this is learning about the environment and the learners’ identity within it. Although the Rosa avatar is dancing constantly, the student operating the avatar reveals that s/he is doing this to explore the sense of being an avatar on the stage, and conducting him/herself accordingly.
- *Disruption of traditional roles.* Finally, the transcript in table 4.1 also reveals the change in division of roles within the environment. The lecturer and I repeatedly attempt to reinforce our roles as lecturers with only a limited success in the real world and no effect inworld. The

response of student B is one of amusement that we would even expect to be able to control the class.



Fig. 4.2: Distractions in the Theatre of Epidavros

Real world conversation	Virtual world conversation
Student B: Ha that's my favourite	Theatron Burner: why the hell are you dancing AGAIN?
Student A: Theatron Turbo just fell out of the sky.	Menthur Minotaur: OK I'm recording ...
Lecturer: Still dancing Rosa. She's like a mad person.	Theatron Burner: oops.
Student A: Dancing's quite fun.	Theatron Burner: sorry.
Lecturer: She dances and dances. It's like Saturday Night Fever	Theatron Burner: why on earth do you keep dancing Rosa?
In background: Oh we're stuck in the wall.	Menthur Minotaur: ok so how did that go?
In background: where are you?	Theatron Burner: pretty well
Me: I'll just give them a couple of minutes of this.	Theatron Burner: navigating is quite hard
Lecturer: Yes they're just fooling around now. All the avatars are changing.	Menthur Minotaur: how about moving?
Background: We're stuck in a wall	Theatron Burner: Turbo we like your outfit
Me: Oh yeah that looks uncomfortable.	Theatron Burner: A LOT
	Theatron Burner: ...
	Theatron Turbo: you look sexy
	Menthur Minotaur: ok we should get back to rl now
	Theatron Burner: thanks , you too
	Theatron Breen: you have such long legs turbo
	Rosa Goldrosen: well
	Rosa Goldrosen: i like dancing
	Theatron Burner: awesome skirt

<p>Lecturer: She's so boring do something else. You're like the most self-obsessed person, you know? Doing her own thing all the time.</p> <p>Student A: It's all part of the dance though you see.</p> <p>Me: Can we quit now and reconvene and chat through what that was like as an experience?</p> <p>Lecturer: But now everybody's chatting.</p> <p>Student B: Well what did you think was going to happen?</p> <p>Lecturer: I thought we were going to explore theatre spaces.</p> <p>Me: (Laughing) Maybe we just need to turn off the PCs.</p> <p>Lecturer: At least talk about the subject.</p>	<p>Theatron Turbo: thnx</p> <p>Theatron Turbo: lol</p> <p>Rosa Goldrosen: because we're on the stage</p> <p>Theatron Burner: it would look better on my bedroom floor</p> <p>Rosa Goldrosen: it feels right</p> <p>Theatron Turbo: Imao</p> <p>Rosa Goldrosen: Could do</p> <p>Rosa Goldrosen: How do I teleport back to rl?</p>
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Table 4.1 Simultaneous conversations in real life and Second Life

- *Cultural familiarity.* The conversation quoted on p.122 also highlights another barrier, in that the student responds with "I'm confused" when asked about the cultural context for the theatre design. Greater familiarity with the world of Second Life, with and the separate communities that exist within it, may have made the students more aware of the place of roleplay communities within the world. A shared cultural background with the creators of the roleplay areas, in this instance a familiarity with the steampunk genre, would also have aided a reading of the space.
- *Immersion.* Although having two students to an avatar was due to the constraints on room and equipment, it was also intended to enable students to share the learning experience with each other and so enable those students who may be less adept at learning the interface to be supported by those who were quicker. This may have had the result of some students becoming more immersed than others. In the group who were recorded, student B (who was moving the avatar) uses the word "we" and places them within the space, for example: "Oh we just jumped on the stage". Student A however, refers to the avatar with an impersonal pronoun "Does it not jump forward?"

4.2.3 Focus group

For the final part of the session, the students reconvened for a discussion about the four questions set through the worksheet. Although fully able to discuss the potential and shortcomings that the environment presents for performance and for communicating design the students did not discuss answers to the question “What do you think the challenges for actors and designers would be in the real theatre this model represents?” and were also unable to discuss the nature of the communities inworld that had built the solely virtual theatre. Although the four central questions were asked about the theatrical spaces, the students’ focus was on the nature of the environment and their experience and they repeatedly returned to discussing the value of virtual worlds in general, rather than the degree to which they’d experienced and learnt about the theatrical spaces.

The transcripts of the focus groups were coded, firstly for whether they were statements in favour of, or in opposition to, the use of virtual worlds (no students expressed a neutral view), since this theme dominated the discussion. These codes were then broken down into expressions of approval or disapproval regarding different aspects of virtual worlds, of positive and negative experiences of the technology and whether or not the students expressed an experience of presence. Finally, opposing positions were set alongside each other together with some illustrative quotes, and listed in table 4.2. The darker lines indicate the themes that were expressed as part of the same dialogue between students. The themes coded were:

1. Values with respect to virtual worlds.
 - 1a Values with respect to virtual relationships.
 - 1b Values with respect to virtual activities.
 - 1c Values with respect to virtual experience.
 - 1d Values with respect to virtual identities.
 - 1d Values with respect to virtual performance.
- 2 Opinion of the design of virtual worlds.

3 Experience of presence.

3a Experience of virtual presence.

3b Valuing copresence.

<i>Theme</i>	<i>Against IVWs</i>	<i>For IVWs</i>
<i>1a. Opinion regarding relationships in virtual and physical worlds</i>	<i>Inauthenticity of virtual relationships “it’s the new era of virtual relationships and stuff is quite scary”</i>	
<i>1b. Opinion regarding activities in virtual and physical worlds</i>	<i>Inauthenticity of virtual activities “I can’t think that people would actually want to be inworld.”</i>	<i>Valuing virtual activities “I’ve played Football Manager every year it comes out and I can spend weeks on it.”</i>
<i>1c. Opinion about living in virtual and physical worlds</i>	<i>Expressing normative values about the good of living in the physical and the bad of living in the virtual “I think I’d rather live.” “I don’t think you should have a second life on your laptop.”</i>	<i>Opposing these normative values “if you’re having entertainment then what’s the difference? It doesn’t really matter.”</i>
<i>1d. Opinion about virtual and physical identities</i>	<i>Inauthenticity of virtual identities “It seems kind of pointless because in one aspect people can represent themselves however they want to not being who they are in the real world”</i>	<i>Inauthenticity of physical identities “I’m constantly deceived (by the wearing of make-up by others in RL).”</i>

1e. Opinion about virtual and physical performance	<p>Normative values about the nature of performance</p> <p>"it doesn't feel like actual theatre because theatre should be happening then"</p>	<p>Potential of virtual performance</p> <p>"there's a huge amount of scope for doing things. With the placing of the audience you could do some really interesting things, like they could fly over the performance."</p>
2. Design considerations	<p>Focus on the current limitations of design</p> <p>"Second Life isn't very well conceived at the moment to see the theatre in great depth. The whole design of it is quite poor."</p> <p>"But the actual visual isn't developed enough"</p>	<p>Focus on the potential uses</p> <p>"I can see it as a cheap and practical way to visit these places."</p> <p>"and perhaps do more with the space than you could do in real life."</p>
3a. Experience of presence	<p>Absence of presence</p> <p>"You don't have the feeling of it."</p> <p>"if someone like me has a disconnect from that kind of environment and have to imagine a performance it feels like it's lacking in something"</p> <p>"you just feel like you're just watching a game."</p> <p>"At the end of the day you're still sat in your bedroom, you're not actually in a theatre, it's just like a second self"</p>	<p>Presence of presence</p> <p>"Even though you're not actually there you can walk around it virtually and go to different places"</p>
3b. Value of copresence	<p>Copresence inworld has no added value</p> <p>"There are 3D environments anyway which you can move through. You could both go through and talk about over the phone. I can't see that it enhances it any more."</p>	<p>Copresence inworld has value</p> <p>"you could physically, well not physically, walk them up to the bit you were talking about."</p>

Table 4.2 Focus group comments from the Red case study

This table shows the disparity between the students' experiences of, and attitudes to, virtual worlds as a learning and performing medium. The experience appeared to have polarised the class,

with most of those expressing opposition to the *idea* of virtual worlds, as well as their negative experience of using them. Other students, although having the same technological and environmental barriers to the experience, responded far more positively.

Looking at the percentage of responses to the questionnaire in the Red case study that were positive about the experience of using virtual worlds against those that were negative, and an approximation of the proportion of time that was spent in the focus group supporting those two positions gives the figures in table 4.3, suggesting that although the focus group was dominated by those students who were opposed to virtual worlds, these were not representative of the group as a whole.

	<i>Positive response</i>	<i>Negative response</i>
<i>questionnaire</i>	64%	36%
<i>Focus group</i>	38%	62%

Table 4.3: a comparison of the positive and negative responses given in two different forms of data gathering

4.2.4 Reflections on the Red case study

The direction of this study changed substantially as a result of this case study. Elements that remained the same were the use of the conceptual framework as a basis for the qualitative study, and the use of a questionnaire for the quantitative study (although changes were made to this). Three additional elements were added at this stage.

The additional elements were

- The link displayed between satisfaction with the learning activity and the experience of presence. Using the criterion of satisfied or dissatisfied learners when interpreting the quantitative data enabled two groups to be identified within the cohort, and comparisons to be made between those groups. Apart from the experience of presence, and the absence of gamers from the dissatisfied group, there were no other apparent distinctions between these

groups. The questionnaire was therefore used in later cases studies to look for further correspondences between satisfaction with the learning activity and presence. The importance of immersiveness and roleplay tendencies was downplayed in further case studies. Despite the literature indicating these were important factors, there were little observable differences between those who experienced presence and those that did not. Degree of naturalisation also seemed not to be relevant. Instead other factors were introduced in an attempt to identify which other factors may be linked to the experience of presence.

- The reasons behind student resistance. From the analysis of the plenary focus group it appeared that there were a group of students who felt that the design was insufficiently realistic, and these were also those who did not experience presence. Other students, experiencing the same environment, felt that the design was sufficiently realistic. There were also a strong minority of students who objected to the concept of virtual worlds because of their values. This, together with the responses to case studies taking place at the same time that did not go ahead, prompted the inclusion of a strand to look at these attitudes in more depth.
- The differentiation of presence. From observing that the students were able to answer some of the questions, but not all, it appeared that the presence was not an experience that either occurred or did not occur, but was gradated. It was noted that students were capable of feeling sufficient familiarity with the environment to answer questions regarding the ease of use of the interface after a single session, and were also capable of observing the design of the theatres. However, the ability to form an emotional connection with the virtual space sufficient to be able to answer the question on how it may have *felt* to be a performer in the real spaces the virtual theatres represented was beyond them. They were unprepared even to appreciate that the question could be answered from a virtual experience. The questions on the cultures were even further beyond the experience they had at that stage. The conclusion after this first case study was that presence developed progressively, from one in which the technology occupied the foreground of attention, to one in which the student employed the technology with competency and could then more readily observe the world. These stages had occurred within the case study. Later stages of this progressive immersion, it was proposed, would then be those in which students were immersed to an extent where they had an emotional connection

to the space and then, finally, where they had sufficient experience of the virtual world to have an understanding of the cultures and communities that existed there. This progressive presence therefore meant that teachers must select learning activities appropriate to the degree of presence the class is likely to have formed. This model developed throughout the study and is presented in its final form in section 6.4; the early form of this model formulated as a result of this first case study was published in Childs and Kuksa (2009).

Further case studies aimed to identify the difference between the two parts of the cohort (those that experience presence and those who do not) in more depth and identify any factors that may influence these experiences. At this point it was thought that these factors may be cultural or value-driven, i.e. that the students who do not experience presence may not be failing to overcome the barriers to the experience, but may be resisting the experience due to opinions about the role of technology, or the credibility of virtual experience. Other factors were thought to be a preference for social interaction within an offline environment or due to these students preferring specific boundaries and resisting playfulness. Questions were then added to the questionnaire to look for these correspondences and to the interviews that were conducted to understand this resistance in greater depth.

Further work also aimed to see whether the model of progressive presence, and the suitability of particular learning activities, held with different classes.

4.3 Green College case study

4.3.1 Description of activity

The second case study was conducted with students of Green College. These students were second year undergraduates taking part in enrichment activities outside of their regular degree activities. The aims of the course were to learn about the elements of Commedia dell'Arte and to explore the process of transforming these performances into Second Life (Duffy-McGhie, 2009; 37). They had been working on these materials and developing their avatar for close to two months at the point at which they were evaluated, over five two-hour sessions. The students had opted in to taking part in

these activities. Sixteen students originally signed up for the activities but over the course of the sessions these dropped to twelve.

The evaluation consisted of version two of the questionnaire (Appendix A2) and short semi-structured interviews. Six students were available to take part in the evaluation. Of these, four were still taking part in the activities, one (student C) had withdrawn and a third (student B) had not begun the activities due to time pressures. Student B's data were therefore not included in the data collection. Of the five students whose interviews were analysed only one had interacted with Second Life outside of these sessions, due to difficulties accessing it from home (none of them had access to the internet in their homes). Student A reported that he had been a resident in Second Life for three-to-four years.

4.3.2 Data from interviews

Learning

Students were divided in their opinions with regard to the value of the learning in the virtual world. Student A was the most experienced of the users of the technology, having been a resident of Second Life for three to four years, and having multiple accounts (or alts). Student A made these references to his learning:

Well first of all you're getting a glimpse of the historical factors, at the same time you're actually seeing what that historical factor is so, you're seeing it and trying it out.

Student A referred to experiencing the "atmosphere" of the theatrical spaces:

we actually have to perform in different spaces to get the atmosphere ... you get that atmosphere from actually watching it and your thought processes about what's going on in that space.

Student A also felt that he had learnt about his own identity from using the platform:

Second Life is going on your personal feelings. You create a character unconsciously with your feelings. You don't realise, but you get a lot of these dark characters and then you get really happy characters and you get all these different feeling characters and you can learn so much from it.

Mark: You mean you learn about yourself from what you create?

Student A: Yeah.

Students C, D, E and F had not any prior experience of using Second Life, and their only experience during the five weeks was within the sessions, i.e. up to 10 hours in total. Student C felt that there had been no valuable learning:

Mark: Did you feel you learnt anything from what you were doing?

Student C: I learnt something but I didn't feel it was very beneficial. I didn't know where we were going with it.

Mark: The idea of performing in that space. Would that have been of no interest either?

Student C: Not really

This was not a rejection of the possibility of the environment being an environment in which learning could take place, just that it was an environment in which *he* could not learn.

Mark: Do you feel like you achieved anything while you were in there? No nothing? (To laptop) He's shaking his head. (To interviewee) That doesn't come out on the recording.

Student C: It wasn't all negative things. There were some positive things, it just wasn't my thing.

Student D had been focusing on learning how to use the platform and personalise her avatar:

Student D: it was mainly just learning about how to use the software. Also learn how to get other things like other skins and costumes; how to make yourself look different.

Mark: Have you been looking at any of the theatres?

Student D: Not really. We haven't had much time

She felt that the process of learning about the software was incomplete and required learning more about how to use it before she felt sufficiently accomplished:

I'd like to learn more how to do, because there was stuff there we didn't know what it wasThings like all the chat tools and how you can search for people and bring them in. There was lots of stuff I didn't know what it was and I thought I'd leave it alone because I don't want to end up being transported somewhere and not know how to get back.

Student E had also been learning about how to use the software, and also exploring the world to find out more about the examples of fashion inworld.

I was looking at doing a fashion show and (lecturer) said "you could do it on Second Life" and I thought that's really good, so I've been looking at the fashions on there, because I didn't really know much about Second Life.

However, Student E felt unsure that learning had taken place at that point.

Mark: Do you think you've learnt anything from it?

Student E: Errrm (hesitantly) yeah hhhmmmm. I don't know really. I'm still learning really. Every time I go on and see stuff like live performances and the commedia dell'arte. I'm only scratching the surface, so far. There's so much more that I could learn from it.

Student F was less ambivalent. Although he had not spent any time personalising his avatar, he did talk at length about experiencing presence and embodiment within the environment. Two experiences figured especially, one was his visit to the Globe theatre, the other was a visit to the Holocaust Memorial Museum's simulation of Kristallnacht, which their tutor had taken them to as part of their introduction to Second Life:

with that you get that little sense of ... you can see things and especially because they're done so well ... there's so much information that you can gather from it.

When asked about learning within the sessions; Student F focused on these two places, as well as the businesses located inworld:

The other point of it is the information basis with the German town and the Globe and also businesses; you can look at businesses. It's a complete world isn't it?

Relationship with the technology

Attitudes to technology

Those students who found the activities in Second Life to be valuable differed in their attitude to technology, some having had positive experiences of technology beforehand, others not.

Student A: Yeah I like technology. Technology is a fascinating way to look at things and I just like playing with it, so I'm one of these people who buy a mobile phone every couple of months.

Student F: Aye see, technology to me is ... I don't really understand it. I don't really have internet. I have a computer at home but I only use it to do my college work and stuff like that.

Student C, who was the only one of the five students who rated the experience low. His attitude to technology was ambivalent, finding aspects of it engaging, but overall not sufficiently interesting to hold his attention.

I'm not really a computer person plus just staring at the screen for ages and just doing that sort of stuff it just didn't interest me ... I thought it was good the 3D and stuff and

virtual, I liked it. It was cool but, I don't know how to explain it because ... it just wasn't my thing.

Prior experience of games and virtual worlds

Although having three to four years' experience in Second Life, Student A did not report any experience of gaming; Student F did not play computer games; Student D was a "quite a big gamer".

For her the parallel was the ability in both to alter one's avatar.

I'm always messing about with stuff like that online. Like you can get all the unlockables and I tend to mess about with different costumes and different characters that you can get. So I like playing about with stuff like that and making something really bizarre.

Student E was also a gamer, and like Student D, found that Second Life offered more potential in some areas than games.

Student E: Yeah I've played games and stuff like that. I used to like the Sims and that's what people describe Second Life as. But like it's real, instead of controlling other people, you control yourself.

Student C did not play computer games, although he did play many physical games.

Mark: Do you play computer games?

Student C: No not really. I love football and stuff like that; used to play cricket.

Using Second Life

All of the students stated that they found the basics of movement easy to carry out within the environment, for example student E:

Mark: And it didn't take you time to learn to move around?

Student E: No. None at all.

However, beyond these basics, students did encounter problems.

Student D: I found it hard to change beyond the avatar. So you tweak little certain things but you couldn't drastically change something. So I never managed to figure out how to do that.

Searching was also something students found to be a problem.

"The only thing, I couldn't think of actual places to go. I was typing stuff in and big huge long lists of places were coming up. I could have sat there for hours and gone to every single place on the list." Student D.

"Stuff like the search, when you look up fashion, when you're looking for somewhere to go and it comes up with all this other stuff and you end up going somewhere and it isn't what I searched for. " Student E

Other features of the interface were not engaged with because they seemed too complicated:

"there was stuff there we didn't know what it was.... Things like all the chat tools and how you can search for people and bring them in. There was lots of stuff I didn't know what it was and I thought I'd leave it alone because I don't want to end up being transported somewhere and not know how to get back." Student D.

"It's got loads of options and I don't know where to start with a lot of stuff. You need someone who's been on it to tell you what to do and where to go" Student E.

Student F struggled most with the platform, but felt that this was more due to his own lack of experience with technology than anything inherent with the interface. He particularly found difficulties with rezzing objects on his avatar.

Student F: I'm confused with it. I'm a bit of a technophobe, so I don't really get on with the technology, but it seems to be clearly mapped out and probably when I actually get to use it a bit more I'll be thinking what was the problem? You know like drag and drop onto things and I've got like 12 boxes on me and I go "what have I done?"

Obtrusiveness of the technology

The students all said that the render times of the environment were a problem, since it took too long for images to be created on their screens, although student A stated that this was his own response to the long render times:

Mark: So what was the problem with that then?

Student A: Patience.

Mark: So you see it as your problem that you're not patient enough, rather than its problem that it's not loading fast enough?

Student A: Yeah I think it's our own impatience. We're so used to having everything quick, aren't we? In our hands. And to wait 15 minutes for something to appear, we're not used to it.

Student E also referred to this problem:

waiting for stuff to load up that's annoying sometimes. When you zoom in and are still waiting for stuff, you're walking round and suddenly something will appear and you're like "aah, where's that come from?" but it's still good it's just that's the only thing.

In addition to the render times, lag was also a problem, as Student D reported, although as with Student A, she was prepared to tolerate these problems.

There were a few glitches where you'd try and run somewhere and it would just sort of freeze and it would take a while for you to catch up and then all of a sudden it would speed up. So little glitches like that, but you get that with pretty much any software.

Experience of the virtual world

Motion

One of the aspects of virtual worlds is the ability to move within them. Bowman, (2002, 283) divides locomotion techniques into naturalistic (walking, vehicular etc.) and magical (flying, telekinesis, teleportation). The magical locomotion techniques available within Second Life were highlighted by all of the students (whether or not they overall enjoyed the experience of the environment) with high approval, describing the feature variously as "cool", "sick", "mint" or "nice".

Student A: I've looked at ideas in Second Life and what you could do and how you can travel and transport yourself from one place to a completely different environment.

Student D: especially when you get to fly and you get to fly really, really high up in the sky and all the clouds and birds flying past you. That was really detailed and that was really fun to be there.

Student E: It's just fun to go on it and fly and to go to all these different places.

Student C: I thought that was really good. You know by just the press of a button you can go in a different space, so ... what's it called when you ...?

Mark: Teleport

Student C: Teleport . I thought that was really cool.... looking at the different places too that was sick, yeah that was nice.

Openness

The possibility of moving freely and easily between different environments within the virtual world was an element that appealed to most of the students. The magical forms of locomotion (flying and

teleportation) particularly appealed to them, as well as the potential for random exploration that these provided.

Student A: Yeah just flying and seeing where I land. That's one thing I find quite fascinating.

Mark: So when you say you're losing yourself in it, what do you think are the things that help you lose yourself in it then?

Student D: Just the openness of it all. You can go anywhere you want in a flash and you can just shop anywhere and explore any island you want to.

Student E: It's something new and it's different. There's no boundaries; you can just fly off somewhere. One second you're in the Globe and then you're somewhere else.

Student C, in contrast, felt more disengaged from the environment because of this feature. For him, because the variety and randomness enabled by these magical forms of locomotion undermined the realism of the environment, the virtual world was less appealing.

Student C: ...usually when we do stuff, we move about, we go do our own things you know, we've got set routines that we're doing stuff, certain time we have to be here, certain time we have to be here, and there we could be anywhere, you could do anything with it, there's no sort of strict ...

Mark: So because you could do anything with it, it was too ...

Student C: It was too open. No structure, exactly.

Mark: And therefore it wasn't engaging.

Student C: Absolutely.

Realism

All of the students stated that the appearance of the models themselves, of the places, within the world was realistic.

Student D: Yeah. The environment's amazingly detailed I think. Like just walking around in some of the shopping plazas and stuff and all the background and everything.

Student C commented on the difference between the reality of the environments and the avatars:

Mark: So you didn't feel you were there in any way?

Student C: No way, no. It wasn't that real. The places looked real, but the characters didn't look real.

Interacting within the virtual world

Finding something to do

Finding an interest within the world seems to be a defining factor in whether participants become engaged and immersed in the worlds. For Student A this was the creation and development of different accounts in Second Life

Yeah. I think it's interesting to see what you can create. I think that's why I do it. It's "who can I create?" "What can I create?" I think it's exciting because you don't know who you're going to create and then you get on there.

For Student D, her interest came in getting different skins and costumes for her avatar and making her avatar look different. She also liked the playfulness that comes with dressing up.

Mark: Was it you I was talking to a couple of weeks ago and you were saying "oh I'm a cardboard box and I'm flying about. It's mint"?

Student D: Ah yes that was really funny.

Mark: What was it about the cardboard box then?

Student D: Because I have never seen anything like that online. Like you can dress up as like a teddy bear or put on an animal costume, but I've never seen anyone dress up as a cardboard box before. It's just really fun to do.

For Student D, the playfulness and flexibility are an important part of interacting with the technology.

(lecturer) was dressed as a monkey and he had a fez and everything. Stuff like that is brilliant because there's nothing you can't really do with it. There's something for everyone as well.

it's great to just sit there and just lose yourself in it, you can just play about with it and see what happens.

Student E became engaged through the possibilities of developing fashions and fashion-based events inworld

I was looking at doing a fashion show and (lecturer) said "you could do it on Second Life" and I thought that's really good, so I've been looking at the fashions on there,

Student F's interest was in the different locations, particularly those with snow:

Going round seeing what sort of world they are. Especially I was going round the ones with snow in. I just like the snow. I was just doing that.

Student C, on the other hand, did not find anything inworld to capture his attention.

I just thought there wasn't that much else to do. I was thinking where are we going with this? You sort your character out, you put on a hat or whatever, you change the hair or eye colour, but where do you physically do stuff like open doors and make houses and stuff?

Community

Another element all of the students had in common was that none of them had become involved in any of the communities within Second Life.

"I think we only got one invitation to join communities and groups and that was from (lecturer). I don't think we really went outside (of that group)." (Student D)

Student E made some attempts to communicate with residents but these were rebuffed.

there was one I walked up to them and said "hi-i-i" they just said "hi" back. I was trying to talk to them and they were just "I'm busy go away" and I was "OK".

Student F expressed a lack of interest in communicating with others online.

I don't think I'd use it as a social sort of thing. I'd use it more to visit things. I don't think I'd ever make friends on there. You've got Facebook and that's communicating with the technology, but with them it's more personal because it's the picture and generally you know them. It's the real person.

However, he was excited about the possibility of presenting his performance work to audiences within Second Life.

I like people coming from all round the world to be able to see it, because no-one would do it... You can just do it when you want. ... People are going to see it performed who would never know it's going on. They might have stumbled onto it or we've advertised it and they've thought "oh we'll go check it out".

Student C was more interested:

I did communicate with other people but it was people who were around me. I found it OK. That was actually the most exciting thing was actually talking to people and moving in different worlds.

Online identities

Developing an online identity

Only one of the students (Student A) had experimented with different identities online. He had a range of different accounts, each one reflecting a different aspect of his personality or mood, and each one created for a different environment. In the survey, this student answered “no” to the identity tourism question, for him these activities were not experiments with taking on different identities, but were giving voice to different aspects of his “real” identity.

Student A: It's just a way of changing your appearance and being able to create not just one type of appearance but creating loads of different things. I think one thing about that, it gives you an idea of the mood you're in. You can create a character to what you feel like. ... You create a character unconsciously with your feelings. ...

Mark: And what do you think you've learnt about yourself from doing it?

Student A: What sort of personality you've got ...it's hard really to explain.

Other students were aware of having an online identity, but had not used the virtual world to explore the development of other identities, although they explored the way their avatar looked, they felt that they still behaved in a similar way in the virtual world as in the physical.

I act the same. I just tend to look different, if you get me. – Student D

Mark: What about your identity online. Is it any different from your identity offline? Is your avatar any different from you?

Student E: When I go on I'm just me. She just looks better.

Mark: What have you changed then?

Student E: Just the hair, and she's skinnier and she's a bit prettier.

Cyberinhibition and disinhibition

The students differed in the ways in which their feelings of inhibition changed in the move from the physical world to the virtual. Student A described himself as more adventurous online than offline; Students D and E said they were the same online as offline.

Student F actually described himself as more inhibited online than offline, although recognising that the reverse would be more to be expected.

I love communicating and crowds and stuff. I go up to people and talk to them quite a lot which makes me look like a nutcase sometimes, but no I just don't go up and talk to people on the avatar thing, just ... I don't know why. It's weird that, most people would be more flamboyant when they're in there.

The language of experience of virtual worlds

Students describe presence

The participants in the interviews use a variety of means to describe a sense of presence within the virtual world and to distinguish between the impression one gets when simply looking at a 3D computer-generated model on a screen, and the experience of the feeling of embodiment *within* that model. For example Student A describes this experience of embodiment as the atmosphere of the location and as transformation.

Because we've got the atmosphere, because you can play around with the characters and make the audience be back in that century, It encourages as an audience member to actually think "wow we've actually been transformed".

For him, the essential part of creating presence is the *act of performance* within that space "It's not just the idea round the theatres; we actually have to perform in different spaces to get the atmosphere". Without that acting within the space, and within an appropriate role, the model is just a model and does not convey that sense of presence.

Student A: Yes you've got the stage there, yes it's just space, but you can use it as it was being used back then. Using a Greek theatre now, it's just a stage,

Student F also talked about presence, and identified the importance of the emotional resonance of the space in developing that sensation, drawing a distinction between the progress through Orientation Island, which is the first space new residents see and takes users step-by-step through a set of activities to introduce them to the interface, and the exhibit of Kristallnacht.

Student F: When it was just in that little bit when you first start, that was not really the thing because it was like a computer game. Then but when you start ... I think it was when we went to the German little town you know with the Jews and stuff like that? ... I actually think that is probably the closest you're going to get to go onto these things, because I'm never ... going to go there, but with that you get that little sense of ... you can see things and especially because they're done so well ... there's so much information that you can gather from it.

For student F, when the world is just a model on a screen it is “not really the thing” it is like a game. However, when the spaces are done so well, with a lot of information, one gets a sense of the space.

Students also struggled with comparing online experiences in different environments, for example student F compared the experience of Facebook and Second Life in the following way:

Student F: You've got Facebook and that's communicating with the technology, but with them it's more personal because it's the picture and generally you know them. It's the real person.

Student F: It can be a platform for performance. You can put yourself out there with all the other things like MySpace, Facebook, but you've actually got this little thing (avatar). And that's another one; it's a real life thing. With MySpace obviously you put your video. Me and my friends do video and we put it on, but with Second Life we could do performance or we could show it there.

Students describe their avatar

The language to describe the degree of identification with the avatar ranges from the word “character” which implies a more emotionally disconnected and fictional construct, to “avatar” which implies an aspect of oneself in the digital world, through to “he” or “she”, implying a real person with whom one is familiar, to “I” or “me”, i.e. that the image on the screen is oneself in the virtual world. This blurring of the lines of self and other, and of real and virtual, is displayed by the students by shifting constantly between these different modes. For example, Student D when describing changing the look of her avatar says:

I found it really hard to change the actual avatar's hair and skin colour. It took me ages to figure out and I ended up having to buy a skin pack and a hair pack from another place, so I ended up having to use more money just to change my skin and hair.

Or when flying, Student D talks about the operator him/herself flying:

you get to fly and you get to fly really, really high up in the sky and all the clouds and birds flying past you.

Language also breaks down in its ability to describe the distinction between manipulating the largely autonomous characters in a game like *The Sims* and one's avatar in an immersive virtual world for Student E, and the distinction between a game-like environment and a social environment.

I used to like the Sims and that's what people describe Second Life as. But like it's real, instead of controlling other people, you control yourself.

Student D was also “quite a big gamer”, and enjoyed similar elements of both, in that she could “mess about with different costumes and different characters that you can get”. Student D was drawn to the more fantastic elements of Second Life because

Stuff like that (unlockables in games) is usually like normal stuff, you just get to put on a dress or jeans and a top whereas (in Second Life) you can go out and buy a medieval dress and you can buy cardboard box skins

Student E formed a connection with her avatar through her avatar’s appearance. Student E refers to her avatar in the third person (“she’s wearing”, “her hair”), then switches to referring to referring to these as objects (“the hair”, “the face”) then making a generic statement but implying that for people it is about people represent *themselves* online (“the way you represent yourself”).

I think one of the things is what's she's wearing, because that's what I'm like. I'm really particular about what I'm wearing. It was her hair as well. I liked tweaking the hair. It wasn't so much about the face, it was about your hair and the way you present yourself rather than your actual features.

Student C did not take to Second Life, and did not identify at all with the representation on the screen, which for him was just a character.

I just like acting and performing and doing that sort of stuff and being that character it just didn't interest me at all ... I want to physically be doing it myself rather than watching a character do it on the screen

Student C also suggested there may not be any contributing factors indicating why some students develop this sense of identification and others do not.

I think it's just simply that for some people it works; some people like it, enjoy it. You don't necessarily always have to have a reason, an answer to something.

Talking about embodiment

As in the pilot study, the students found difficulty in responding to questions about embodiment. Although a core part of discussions within the literature, this seems to not be an aspect of presence that participants are aware of, or articulate. Student D responds to the question with a reference to the environment itself:

Mark: Did you feel like you were there and moving around within those spaces?

Student D: Yeah. The environment's amazingly detailed I think.

Student E responded hesitantly and seemed unsure of a response.

Mark: so when she's walking around in that space it's like you're moving around in that space?

Student E: (hesitantly) Yeah

Mark: Did that take a while to develop?

Student E: Yes that one took a while to develop.

Student F talked about embodiment, but struggled with a way to describe the sensation:

Mark: Did you feel like it was you there, to some extent, in the world?

Student F: Yeah, kind of. Not at first when you build the avatar and you see it, but when you, sort of, I don't know. It's a odd thing, you sort of seeing your eyes, you're sort of seeing stuff. You're going through and when you get sat into it, you do sort of get transported there, I suppose. In that sense of ... you can see the little fella walking about but ... I'm obviously not saying that it's me, because it's created, but it's my character, it's my little slice of me in that world, even though it's a general avatar, you know what I mean, it's not changed, it's just the boy next door.

4.3.3 Reflections on the Green case study

Although only five interviews could be conducted with the students, the second case study reinforced the observations of the first, in that the one student who did not experience presence was also the one student who was dissatisfied with the learning experience (student C). This student's interview data also added more detail to the category of students who were antipathetic to the experience. He expressed no opinions opposed to the concept of learning within virtual worlds, he could appreciate that they could be a good thing, but stated simply that they were not for him. This reinforced the validity of treating the value-related rationale as a separate category to the experience-of-presence category when building up the categories of students' resistance. Student C's responses corroborated Heeter's explanation of those who did not experience presence i.e. that "About one fourth of the population is so strongly situated in the real world and their real body that they have a difficult time becoming involved in a virtual world." Whereas the other students described the liberating feeling of being able to fly and teleport, Student C described the physical constraint of being sat in front of the computer watching a character do things on the screen.

The students who did feel presence also corroborated the model of progressive development of presence. These students had spent 10 hours in Second Life as opposed to the one hour of those in the first case study. For these students navigation was no longer an issue, although they still struggled with other elements of the interface such as searching. For all of the students the technology required to move was unobtrusive, and all had a well-formed body image in the virtual world. The emotional engagement with the world was also greater. However, only one student, student A, who had been visiting Second Life for several years, discussed feeling the atmosphere of the space. In the Red study, students had been asked what they thought the experience would be of performing in the real world places the models represented, but had been unable to answer this, since they felt no emotional connection with the spaces. Green student A's response indicates that he had attained the degree of immersion required to effectively engage with the question. The supposition made at the end of the Red study that although students did not experience this level of immersion at an early stage, with more experience this level of immersion could be attained, therefore seemed to be a valid one. Student A had, however, not developed the level of connection with the cultures and communities of Second Life to experience a cultural immersion within the environment.

4.4 University of Magenta case study

4.4.1 Description of activity

The third case study consisted of a session delivered to students on the distance learning course "Introduction to Virtual Worlds" taught at the University of Magenta. The students taking part in the activity had seen other virtual worlds as part of their course, including Metaplace and Active Worlds but for most of the students this was their first visit to Second Life. The subject of the session was the use of virtual worlds in education, combined with an introduction to Second Life as a further example of an immersive virtual world. To give the students an example of a learning activity, I reran the activity I had trialled in the first case study, asking the students to take part as if they were theatre design students. I then asked them to reflect on it as a learning experience and reflect on my findings from that case study.

The session was split into four stages and took place over ninety minutes. It was entirely at a distance. The stages were;;

- A general introduction to the space and to the activity, including some of the practicalities of moving around in Second Life and their experiences of Second Life.
- A field trip around the four theatres. Two of these were modelled on real life theatres and two existing only in Second Life.
- A reconvening of the class to discuss the students' responses to the questions asked as part of the Red activity.
- A reflection on the activity and the value of virtual worlds in general and the students' responses to the proposition that a prerequisite to learning is a sense of presence within the environment.

The data gathered from this session comprised the transcript taken from the text chat recorded inworld and the surveys completed by the students. An attempt was made to quantify the degree of discussion each question generated by counting the number of posts made in the chat transcript that related to each question.



Figure 4.3 The University of Magenta students explore the Globe theatre observed by the guest lecturer (blue male in centre of auditorium) while whole group is observed by module leader (white male with blue Mohican in foreground).

4.4.2 Text chat transcript

The discussion with the class after the field trip was based around six questions. Four were part of the simulated learning activity, and were the same as those asked of the students in the Red case study. The final two questions were asking the Magenta students their opinion of the learning activity as an exercise and the use of Second Life for teaching.

What would be the challenges for actors and designers working in the virtual theatre in Second Life?

This question generated 32 posts in local chat. Most of the chat raised the technical problems of lag and the factors that would increase this. This topic sparked the procedural conversation regarding the technical problems on this front they were experiencing. The students also raised the experiential aspects of the space, e.g.

"Hmmm, with enough practise and choreographing"

"yeah i think with a big enough audience watching u , ud feel like a performer in any platform"

"I think you'd need to be good at nav"

"for an actor it would still feel performance like"

What do you think the challenges for actors and designers would be in the real theatre this model represents?

This question only resulted in one response, which was "hmmm, not sure on that question".

How do these theatres/ auditoria differ from real life theatrical spaces?

This question generated 17 posts. The students had picked up on that the Caledon Gaiety is created in the style of a music hall, but focused mainly on the interactivity the builders had added to the theatre, such as being able to open and close the curtains and dancing animations. The students picked up on some aspects of the intention of the builders, one being that the focus was more on creating interactive elements than on recreating details of a theatre; there was no "smell of the grease paint". They also stated that space had been used more flexibly than would have been possible in a real life theatre.

"I felt more like I was playing in a wrold as opposed to enjoying the space"

“the Caledon which was built with less attention to detail. (i.e. it didnt have to look like any particular theatre, just a theatre”
“practicality, this theatre has a bigger space and a better view for the audience”

From the design of the theatres, what can you tell about the communities who built these spaces?

This question generated six posts. However, this discussion did not address the role of community, but instead reflected on the experience of the builders with respect to theatre, drawing further on the distinction the students had observed between the solely Second Life theatres and the real life ones replicated in Second Life, the argument being that those who are used to performing on a real stage will want to replicate the realism of the stage, whereas the Caledon Gaiety had been created by “virtual actors who havent ever acted on a RL stage”. The idea that Caledon is a specific *community*, who would have built the theatre to add social capital to that community, was not raised.

What is the effectiveness of virtual worlds as a platform for learning?

This question generated a longer discussion (19 posts). The students related their direct experience of being learners in a variety of virtual worlds. Issues they raised were:

- The distractions of the environment.
- The frustrations with not being able to move the avatar around properly.
- The frustrations with not being able to move the camera around properly (‘Decent camera control takes a week or so... Really intuitive once you get the hang of it but the camera especially takes some getting used to ^^’).
- The technical overhead having an impact on the time available for learning (“the 'student' needs to learn teh environment before they can learn anything in teh environment”).
- The difficulties with teaching when feedback from the students through body language is removed (‘without feedback (voice or keyboard) you dont know if your audeince is listening’).
- Technical difficulties preventing any learning from taking place at all (‘tech dificulties can knacker the whole class’).
- Students’ avatars being present but the students themselves not listening. (‘quiet class members could "attend" but not listen or learn / also in RL but easier to get away with it here).

Do you agree that presence is a prerequisite for learning and develops progressively over time?

Some of the students struggled at first with answering this question ('this question has me stumped', 'explain ^^'). Once the concept of presence was explained, five of the students had something to say on this topic based on their experience, and it generated 14 posts altogether.

A: yes - I think folk visitng this sapce will have differing levels of satisfaction of simply being here those who dont instantly get it may not come back

P: the users are or feel socially 'connected' without the need to actually be social.

A: yeas - though my first SL experince I wasnt too sure

B: me too

M: Hmm, not all users. Those I know, and have meet in real life I have a strong connection with in SL.

X: I think with most people, there is a limit to how far they can abstract or imagine things, which would make it harder to accept what they consider an 'imaginary' space

A: felt like a total novice whilst others are very experienced in SL, blowing fireballs etc

X: If feel fairly connected to my avatar, but then I have spent years of my time 'projecting' myself onto various characters in video-games, but I've noticed that between different people, they have different levels of how invloved they get with a character in the game.

In this conversation the students are articulating some of the issues that other users may experience, which were:

- That the ability of people to “project” themselves into a character in a game varies.
- Some people may not be limited in the extent to which they are able to abstract or engage their imagination.
- Copresence can exist within a virtual world without the need for communication, presumably because the participants are embodied within a shared space.
- The alienating effect of being a newbie amongst more experienced users, but that his/her experience of presence increased with time.
- Student X suggests that being involved in a game requires an element of projection onto the characters in the game and hence his/her gaming experience has prepared them for the experience of Second Life.

4.4.3 Reflections on the Magenta case study

This case study provided fewer data than previous case studies, due not having the opportunity to interview participants. Data sources were limited to the chat transcript and the questionnaires, which half of the students completed. The observations of the data indicated the following:

- All of the students who experienced presence were satisfied with the learning activity. Only one student did not experience presence, and she also rated the learning activity highly.
- The students were able to reflect on and discuss the learning activities that required a lower degree of presence, but found difficult in discussing those activities that required a greater degree of presence.
- The students also displayed the same difficulty in expressing the concepts of presence and embodiment, and were unfamiliar with the meaning of presence, although were familiar with the experience. Their descriptions conveyed an understanding of copresence and embodiment (referring to these as social connection and projection respectively). The students also identified some of the factors that may prevent people from engaging with a virtual world, such as lack of imagination.

Since the students were able to discuss the same topics as those in the Red case study were able to discuss, and had difficulty with discussing, or could not discuss, the same topics with which the students in the Red case study had difficulty. This suggests that different activities required different degrees of presence, that the Magenta students had reached a similar level of presence as the Red students, and that these stages progressed in a similar order. Replicating the learning activity conducted at the University of Red therefore demonstrated that the findings were generalisable to some extent. The ideas put forward by the students regarding the causes for resistance by other students suggested additional elements for this strand of the study.

4.5 University of Blue case study

4.5.1 Description of activity

The case study at the University of Blue consisted of two sessions held in Second Life during March and April 2009. The sessions were part of a course on Human Development. This course was part of an MA programme in Human Behaviour delivered to a group consisting mainly of professional counsellors. The course was delivered online through Second Life and through Blackboard. The inworld sessions of the course comprised six hour-long sessions altogether, and were preceded by a training session. The sessions included in this case study were the second and third of these sessions, one led by the course tutor at which I was only an attendee, and one led by me as a guest lecturer.

The course tutor's concept behind running these sessions in Second Life was the view that, by introducing students to an environment that they may find challenging and alienating, that consisted of a culture and rules which with which the students were unfamiliar, and where their identities were unformed and their bodies unfamiliar, the students' experiences would replicate many of those of adolescence. The students would then be in a position to explore many of the issues faced by adolescents in the real world, drawing on their immediate recollections of experiences in Second Life. The students' references to their stages of development in Second Life therefore draw upon this frame of reference (e.g. "I'm at the diaper stage in Second Life"). In addition to the students' regular lecturer and me, a teaching assistant was present, to take the register. Only the teaching assistant knew which avatar represented which student. Some of the students were sharing a physical space, either of two rooms at the University of Blue; others were connecting from other locations. Sessions were conducted with the lecturer using voice and the students using text chat.

The content of the sessions I ran was on the role of identity in Second Life. The data gathered were from three sources; an online survey and interviews as well as the transcripts of the sessions. Of the 19 students participating, two took part in both the survey and the interview (students F and D).

4.5.2 Session 2

Students' learning

Students were asked to talk about their learning experiences in Second Life

Student V: its fun

Student I: not very effecient

Student L: It's much easier than I thought!

Student V: but distracting

Student C: the lecture part was okay, the group discussion was pretty akward

Student M: it's fun..but i need to get used to it

Student Y: I found it was much easier to post my thoughts than try to talk in class

Students were asked to recount where they were in their development

Student B: i am having diffculty navigating

Student V: My first priority was to figure out how to improve my appearence

Student M: who doesn't

Student B: i want to improve my appearance and that is the only thing i have explored here

Student D: I wanted to learn how to get around

Student V: Il've figured that out but still cant walk right

The students made reference to the process by which they were becoming familiar with the world and their place in it, recognising that there are separate stages for them to become involved in the world.

Student A: first making creative efforts, then learning from instruction too

Student R: things are okay, I'm loving knowing some "safe" places to go

Student O: Just like life, I imagine one day i'll just realizer i'm doing it without effort and then there i'll be... for that

Relating to extended body

Some students were already referring to their avatars in the first person, for example, this student when demonstrating the effect of setting their avatar to the "away from keyboard" gesture says

Student O: I'll try it to show you what happens to me...

Some still felt disquiet about their extended bodies and anxious that they were exposed to others because of them.

Student O: This is my first experience with SL and it's beenbizarre ... Being a complete novice at everything... becoming part cat and not being able to get out of it... not knowing how to walk or talk.... or type

Student E: This is sad...I am scared to leave! I am worried will end up bald, lost, and naked again. One life is enough...

Student Z: I worry about looking silly in this because I don't feel comfortable with this type of environment

Student D: don't want to look "stupid" ... I'm worrying about sitting down and can't do it

There was a process of learning about the extended body which took a while for students to observe and learn

Student K: I didn't realize our hands type when we type

Student R: I was just noticing and hearing that

Recognition and copresence

Students also built up an experience of each other through the virtual world; some of this was by relating their Second Life avatar to the offline person, where this was known. This also took place by employing visual cues to recognise avatars

Student K: [Student R], did you get a list of who's who?

Student R: I only know two people. Oh wait I know three people. I remember [Student X] from the spandex pants! LOL

Student K: the tartan spandex!

Student R: YEPPER

This extended body and recognition through the avatar added to the social presence and copresence within the environment and became a platform for interaction.

Student R: hey [Student X], couldn't figure out how to change your pants yet?

Student X: maybe I like hot pink plaid spandex

Student O: I like hot pink spandex!

Student K: It suits you

Student X: I started to change them, and when I got bored these were the ones I had on

Student R: good reasoning

Student R: [Student D], why the change in clothes?

Student D: you guys were teasing me about my top last week ... or what you thought was NO top

Student R: you mean the one we thought you didn't have on?

Student I: what top [Student D]? YOU were naked!

Student K: I only recognize you from your bracelet [Student D (using her real life name)]

Student D: no, had a natural colored shirt on ... and the bling bracelet

Student R: I like the top

Student D: it's like real life, no time to shop

This was such an intrinsic part of their recognition of each other inworld, a single identity linked to a single avatar, that when my avatar changed appearance, this unsettled some of the students.

Student R: I LOVE the morphing that Gann can do. I was taken aback at first, mostly because I didn't know who it was

Comfort and inhibition

There were differences in attitudes to exposure to people whether they were known in real life or not. Some felt more comfortable if they knew who each other were, some felt less comfortable.

Student T: Well, I just think that in here it's very safe because you are hidden - you are safe

Student L: not so much because we don't know who one another is yet

Student R: no, not right now, people don't know who we are yet

Student T: No I think it IS safe because you are hidden

Student B: i agree it is more safe here to be "yourself"

Risk-taking and confidence

Part of this process was learning enough, and so feeling confident enough, to take risks.

Student I: It is really hard to be a risk taker when we are just trying to get used to the world

Student A: you have to learn how to navigate, what you like, etc. get settled, then you might take risks

Student F: We talked about appearance and how blending in was a tactic to avoid bullying

Student V: we talked about how weather we looked like how we do in first life

Student R: [Student D], [Student Y], [Student L] & I thought we still cared about how we looked even though we were in second life

Student C: my group had a combination of choosing what style we wanted and just trying to deal with the technical difficulties

Student B: we said that too. we cared what we looked like

The appearance of a student's avatar led the others to interpret whether or not that particular student was a risk-taker or not, and therefore confident and accomplished in the environment. This was sometimes accurate since the choice was deliberate (in the case of Student B's wings) or

inaccurate since the action was accidental due to lack of experience (in the case of Student X's tartan trousers or Student D's skin-matching top).

Student L: I think my clothes say I'm not a risk taker

Student R: [Student X] is!

Student L: true but maybe not here?

Student X: I think you're right [Student O], I didn't deliberately design these pants to take a risk

Student T: ahh

Student X: I was experimenting with different designs and these are the ones that I was wearing when I got bored

Student O: wings

Student L: You look confident

Student M: Your stance makes you look confident

Student T: make you look like you're part of this world

Student L: It takes a special avatar to pull off wings

Student V: ha ha I can

Student A: could just be having fun

Student B: mine is definitely to have fun. i am just struggling to learn what i am doing

Priorities of students

Students differed in the importance they placed on the look of their avatar. For some, selecting one of the off-the-shelf avatars available when creating an account was enough. Others wanted something more personalised. Others felt they wanted to learn just enough about redesigning their avatars to avoid looking out of place.

Student L: I tried to stay conservative and not stand out too much.

Student O: It wa important to me to stand out

Student I: I just picked the avatar that was most appealing to me

Student K: Yes I'm not ready to be too crazy with my appearance or brave enough to have my avatrave be too unattractive

Student V: My first priority was to figure out how to improve my appearence

Student M: who doesn't

Student B: i want to improve my appearance and that is the only thing i have explored here

Student D: I wanted to learn how to get around

Student V: Il've figured that out but still cant walk right

Students also gave their criteria for their choice of avatar

Student L: I didn't want to look UGLY

Student B: that is my priority

Studen O: I used shopping as practice for navigation

Student V: I wantedto look more "personalized" rather then thesample model

Student B: i chose the gender and nationality that i am

Student A: originality seems important to some as well, beauty in the eye of the beholder

Student L: I want to look like I smell nice.

Student G: then at the same time, I didn't want to be too skinny and generic

Student V: i as well, although I wanted my skin to be darker, but didn't get to that

Student T: I wanted to be taller

4.5.3 Session 3



Figure 4.4 Teaching to the University of Blue students. The author's avatar (blue-skinned male in the centre of the plaza) is the lecturer, surrounded by students.

Students' learning

Some students were still informally tutoring others in the use of the platform.

Student V: are you laughing at my piano skills?

Student E: yes

Student V: hahahaha

Student E: I was trying so sit down at the piano for twenty minutes and couldn't manage it, so I was laughing when you ran up and sat down

Student V: you right click on the seat ... and click on sit here

Factors that support feelings of comfort

As in the first session, students still stated that they were more comfortable with their classmates than with people outside of the class, although the one-to-one correspondence between classmate and avatar was still not fully known.

Student R: its the connection, lam comfortable with this group

Student T: i agree with that

Student R: out on my own, the only people i've met have asked me strange things

Student T: even though i don't quite know who everyone "is" ... I do, but I don't know the avatar connected to them

Student I: I'm not sure I need to know who they are

Student I: but I spend time trying to figure it out in class

Student T: kind of like a dual relationship of some type

Student L: Also, there's trust that the person is in your class and not crazy. well probably.

Factors supporting presence

As well as feeling more comfortable during the teaching sessions with classmates, the students also reported feeling greater degrees of copresence within these sessions. Even though they were not aware in all cases of which avatar represented which student, solely knowing an avatar was *someone* from their class helped with a sense of connection with the other.

Student R: i have in these sessions, not so much on mine own

Student L: yes, I feel the physical presence

Student G: I kind of do, with the people I know irl better

Student V: like here, with people i know i feel more connected

Students also said that they felt more presence the more time they spent inworld.

Student T: The more time you spend here ... I haven't been here in a few weeks, so it seems really strange right now

Student T: The more time you spend here and getting to know people is really important ... makes it seem more real

Another factor mentioned was the absence of a space of their own, which impeded their sense of presence.

Student V: I would feel more connected If I had a space

The ease of manipulating the interface, and finding one's way around the environment, also was a contributory factor towards experiencing presence.

Student A: halfway, need to understand how to find things like clothes, and to hear music for example

Another impediment was the lack of non-verbal behaviours visible from avatars..

Student M: yes but it is difficult for me due to not being able to witness other peoples non-verbal behaviors or reactions to comments

4.5.4 Interview with Student F

Experience of Second Life

Student F faced problems with using the interface at first,

it was my second time on, I teleported, stood on a teleporter, and wound up in this abandoned space station, trapped in a corner, and I couldn't get out. I couldn't see and I couldn't turn around and I'm like "I'm stuck" and I was all alone.

However, once past this stage, Student F's further engagement was motivated by the process of finding some specific personal interest inworld.

I've been on for a while; at least once a day just to get the hang of it. I would spend a couple of hours each day just playing around and finding different landmarks and it enabled me to meet new people,

Student F's continuing engagement was also supported by connections with other members of Second Life.

I encountered a lot of people in a lot of different areas and they were all more than nice to me. I had people coming up and talking to me and asked if I wanted to join their community

This was in contrast to the experiences of many of the other participants in this case study.

I think if I had come across people that were openly hostile, some people said that they had been put in nets or had people run at them with guns and swearing, I think that I would have felt a little bit intimidated by that at first, but I didn't encounter that at all

Although Student F experienced difficulties with the environment at first, he was able to contextualise this as a normal part of the process of learning to become accustomed to the technologies

I got stuck in that corner and I think that was just because I was so new to the environment still, but I think that was really my low point. But I understood going in to it that, like anything, there would be a learning curve, so I wasn't going to let it get me down that I was stuck.

I wasn't afraid of the learning curve and part of that is because I've gone online before in a world or two and have understood that there's a learning curve no matter what you're going to do.

The development of an inworld identity led to greater confidence.

As I establish my identity more in Second Life, I get more comfortable with walking around and talking to people that I don't know. I think the first week that I was on I was so new to the process I didn't really know what I was doing, I just flew around looking at things so I didn't have to talk to anybody. Now I don't mind walking around talking to people who I have no idea who they are because I've started to identify who my avatar is, so I'm not so afraid of what other people might think any more.

Creating a sense of individuality through adapting his avatar was also important.

I think that right now I've given him a standalone appearance, not something that's representative of me but just something that is out there. It's not like random choices. One of the costumes that I put on and walked around with for a little bit was the Kool-Aid guy. I put that on and walked around. He's great for sentimental reasons, but at the end of the day I didn't keep that on that long. I tried to build the avatar in a way that he would stand out on his own and not necessarily blend in with the mix, especially after I got the comment that "oh you look like three others" and then the person listed who they were, so then I said "You know what? I'm going to try to redefine my avatar so that he stands out and doesn't blend in to everybody else in the class".... So I made it important that I went out and if I couldn't figure out how to put it in my inventory at least I could try and create something in the edit appearance so that I could edit my appearance enough that I didn't look exactly like the other avatars any more.

Factors that support presence

Like his classmates in the virtual sessions, Student F stated that he felt a greater sense of copresence amongst his classmates than with other avatars, this was particularly true when he could assign a particular avatar with a particular person.

I feel more connected to the people that I know. When I'm in Second Life on my own and I'm walking around, when I encounter people I talk to them, even just to say "hi", I don't necessarily feel a connection or a presence right there because I don't know who they are, but as I start to grow my fiends list from the class I know all those people, so as I get to know their avatars and who they are, I definitely feel a greater presence.

The sim where the sessions took place also conveyed a greater sense of presence than the world in general.

Like when we're in the open air festival market for class; I feel like I have a greater presence there than I do when I'm out exploring on my own

Opinions on the value of Second Life for learning

Student F identified the reasons that the environment provided a purpose for learning to be around the uses of the environment as a means to deliver more accessibility, to lecturers from other parts of the world, as well as providing an open environment that others could attend.

not only does it provide us with the opportunity to have guest lecturers come in that we might not otherwise have access to, but it enables other people to come in, to listen who aren't even in our class. It always welcomes outside opinions,

The development of an identity inworld is seen by the student as a requirement for a continued engagement with the world

I think you definitely have to be able to grow if it's an environment that you want to keep at.

Developing this avatar requires the participant to be open to the virtual experience:

I would say the biggest thing for anybody who wants to start using it is, you have to keep an open mind. I think if you keep the mind open that ultimately allows you to better develop your avatar,

4.5.5 Interview with Student D

Aspects of Second Life that impede communication and learning

Student D had conflicting opinions to Second Life as a medium for learning. On the one hand, it had interesting aspects for her, on the other "it sucks" and was time-consuming. The time consuming aspects were due to the main mode adopted for discussion in the sessions, which was text chat. Text chat is seen of being of value by Student D, but only if employed as an adjunct to other media.

When we're typing things in, when we're responding by typing, it's extremely time consuming. A lot of thoughts aren't completed and a lot of responses aren't completed to other people's thoughts.

If you say something it might be 8 or 9 lines down of us typing responding to it and then another thought might have come up that somebody else wants to touch on. It happens face-to-face but you're able to follow it more face-to-face because that's how we interact.

We always interrupt each other, that's what we do as people, if they're not good at that they can put their thoughts down [in a discussion board] without anybody interrupting them and actually complete a very good thought.

I think if you did a class though Skype, similar to this, where the dialogue is present-time dialogue I'd like that, but I just don't like the posting of things. I like the posting of things in addition to [other activities].

If the virtual had real-life voice time I would like it more

Communication through discussion boards also has the advantage over Second Life because the contributions are disembodied. Student D proposes that the embodied nature of an immersive virtual world reproduces some of the social anxiety people feel in face-to-face discussions.

they might not say a lot in a conversation, because they're shy or because they think they'll sound stupid, whereas I think those same people are shy on Second Life and afraid they'll sound stupid on Second Life too because they have a physical identity. I think there's an anonymity that goes with Blackboard that people embrace.

Face-to-face synchronous discussions have advantages over synchronous ones because of the ease of incorporating paralinguistic and non-verbal features to communication face-to-face.

it's easier to read people. I tend to be very point blank about how I respond to things and in writing people read more into how we write things because it's grey and doesn't have emotion, it doesn't have humour. I will often say things in humour, but if I write them that way it can appear offensive.

As an environment for younger students it has other disadvantages:

As an educator, I don't find it the safest place to be. ... I'm standing in just the original site I went into and a guy comes in with an erection that big (indicates through gesture a large erect penis) next to me and I find those sites that ... I wouldn't find safe for kids to use. It's offensive to some people. I don't really care but it's offensive to some people.

The difficulties in using the platform were also an impediment for most people:

we were expected to jump in and know how to use it. There wasn't a lot of time for people to be patient and play with it and I think that this class is ... the average age is in the late thirties or early forties so I think it's people that aren't particularly well-

versed in computers all the time either and I think the frustration level, because there's not a lot of time to play with it, gets on people's nerves and I think that's where people get angry and frustrated too with that ... If we had been able to sit down in our class one night with [the lecturer] and really do a little bit more of pre-learning on it I think it would have been a bit easier.

If I hadn't had to do this for class the frustration level would have been too high too quickly and I wouldn't have played around with it. I'd have left it by the wayside and said "fuck that"

Elements of Second Life that support learning

Student D identified two elements of Second Life that were of value – one of these was the way in which it created a sense of presence for the participants (“I think it’s great”). The other was the ability to take on other identities, particularly in order to explore issues about diversity and being different within a community.

I think that's part of the fun of being in Second Life. I think really doing some role playing; still innately being who you are but being able to be creative with it.

I think it would be fun. I think people don't understand how people really do treat people differently. If you are different, if you are black in a white community, if you're British living in the States, if you're an American living in the UK, there are differences that, unless you're that person, people don't necessarily realise.

Sense of presence

Student D had a sense of presence within the environment, experiencing proxemics within the virtual space.

I tried to get a place where I was comfortable to be, so I'd have good visibility of you when you were lecturing; also not being in front of anybody. I wanted to be beside people so you can interact. Had I known other people better in the class, I probably would have sat closer to someone who I knew their avatar's name.

The experience of presence and embodiment was, for this student, immediate.

I felt that right away. I just looked at it as that's kind of an extension of me and if I'm going to do it, I'm going to embrace it...I'm a risk-taker and I think part of trying it is not to fight it. I knew what it was supposed to be and that that was supposed to be a part of me there, so if going to learn from it and get anything out of being in the lecture and that situation that I really put my self into it.

As too was developing an identity online:

I kind of fell into somebody I like right away. When I was playing around one day and somebody helped me and wanted me to change who my avatar was "oh you need new clothes" or new hair, or new this or that [but] I really kind of liked what I tweaked the original avatar to be.

Student B reported that learning to move around had taken her longer to acquire, of the order of 10 hours. However, the student would probably have then gone on to experiment with different identities if this process had not taken up all of the time she had available to learn the platform.

I didn't [try roleplay] because I struggled the first 10 hours that I put into it learning how to manoeuvre and manipulate and go up and down stairs and sit down and stand up. Those are really the things I was more interested in trying.

Developing an inworld identity also helped Student D create a sense of presence in the world.

Me: Did forming an identity help with you feeling the place was one you were comfortable with?

Student B: Absolutely, absolutely.

However, the student did not think that this sense of presence contributed to her ability to learn in the environment, rather that it influenced the way in which she related to the activity; without the sense of presence then she would have still taken on board the content, but done so in a detached manner.

if I had detached from it I think I could have learned from it just as well but I wouldn't have focused so much on my avatar. I would have focused more on ... what I was writing

4.5.6 Reflections on the Blue case study

This case study provided an opportunity absent from the previous ones, which was to observe a learning task that drew upon a situative teaching approach, in that in this case the students were developing knowledge through discussion and interaction. This required a higher degree of social presence to exist amongst the students. These students were at an intermediate point between those of Red students, with no previous experience, and those of Green students with more extensive experience, and had reached the point where body image was becoming important. They were using their virtual bodies to create social presence, but had not yet acquired all the skills required to navigate effectively within the environment. The chat transcripts and the interviews

reveal the extent to which building a body image inworld is an essential part of developing a sense of presence within the environment. This body image had developed at a stage prior to the students developing a strong sense of embodiment within the spaces. This led to the separation of body image and body schema stages in the model of progressive presence. Student B's experience of rapidly achieving the point at which she felt present within the environment also indicates that these stages are progressed through at quite different rates.

The survey data consisted of a very small sample (only two students). One of these (student B) experienced presence, but her satisfaction with the learning experience was low. This runs against the rest of the data that indicated that presence is correlated with satisfaction; however this can be explained by the student not being dissatisfied with the environment, but with the academic content of the course. This exemplifies the difficulties with making any strong statement in a field that is so interpretivist, since so many other variables may influence students' responses.

4.6 Yellow University case study

4.6.1 Description of activity

This case study was a single two hour session in May 2009 located in an IT suite in Yellow University as an extra-curricular activity. Nine participants took part altogether. Four of these had experience of Second Life before the session (between four and ten hours approximately), the remaining five had none. The session involved an introduction to Second Life and the Theatron project, and a tour around the Globe Theatre in Second Life.

The subject-specific content of the session was a staging of the final scene of Hamlet on the stage of the Globe. The activities replicated the steps in staging a real world scene, i.e. props were identified, roles were assigned and the script was analysed to work out placements of actors. In addition, animations were identified that would be required for actions throughout, such as drinking, sword-fighting and dying.

The session ended with a read through of the final scene in the physical room, accompanied by the movement of avatars on the virtual Globe stage.



Figure 4.5 The Yellow University students perform the final scene of Hamlet.

4.6.2 Data collection

The data collected were a transcript of the text chat in the session and recordings made of the inworld activity. All of the participants completed version three of the survey (see appendix A3).

The transcript contained the following features of the interaction between the students:

- As in previous case studies, students' interaction is based on references to avatars' appearance. The individualisation of the avatars enables students to identify each other and adds to their inworld social presence.
- The participants have immediately taken to the use of the first person when discussing their avatars "check me out" "our wings might get entangled".
- Students deliberately blurred real world and virtual world elements, importing ironic flirting ("nice arse") and real world physics ("my wings is heavy") into the conversation.
- The students learned to use gestures to communicate, an aspect that the students in the University of Blue case study specifically noted the lack of. The students in this exercise were

carrying out their activity in an IT suite with support to hand, which may account for this additional learning. Another reason was that students had to learn gestures in order to carry out the performance.

Written feedback about the session included:

"Was a very good way to practise and learn. Learned about Hamlet too."

"Difficult to work out stuff – 2nd life can be tricky... It's best to just jump in & play around".

"Actually quite easy once you get the hang of it... The more I fiddle the more I enjoy it."

"It still seems at a particularly embryonic stage. The potential seems fairly limitless".

"It's quite immersive with lots of people here."

"I can see the process being similar to stage play with early run-throughs being formative"

"A lot of set-up and co-ordination required in terms of assigning roles and objects before the action starts. It's good to be able to see people practising."

4.6.3 Reflections on the Yellow case study

This case study produced very few data, since students used the chat to a limited extent which reduced the amount of transcript to analyse and there was no opportunity to interview the participating students. However, questionnaires were conducted with all of the students. The data from these were all positive about the experience and all reported experiencing presence. However, this was a self-selected group of volunteer students, who were participating out of an interest in the potential of virtual worlds.

The study did add something new to the study however, in that it was the only one of the five to use a logic of immediacy rather than a logic of hypermediacy in its delivery, i.e. all of the other cases were exploring the role of Second Life in mediating the content, or Second Life itself was the content of the session. For this case study, the focus was the staging of Hamlet *as it would be conducted on the physical stage*. The result of this was that, although the environment was convincing enough from a reproduction and spatial aspect, so that the physical placement of the avatars did provide "rewarding pedagogical insights" into staging in the physical world, the lack of control over the animation and motion of the avatars presented frustrating technical challenges (Williams, 2009; 51).

The case study did enable the experience of the first case study to be confirmed, since it was also an introductory session taking place over the space of two hours. By the end of the introductory session, students were able to navigate effectively and were reaching a stage where the activity could be focused upon rather than the technology. The participants were also distracted by the various elements of the environment.

Three participants reported problems with navigation, which is a slightly higher proportion of those who were new to Second Life than in other case studies. This may be because of the nature of the exercise; they also had to display more precise manoeuvrability than in other case studies, since blocking out the movement of the avatars in the scene was the main learning activity.

4.7 Reflections on the case studies

The case studies presented here provided an opportunity to gain data regarding students' behaviour during, and responses to, a range of learning tasks. Using a multiple case study approach also enabled the cases to be reviewed and the study modified slightly between cases. Changes to the research design between case studies included:

- Alterations to the design of the questionnaire to focus on different characteristics of learners.
- Establishing a model of progressive experience of presence.
- Adding a strand looking at students' resistance to learning in virtual worlds.

The cases established a balance between providing too great a variation of tasks, in which case little retesting could take place, and too limited a variation, in which case an overall picture of the responses of students to the environment would not be obtained.

The range of case studies enabled the following to be observed:

- The gradual development of students with respect to ease of navigation through the environment, sense of connection with their own and others' avatar and the sense of immersion. In the Red, Magenta and Yellow case studies most, if not all, of the students were working with Second Life for the first time. The students in the Blue case study had two previous sessions inworld and the students in the Green study had had up to 10 hours inworld. This gave students with a range of different degrees of experience.

- The responses to students to an initial session. The responses of the Red, Magenta and Yellow students in their initial sessions followed very similar paths, indicating that the findings regarding initial exposure are generalisable.
- The difficulty students face when asked to respond to tasks that require a greater degree of presence. The Red and Magenta students were both set the same types of tasks, and both groups displayed similar difficulties with tasks that asked them to reflect on their experience of the space and to draw on their knowledge of inworld communities, indicating that this observation too is generalisable across tasks in initial sessions.
- The effects of gradual development of a greater feeling of immersion. The initial results of the Red case study suggested that with a longer time spent inworld, students would be able to experience an emotional connection with the virtual spaces. This was borne out by the responses of the Green students in a later case study.
- Different responses to cognitive and situative teaching approaches. For those students who were asked to focus on the spaces (the Red, Magenta and Green case studies), the degree of mediated presence influenced how successful these activities were. For those asked to develop knowledge through discussion and social participation (the Blue case study), the development of social presence through avatar design influenced the success.
- Different responses to tasks that draw on a logic of immediacy and those that draw on a logic of hypermediacy. The Red and Magenta case studies had as a learning task the direct observation of the environment; the Yellow case study required students to use the environment solely as a basis for an activity replicating a real life activity. As a consequence the Yellow students faced more technical barriers to accomplishing the learning tasks.

One limitation of these studies is that only one case study was conducted with students with a medium term exposure and one with students with a longer term exposure to Second Life. The only medium-term exposure group was also the only group to engage in a task based on a situative teaching approach. This means that it is difficult to determine whether the students were focusing on social presence because this was related to the learning task, the subject discipline, or because this is typical for students at that stage in their increasing experience of the virtual world. The latter

is possible, since some of the Green students had spent time developing their avatar, and some of the Red students were showing interest in this activity. With an opportunity to design further case studies, an additional variation would have been to investigate situative teaching approaches at earlier and later stage of development than the Blue students to see how students' behaviour would differ.

In the following chapter, the data from these separate case studies are analysed across the individual categories of the conceptual framework to produce a cross-case synthesis of the data (Yin, 2003; 133-134). These are then reviewed and cross-case conclusions (Yin, 2003; 50) are provided in the final chapter.

5. Analysis of case studies

5.1 Introduction

This chapter contains two separate analyses synthesising the data from the case studies. The first of these is an analysis of the learners' experience of presence during the activities that took place in the immersive virtual world. The second is an analysis of the students' resistance to participation in the virtual worlds.

The analysis of the experience of presence is based on a set of quantitative data (contained in the appendices) and a set of qualitative data (contained in chapter 4). The quantitative data were gathered from a series of surveys conducted with the students at the end of the learning activities. These surveys were modified after the first and second case studies to focus on different aspects of the learners' characteristics. The final version was retained for the remaining three case studies. In parallel with this, qualitative data regarding learners' experience of presence in virtual worlds and the factors supporting presence were gathered from transcripts of teaching sessions, of interviews and of focus groups. The analysis is divided into the separate elements of the conceptual framework, i.e.

- Tools and implements (an analysis of the tools used in the activities).
- Rules and conventions.
- Division of roles.
- Communities (the communities with which the students interacted).
- Subject (the learners who took place in the study).
- Identity (the role that identity plays in the educational experience).
- Presence (the role that presence plays in the educational experience).
- Object (the tasks the students undertook).

As the study developed it became apparent that a minority of students were not engaging with the activities, and these students were resistant to the experience of virtual worlds. Section 5.4 is an analysis of the comments that expressed antipathy towards the activities and an attempt to organise these into a typology of responses. The majority of the data for this analysis are from the same data

set taken from the case studies. However, further data about students' resistance were obtained from case studies that did not go ahead. These data are introduced during the analysis.

5.2 Quantitative study of the experience of presence

5.2.1 Design of the questionnaire

The quantitative study consisted of a single page of statements with which students could agree or disagree and was distributed at the end of their learning in virtual worlds. The intention was to explore Biocca's hypothesis that presence promotes cognitive engagement, and so statements covered the extent to which they experienced presence, and also the degree to which they were satisfied or dissatisfied with the learning experience. Another area covered was the students' ease of navigation. The questionnaire also contained statements about the students themselves, in order to identify anything in the students' experiences or preferences that might predispose them, or disincite them, to learning in that environment.

Paper questionnaires were distributed in the first two case studies, these were revised after each study in order to improve the statements on students' tendencies and preferences. The third version of the questionnaire was used for the remaining case studies without alteration; online for the third and fourth case study and delivered on paper in the fifth. The remainder of this section reviews the results for each version of the questionnaire. The analysis synthesising these different versions of the questionnaire is in the following section.

5.2.2 Red case study survey results

The questionnaire was responded to by 14 out of the 15 students, a response rate of 93%. The statements of the students' own preferences and tendencies were aimed at identifying:

- Their degree of naturalisation with respect to technology.
- Their tendency towards roleplay.
- Their tendency towards immersion.

The questionnaire is included in Appendix A1.

Students were grouped into those who were satisfied with the learning activity and those who were dissatisfied (see section 3.2.3 for description of the data analysis method). Students who agreed with statements were given a score of 1 and those that disagreed a 0. Students who ticked the dividing line, between yes and no were scored 0.5. The overall scores for each group, and for the class as a whole, were calculated as a percentage. The results of the questionnaire are shown in table 5.1.

	Overall % N=14	High rating group % N=9	Low rating group % N=5
Degree of naturalisation			
I use instant messaging (MSN, Yahoo Chat etc.) regularly	71	78	60
I play computer / console games regularly	36	56	0
I've used Second Life before	7	11	0
I regularly use social networking sites (e.g. Facebook, MySpace)	100	100	100
Immersive tendencies			
I sometimes lose track of time when I'm reading	100	100	100
I prefer not to talk while a TV programme / film is on if it's one I really like	100	100	100
Some of my friends are people I only know online	14	11	20
I daydream	100	100	100
Roleplay tendencies			
I don't like to communicate with people online unless I know who they really are	71	56	100
I always behave the same way, it doesn't make any difference who I'm with	21	28	10

I sometimes wonder what it would be like to be a completely different person	54	44	70
I'm never really myself in front of other people	14	17	10
Navigation			
It was far too difficult to find my way around	43	44	40
It was too difficult to move the way I wanted to	54	50	60
Presence			
I just felt too detached from the space	50	22	100
I didn't feel like I could relate to my avatar	71	56	100
I felt like I was there	21	33	0
I felt like I was sharing a space with other people in the virtual world	86	89	80

Table 5.1 The responses from the Red case study, separated into those who rated the learning experience highly and those who rated it as low

5.2.3 Green case study survey results

Modifications were made to the questionnaire used in the case study (Appendix A2). Questions about immersive tendencies proved to be ineffective, with nearly all respondents answering yes to the questions, so were dropped. The question on immersive tendencies that remained was the one that focused on their tendency to form relationships that were solely online. The questions on immersive tendencies were replaced by those on cyberinhibition and cyberdisinhibition (so called "textrovertism"), since the participants in the first case study appeared to divide along lines where those who were opposed to virtual worlds were more extrovert in a face-to-face situation and those who were in favour of them were more introverted (table 4.3). Additional questions were included on risktaking due to a suggestion that this may be a factor (Michael Hammond, personal communication, 2009). Again the groups were divided into those who rated the learning activities highly and those that rated it low (table 5.2).

	Overall % N= 5	High rating group % N=4	Low rating group % N=1
Degree of naturalisation			
I use instant messaging (MSN, Yahoo Chat etc.) regularly	40	50	0
I play computer / console games regularly	40	50	0
I've used Second Life before	80	75	100
I regularly use social networking sites (e.g. Facebook, MySpace)	100	100	100
Risktaking			
I only like to use a technology if I can be sure that it's going to work	60	50	100
I think there's no point imagining other worlds, this one is enough	20	25	0
I don't like to communicate with people online unless I know who they really are	60	50	100
There's no point learning something unless it's going to be useful	20	25	0
Textrovertism			
I think communicating using technology is too impersonal	0	0	0
I prefer writing things to saying them	0	0	0
I usually find I listen more than talk in social situations	50	50	100
Some of my friends are people I only know online	40	25	100

Roleplay			
I sometimes pretend to be someone else when I'm communicating online	0	0	0
I always behave the same way, it doesn't make any difference who I'm with	80	75	100
I sometimes wonder what it would be like to be a completely different person	60	75	0
I'm never really myself in front of other people	20	25	0
Navigation			
It was far too difficult to find my way around	0	0	0
It was too difficult to move the way I wanted to	20	25	0
Presence			
I just felt too detached from the space	0	0	0
I didn't feel like I could relate to my avatar	20	0	100
I felt like I was there	80	100	0
I felt like I was sharing a space with other people in the virtual world	80	100	0

Table 5.2 The responses from the Green case study, separated into those who rated the learning experience highly and those who rated it as low

5.2.4 Survey results for remaining case studies

The following case studies used a new version of the questionnaire (Appendix A3). In this questionnaire, additional statements were added to identify the attitudes to virtual worlds that had emerged at that point in the study and which corresponded to resistance to virtual worlds. Some statements were removed to make room for these. These results are shown in table 5.3

	Overall % N=16	High rating group % N=15	Low rating group % N=1
Degree of naturalisation			
I use instant messaging (MSN, Yahoo Chat etc.) regularly	69	67	100
I play computer / console games regularly	68	73	0
I've used Second Life before	63	67	0
I regularly use social networking sites (e.g. Facebook, MySpace)	69	67	100
Risktaking			
I only like to use a technology if I can be sure that it's going to work	25	27	0
Imaginary worlds can't help me learn about the real world.	0	0	0
I don't like to communicate with people online unless I know who they really are	25	27	0
There's no point learning something unless it's going to be useful	19	20	0
Textrovertism			
I think communicating using technology is too impersonal	13	7	100
I prefer writing things to saying them	63	67	0
I prefer to learn by talking to others rather than reading it in a book	50	47	100
Some of my friends are people I only know online	50	53	0
Roleplay			
I sometimes pretend to be someone else when I'm	44	40	100

communicating online			
I'm never really myself in front of other people	31	33	0
Play and learning			
Playing games is just for children and teenagers.	0	0	0
I like to have fun when I'm learning	100	100	100
Navigation	0		
It was far too difficult to find my way around	13	7	100
It was too difficult to move the way I wanted to	37	33	100
Presence			
I just felt too detached from the space	18	13	100
I didn't feel like I could relate to my avatar	12	13	0
I felt like I was there	63	60	100
I felt like I was sharing a space with other people in the virtual world	100	100	100

Table 5.3 The responses from the three remaining case studies, separated into those who rated the learning experience highly and those who rated it as low

5.2.5 Analysis of responses

The cases used small sample sizes, the following observations are therefore only indicative, in that they point the way to factors that support a positive learning experience in virtual worlds and so indicate relationships that may be supported with a larger representative sample and so could be the subject of a further investigation. They also indicate those elements that are not determining factors for a positive learning experience in virtual worlds.

1) There is no observable relationship between degree of naturalisation and a positive experience of virtual worlds.

Both those students who experienced a positive learning experience and those who did not had a similar previous exposure to technology. This reinforces some of the qualitative data, in that students who reported themselves as not particularly interested in technology found the experience of virtual worlds to be a positive experience. This is perhaps driven by the ubiquity of social networking sites; all students had used Facebook or a similar platform, compared with 85% of students in a survey conducted the previous year by Childs and Espinoza-Ramos (2007; 496).

2) None of the students who rated the experience as a poor one were gamers.

Where there was a distinction between the two groups was in the degree of game-playing. In the Red case study, 56% of the group who rated the session highly played computer or console games, whereas none of those that rated it low did. For Green students these percentages were 50% and 0% respectively. This compares with 81% of adults from the age group of the students in the Red and Green case studies being gamers in the general population (Lenhart, Jones and Macgill, 2008; 2). In fact there was a higher percentage of gamers amongst the remaining case studies (73%) even those most of these participants were mature learners. Although virtual worlds are dissimilar from games; a correlation between the two activities is indicated.

3) There is no observable relationship between immersive tendencies, roleplay tendencies and the likelihood of a positive experience in learning in virtual worlds.

The immersive tendency reported by those who rated the experience highly and those that rated it low is very similar. This could be due to the lack of discrimination provided by the questions asked. However, this could be an example of the Forer effect, or personal validation fallacy, i.e. these are statements that appear significant but could be applicable to anyone (Stubbins and Stubbins, 2008; 115). The respondents will therefore all answer positively and this will not result in distinguishing between the two groups. Taking these results at face value, however, indicates that a general ability or willingness to become immersed by media as a whole does not predispose or act against students' ability or willingness to become immersed in a virtual world. Similarly, the roleplay

questions, although creating a wider variation in responses, do not indicate that one group is more likely to have a tendency to engage in roleplay than the other.

4) There is no observable relationship between risk-taking and the likelihood of a positive experience in learning in virtual worlds.

This is very difficult to ascertain from the data, since only two respondents who fell into the negative category were asked this question. The group who did find the experience positive tended to be risk-takers.

5) Those who had a negative response to the experience of learning in an immersive environment tended to be disclosurist.

Disclosurism is the need that some participants in virtual worlds feel to discover who the person with whom they are interacting “really” is, rather than relate solely to their virtual persona. Although the participants who rated the experience positively were evenly distributed between disclosurist and non-disclosurist, six of the seven who found it a negative experience were disclosurist (i.e. agreed with the statement “I don’t like to communicate with people online unless I know who they really are”). This may indicate a particular distrust of pseudonymity amongst this group, or that this group feel that the online interactions are inauthentic.

6) Textrovertism is not strongly linked to a positive experience in virtual worlds.

Within both groups (those who found the experience a positive learning experience and those who found it a negative one) there appears to be no strong preference for written or verbal communication.

7) Participants disagree with the idea that online communication is impersonal.

With only two exceptions, all those who responded, whether having a positive or negative experience of virtual worlds, disagreed with the statement that online communication is impersonal. This may, again, be due to the ubiquity of social networking sites, which all students have experience of.

8) All participants agreed with the idea of playing being a part of learning.

This question may also be subject to the Forer effect, since few people would categorise themselves as against fun. However, this contradicts some of the unsolicited comments gathered outside of the survey, where people expressed a disapproval of virtual worlds because they viewed them as games.

9) Ease or difficulty of navigation was not a factor in whether the students found virtual worlds a positive or negative experience.

Both groups responded similarly in response to the statements about ease of navigation, indicating that having difficulty in moving and wayfinding did not affect how they valued the educational experience. The more time that the students spent with the software the fewer problems they had with navigation using it. This is indicated by the number of agreements with statements of difficulty (13 agreements with the statements that the students experienced difficulty from the Red case study from a sample of 14 participants; compared with 1 from 5 from the Green survey).

10) The navigation skills from gaming are not transferable to navigating a virtual world.

Taking the gamers in the Red case study as a sub-group and looking at whether these found navigation difficult indicates that amongst these participants about half (the same as the group as a whole) did so; i.e. being a gamer does not necessarily give one an advantage when learning to navigate in a virtual world.

11) Experience of presence is correlated to valuing the learning activity.

Respondents with scores of 2 to 4 were classified as experiencing a high presence; those with 0 or 1 as low presence. Those who scored 3 or 4 when asked questions about satisfaction with the learning activity were placed in the high rating category. When grouped according to these divisions, the matrix (shown in table 5.4) is produced.

	High presence (2-4)	Low presence (0-1)
High rating (3-4)	26	2
Low rating (0-2)	1	6

Table 5.4 Showing responses of participants with respect to experience of presence and of rating the learning activity as positive or negative.

The table indicates a strong correlation between an experience of presence and rating the learning activity as a positive one. A chi-squared test on these values produces a p value of $\leq 1.2 \times 10^{-12}$, i.e. smaller than 1 in 860 million. This does not mean that the students' cognitive performance was actually improved. However, if the students' perceptions that they had learnt effectively are accurate this does show a very strong one-to-one correlation between learning and the experience of presence. This would support Biocca's statement that "as with other forms of presence ... increases in self-presence are correlated with higher levels of cognitive performance."

12) Copresence is the most commonly experienced of the forms of presence.

Of the forms of presence that the participants experienced, copresence was the most common (i.e. nearly all answered yes to the statement "I felt like I was sharing a space with other people in the virtual world". Both those who rated the learning experience high and those who rated it low reported some sense of copresence, with the majority of both groups stating that they felt like they were sharing a space inworld with other people. In fact, for the group that rated the experience as low in the Red case study, *this was the only form of presence they reported experiencing*. Copresence and mediated presence are usually thought of as inextricably linked. As Taylor (2002; 44) states:

Through action, communication and being in relation to others, users come to find themselves "there". It is through placing one's avatar in the social setting, having a self mirrored, as well as mirroring back, that one's presence becomes grounded.

For these participants, their sense of connection with others within the space however this did not result in them being grounded in the setting. Possible explanations for this are that although they felt aware of the others in the space, they had no sense of *themselves* in that space; their connection with their own avatar was absent.

5.2.6 Conclusions regarding the quantitative data

Few firm conclusions are possible due to the low numbers of data, and due to the majority of the participants being self-selected (either self-selecting for the learning activity, or self-selecting for participation in the survey). However, the results do indicate that a sense of presence is a prerequisite for a successful learning experience. The factors that influence whether participants will experience presence are not so clear. Previous exposure to technology, immersive tendencies,

roleplaying tendencies, textrovertism, risk-taking and attitudes to play in learning all seem to be similar for those who did not value the learning experience and those who did. Two elements do seem to be clear; people who rate the learning activity as poor are disclosurist, and are not gamers.

The following section aims to find the elements that may influence participants' views of the effectiveness of the learning activities from within the qualitative data.

5.3 Qualitative study of the experience of presence

5.3.1 Tools and implements

In Leont'ev's representation of Activity Theory, an individual or group acts on a task by employing a range of tools that can include technological devices, or simple tools, or even language and concepts (Center for Research on Activity, Development and Learning, 2004). Steuer (1995; 37) defines a mediated environment as one which forms the space in which interaction can occur, individuals communicating directly with the space rather than each other. In these case studies, all the interaction is mediated via Second Life, in both Activity Theory's and Steuer's meaning of the term "mediated". The discussion in this section reviews how the students experienced the environment and how this influenced the learners' experience of presence.

Realness of the environment

All of the students were exposed to the same software, running on very similar hardware, i.e. all were exposed to the same degree of breadth and depth of sensory information (Steuer, 1995; 42) and yet the students' descriptions varied regarding how realistic the environment was. Some found the environment to be realistic, for example the student from the University of Red who stated that "Even though you're not actually there you can walk around it virtually and go to different places and perhaps do more with the space than you could do in real life" or the student from Green College who stated that "The environment's amazingly detailed I think. Like just walking around in some of the shopping plazas and stuff and all the background and everything". The lecturer who took part in the Yellow University case study stated in a separate report that "the elegance and

harmony of the Theatron Globe as a performance environment also inspired and delighted participants” (Williams, 2009; 52).

Those who have not experienced presence within the activities were also those who raised issues with the design limitations of the environment. For example, statements from the Red case study such as “You don’t have the feeling of it” coincide with “The whole design of it is quite poor” as well as statements of normative values of what theatre should be (“you need that element of it’s something special about the actual performance”). Those students that do recount experiences of presence (“Even though you’re not actually there you can walk around it”) also express interest in what the medium may be capable of in the future (“and perhaps do more with the space than you could do in real life”) also coincide with what may be achieved in performance terms (“With the placing of the audience you could do some really interesting things, like they could fly over the performance”).

Also while describing their experience of presence, or lack of it, the students place the cause of this as external to them. For example, the sharing of the experience of walking around a theatre with other avatars rather than to moving through 3D models as a disembodied presence is seen as having no additional value by one student (“I can’t see that it enhances it any more”) but leads to a shared experience for another student (“you could physically, well not physically, walk them up to the bit you were talking about.”). The failure to experience presence is perceived to be a fault of the technology, or of the nature of what the technology is expected to achieve, rather than their own individual perceptions. Those who experience presence see this as a success of the medium.

This problem of defining technology in terms of the perceptions of that technology, rather than having an objective measure is highlighted in the literature. Biocca (1997) criticises Steuer’s concept of vividness in that it defines a feature of the technology through its effect on the person observing it, implying that realism and vividness are objective qualities. Ellis states that the experience of realism is due to the interpolations the students make by processing those observations (Ellis, 1991; 323) and it must therefore be at this point in the process where the difference arises. The experience of the students would tend to reinforce these statements by Ellis and Biocca. Despite the perceptions of the students that the failure or success of the technology is integral to its design, not their perceptions, their disagreement in its realness and vividness indicates that integral to the

process is how the individual perceives it and is linked to the difference in students' development of presence.

Interactivity

Some of the theatres explored on the "field trips" with the Red and Magenta students had interactive elements, curtains could be opened and closed and objects could animate the students' avatars. However, these forms of interaction did not necessarily add to the students' sense of immersion. As one Magenta student stated; "I felt more like I was playing in a world as opposed to enjoying the space" i.e. s/he was simply interacting superficially rather than experiencing the environment.

Interaction with the environment did involve students when there was some form of personal involvement with the space. This did not necessarily mean clicking on objects and getting a response, in the sense that Dreyfus means interactivity (2000; 57) i.e. "What gives us our sense of being in direct touch with reality is that we bring about changes in the world and get perceptual feedback concerning what we have done", but instead there was something about the environment that encouraged their participation or engaged their emotions. For example, the student in the Red case study who felt it was important to dance on the stages, since "i like dancing, because we're on the stage it feels right". Student F in Green discussed the difference between Orientation Island (the introduction to Second Life which is based around interacting with objects) and the Kristallnacht exhibition in the following terms:

When it was just in that little bit when you first start, that was not really the thing because it was like a computer game. Then but when you start ... I think it was when we went to the German little town you know with the Jews and stuff like that? ... there's so much information that you can gather from it.

With the students who had spent longer inworld (those from Green College and the University of Blue), one factor that distinguished those that rated Second Life highly as a learning experience from those that did not is that they all found some personal involvement with the platform, either exploring the world to find specific locations, or personalising their avatar. For these students, contrary to Dreyfus's statement, experiencing the virtual world as real is not brought about by manipulating the world, but through having an emotional engagement with the space, either

through doing something in that space, or through the information observed having an emotional impact. Green student A also makes this point:

we actually have to perform in different spaces to get the atmosphere ... you get that atmosphere from actually watching it and your thought processes about what's going on in that space.

Conversely, the one Green student who did not find working within the virtual world a positive experience did not find anything to engage him. Whether this was because he did not find something to engage his interest because of his lack of feeling of presence, or he did not feel presence because he did not find anything to engage him, is difficult to say. It may have been that activities such as participating in a community, or building, may have been rewarding for him. However, the skills required to conduct the activities take a longer time to acquire, and unless simpler activities engage students they will not spend enough time inworld to acquire the skills in order to find the elements that will engage them.

Communication channels

Students in the Red case study managed to mix the communication channels easily, switching between using the text chat inworld and calling across the room in the physical space. Conversation flowed between these channels and was easily managed by the students.

Most Blue students found text a cumbersome mechanism for communication. Blue students reported it as awkward, inefficient and time-consuming and would have preferred to use voice. The lecture part of the sessions may have been more successful than the discussions for this reason.

Text chat slows down the interaction and also creates multiple discourses, which can be difficult to follow and also means that discussions may not be completed. It also means that there is a time-pressure on contributing, resulting in participants feeling under pressure to submit posts that are not fully thought through or to not contribute them at all. Face-to-face discussions can present similar pressures, but these are more easily managed since the participants have non-verbal cues to support the interaction. Using an online discussion board has advantages over synchronous text because it allows longer thinking time, particularly for people who find interjecting in a face-to-face environment difficult. One Blue student, however, also found Second Life an easier medium to

interject and be heard in than a face-to-face classroom and stated that “it was much easier to post my thoughts than try to talk in class”.

Blue student D stated that this isn’t an inherent problem with all distanced synchronous communication, since ones that employ voice (such as the videoconferencing medium being used to conduct the interview with her, or using voice chat in Second Life) overcome this problem, it is the slight delays introduced through the need to type which introduces the difficulties with communication.

I think if you did a class though Skype, similar to this, where the dialogue is present-time dialogue I’d like that, but I just don’t like the posting of things. I like the posting of things in addition to [other activities].

Offering students a combination of different modes within a session may then be the preferred option for running these sorts of sessions.

A problem expressed by some students was the lack of non-verbal communication such as body language for example Blue Student M stated “it is difficult for me due to not being able to witness other peoples non-verbal behaviors or reactions to comments”

Navigation

Naturalistic locomotion

The difficulties encountered with moving through the environment varied across the five case studies, due mainly to the amount of experience of the different groups of students. The Red and Yellow University students had the least experience, with statements such as “navigating is quite hard” and “Difficult to work out stuff – 2nd life can be tricky”. The students at the University of Magenta were largely new to Second Life, but had experiences of other virtual worlds and some of those students also were “really frustrated not being able to move around properly”. Although the students in Blue had more experience of the environment, some were still having difficulty in moving around even in their third session inworld, for example comments such as “I’m worrying about sitting down and can’t do it”.

The statements about difficulties and successes in navigation were accompanied by statements about the importance of it for engaging with the environment. Becoming more used to navigation

made a big difference to the students' experience, for example from Yellow University one student stated that "Actually quite easy once you get the hang of it... The more I fiddle the more I enjoy it." Others could anticipate that they would feel more immersed once they did not have to focus on movement in order to move "I imagine one day i'll just realize i'm doing it without effort and then there i'll be... for that" (Blue student O). A Magenta student was aware of the importance of this as a prerequisite for learning "the 'student' needs to learn the environment before they can learn anything in the environment. This could lead to frustration if they have difficulty in the first part". Controlling the camera was particularly noted as difficult, e.g. this statement by a Magenta student "Decent camera control takes a week or so... Really intuitive once you get the hang of it but the camera especially takes some getting used to ^^^"

A few of the students talked about the process about using the interface as a steep learning curve. Blue student F made the observation, however, that "I wasn't afraid of the learning curve and part of that is because I've gone online before in a world or two and have understood that there's a learning curve no matter what you're going to do." This is the distinction that Wenger refers to as distinguishing between marginality and peripherality (1999; 164). Blue student F, because of his previous experience, is able to discern that the difficulties he experienced with being trapped in a corner of the room is a transitional, and inevitable, part of the process of participation, and so recognises this as a stage of an inbound trajectory (Wenger, 1999; 154 – 155). A student that does not recognise this as a transitional experience, and so feels that the difficulties with navigation marginalises them, may withdraw from further engagement.

Magical locomotion

None of the students in the Green case study had difficulty with navigating and moving within the virtual world. However, these students had spent many hours working in Second Life. These students did, however, have an ambivalent attitude towards the "magical" means of movement (using Bowman's term for non-naturalistic movement such as teleportation and flying [2002; 283]). Although enjoying the potential to just reappear in a different place was thought of as "really cool", the possibility of triggering teleportation accidentally raised anxieties "I thought I'd leave it alone because I don't want to end up being transported somewhere and not know how to get back." Flying

was also a mechanism for movement that was particularly enjoyable, for example Green student D stating “when you get to fly and you get to fly really, really high up in the sky and all the clouds and birds flying past you. That was really detailed and that was really fun to be there”.

The potential these magical forms of movement gave for open exploration were part of the immersive nature of the platform for some of the students, with comments such as “Yeah just flying and seeing where I land. That’s one thing I find quite fascinating” “There's no boundaries; you can just fly off somewhere. One second you're in the Globe and then you're somewhere else”. However for another of the Green students, although enjoying teleportation as a form of movement, this made the environment less real for him and therefore less engaging.

Unobtrusiveness

The difficulties experienced in the short term by navigation also made the technology more obtrusive, many of the discussions by the students in the Red case study were about how to move and what movements were possible. In addition, all of the students reported technical difficulties with the platform, experiencing lag and long render times and occasional crashes when working within Second Life. These technical problems did interfere with the enjoyment of the experience, but for those students who found it a positive experience were prepared to justify the disruptions experienced, for example Green Student A stating “it's our own impatience. We're so used to having everything quick, aren't we? In our hands. And to wait 15 minutes for something to appear, we're not used to it” and Green Student D stating “but you get that with pretty much any software”.

Bowman (2002, p. 281 - 282) states that obtrusiveness of the technology interferes with a sense of presence. However, even though the technology remained obtrusive, many students still felt presence (although some did not). Instead, for those students who still experienced presence, interruptions were overlooked, or incorporated into their experience with minimal distraction. This may be part of the process Murray and Sixsmith (1999; 324) refer to as the tool withdrawing “into the architecture of the body”, so that rather than is not obtrusive, it is instead “not separate, but part of bodily experience”. Those students who have successfully appropriated the technology still see the disruptions, but don’t experience it as an external imposition, but have incorporated it as an integral part of their connection with the virtual world.

5.3.2 Rules and conventions/division of labour

In the expansion of Activity Theory to consider the *setting* for that activity, three other factors were included to the model. The rules and conventions that govern the activity and the manner in which tasks (or labour) are divided between participants within the activity are two of those elements. Wenger also considered the influence of social structure on learning in his Communities of Practice model. The way in which virtual worlds transform these rules, conventions and roles are considered below.

The use of the platform appeared to undermine the rules and conventions of classroom behaviour and disrupt the division of roles between lecturer and student. In the Red case study, students were easily distracted by the potential of the platform, and would take to dancing, or banter, or consuming magic mushrooms, rather than focusing on the tasks.

The distractions of the environment were seen as an inevitable consequence of being in a virtual world, for example Red student B's comment "Well what did you think was going to happen?" and several of the Magenta students comment on how distracting the environment was.

The students who have spent longer inworld are not distracted to the same extent. For example, the Blue students stayed on task once the sessions started, and the Green students did not comment on the distracting nature of the environment being a problem.

As noted by Becker and Mark (2002; 33), social conventions did develop to maximise social presence. This was most obvious in the Blue case study, possibly because these students had spent longer time inworld than all but the Green students, and/or because their activities involved more social engagement because of the collaborative learning nature of the activity. Social conventions developed here were those of individuation of avatars to enhance the distinctiveness and enable them to be recognised. Students based much of their interaction around the appearance of their avatars, discussed further in section 5.2.4, and were disconcerted by my habit of morphing through various forms, since this undermined their ability to identify me ("I LOVE the morphing that Gann can do. I was taken aback at first, mostly because I didn't know who it was"). The students also employed proxemic conventions in the positioning of their avatars, for example Blue Student D discussing her choices regarding placing her avatar so that it was beside others to talk to them, had a

good visibility of the lecturer and didn't block anyone else's view, despite the fact that none of these were necessary within the environment, indicates that she had transferred these conventions from the physical world in order to make her virtual world interactions more like physical world ones. Figure 4.4 indicates that these conventions had been adopted by the whole class. Similar conventions are indicated by figure 4.3 in which the guest lecturer and module leader can be seen positioned at greater distances from the students they are observing, despite the technology enabling them to observe from any location.

5.3.3 Engaging with communities

Community, within the context of the study, can mean both the community of learners and the communities with whom the learners interact within the virtual world. This study focused on the interaction the students had with the inworld communities, which was minimal.

Although many of the students who had spent longer using Second Life had discovered activities with which they could become personally engaged, these activities were entirely solitary activities. "I think we only got one invitation to join communities and groups and that was from (the lecturer). I don't think we really went outside (of that group)" (Green student D). Green student E made some attempts to communicate with residents but these were rebuffed "there was one I walked up to them and said 'hi-i-I' they just said 'hi' back. I was trying to talk to them and they were just 'I'm busy go away' and I was 'OK'. Other students related similar experiences. Other factors were;

- A lack of interest in participating in these communities by the students.
- Lack of experience in searching for and participating in communities.
- An inhibition about talking to other avatars within the environment.
- Lack of time.

Blue Student F's experience was quite different to this: "I encountered a lot of people in a lot of different areas and they were all more than nice to me. I had people coming up and talking to me and asked if I wanted to join their community" however he did recognise that some of his peers had been on the receiving end of grieving, "some people said that they had been put in nets or had people run at them with guns and swearing", suggesting in class that this might have been due their appearance "We talked about appearance and how blending in was a tactic to avoid bullying".

Students with less experience of Second Life seemed unaware that there were communities inworld. The Red and Magenta students were unable to answer the question posed to them about the nature of the communities that had built the Caledon Gaiety and the Ballet Pixelle stage, example responses being “I’m confused” and “this question has me stumped”.

The community of learners surrounding them was important for the students who had had more exposure to Second Life. Although the Blue students did not know which avatar corresponded to which classmate, they knew that all the avatars present were avatars of classmates and this reassured them. Blue Student R states: “its the connection, iam comfortable with this group. out on my own, the only people i've met have asked me strange things”, Blue student L confirms this by saying “there's trust that the person is in your class and not crazy. well probably.” This sense of security with the people that surrounded them added to their sense of copresence within the group.

5.3.4 Characteristics of the subjects

Within the description of Activity Theory, the subject of the activity is the individual or group whose point of view is investigated as part of the study, in this case, the learners who took part in the sessions. The quantitative part of the study indicated that the some aspects of the students’ predispositions, i.e. their experience with technology, had little influence on the degree to which they were satisfied with the learning sessions, other aspects, such as their ability (or preference) to experience presence, were strongly related to how satisfied they were with the learning activities. These findings were echoed by the qualitative data.

Degree of naturalisation

The statements in the interviews with the Green students indicated that whether a student engages with learning in an immersive virtual world is not related to their experience of the technology itself. One of the students who felt the learning in virtual worlds was effective was not someone who was normally comfortable with technology (Green student F), the other student who was not comfortable with the technology rated the experience low. The remainder of the students described an enjoyment of technology, either through console games or through previous exposure to Second Life.

Although having a superficial similarity with games, students' experience or otherwise with gaming did not seem to predispose them to interacting with Second Life, the appeal of Second Life over games to those who liked it, seemed to be its use as a space for exploring and representing oneself as an avatar over that of playing a character in a game. As Green student E stated "it's real, instead of controlling other people, you control yourself".

A correlation between gaming and participating in Second Life may be due to a factor raised by Magenta student X, in which the student says that "I have spent years of my time 'projecting' myself onto various characters in video-games". In the survey data in the previous section it appears that all gamers experience presence and this may explain this correlation, i.e. it could be assumed that without this ability to project onto one's game character, games would not be engaging and the person would not continue to be a gamer.

Embodiment tendency

Two students, Blue student D and Green student C had a mixed experience of the virtual world. Blue student D had a feeling of embodiment, saying that "I just looked at it as that's kind of an extension of me and if I'm going to do it, I'm going to embrace it." However, she also said that she was still not willing to take part in it. Her comments were that "Sitting at my laptop when I don't have to is usually something I don't care to do." These statements echo the account of Student C in the Green case study who described the experience as "just staring at the screen for ages". For both of these students, although they do not express a disapproval of the *concept* of virtual worlds, participating in the virtual world feels as if it is just sitting and looking at a computer screen. In contrast, the Green students, students A, D, E and F talked about the liberating experiences of being able to visit the various places within the environment. Student F described the experience of being transported there through association with "the little fella walking about" on the screen, and Green student D described how in the virtual world "you get to fly and you get to fly really, really high up in the sky and all the clouds and birds flying past you". For these students, this is not a sedentary experience since they are not as aware of their bodies being stationary in front of the screen, but they have managed to "transform" or "transport" themselves to the virtual world. For students who have not

made this transference the perception of their real bodies has disrupted the sense of virtual presence (Murray and Sixsmith, 1999; 327).

The consequences of this are discussed in section 6.3.3. The effects of this on students' engagement and resistance are discussed further in section 5.4.2

Roleplay tendency

In the case studies, the students did not roleplay, or (in the distanced activities where offline identities could not be confirmed) did not declare that they were roleplaying. Assessing the students' tendency to roleplay is therefore difficult to assess. However, the students did display differences in the degree to which they were prepared to accommodate non-realistic or fantastic elements in their interactions. Some Blue students wanted to be conservative with their avatar's appearance or not "be too crazy"; a Green student liked the variety offered by Second Life, such as medieval dresses and avatars made from cardboard boxes, compared to the unlockables available in games that consisted of, for example, a dress or jeans. This contrast could be due to a greater confidence due to having spent longer in the virtual world, or it could be because of unease about non-realistic elements. For example, when it was pointed out in the Blue case study that everyone in the group had chosen a human-looking avatar, Blue student L responded that "I think it's frightening when it's so new to even consider representing yourself as non-human" a point which one of his/her fellow students agreed. The students appeared to be responding to the range of opportunities in different ways, some willing to experiment with the possibilities of the virtual world with regard to identity, and others feeling daunted by the idea of being different, indicating that the choices between anthropomorphism and polymorphism are not as balanced as Murray and Sixsmith (1999; 316) imply. Bayne (2008; 201) discusses this unease with non-realistic elements, particularly the use of non-human avatars and finds that for some students who do not object to virtual worlds *per se*, this aspect is one they do not feel comfortable with.

Inhibition v disinhibition

Because the Blue students did not necessarily know which of their classmates was represented by the avatars, although they knew that all of the avatars came from their class, matching up avatar to classmate was something they were attempting to guess but had only been partially successful at

this. Most students were concealing their offline identities. The consensus opinion of the Blue students was that they felt more comfortable when talking to their classmates and being in the familiar settings of the marketplace where the classes were held, rather than in other parts of Second Life. That they also felt a stronger sense of copresence when with this group correlates to Caspi and Blau's assertion that copresence is greater when there is identification with the group with whom one is interacting (2008; 326) They were comfortable with the group and felt that they could trust that the people they were interacting with were ("probably") not "crazy" and not potential griefers. The need for disclosure in order to be reassured was therefore avoided.

However, the Blue students differed on whether they felt more or less comfortable in the virtual class than a face-to-face class. Some felt that the pseudonymity was conferring the freedom to be themselves more, and so felt more safe, others felt less safe because they didn't know who each other were in real life in all cases, cf. this exchange between Blue students L and R on one side of the debate and B and T on the other.

Blue student L: not so much because we don't know who one another is yet

Blue student R: no, not right now, people don't know who we are yet

Blue student T: No I think it IS safe because you are hidden

Blue student B: i agree it is more safe here to be "yourself"

The real self being known can increase sense of self-consciousness in some students and increase the sense of security in others. This reflects the augmentationist versus immersionist debate, where augmentationists prefer to use the virtual world as an extension of real interactions, and the immersionists hide their real world selves and feel they can be their true selves online. This is echoed by Green student F who notes that the expectation is that a virtual world is an environment where "most people would be more flamboyant when they're in there" however he states that even though he is "very loud and boisterous and stuff like that" in the physical world, in the virtual world he is more introverted.

The Blue students also reported that they felt self-conscious inworld because they were embodied, for example comments such as Blue student Z ("I worry about looking silly in this because I don't feel comfortable with this type of environment") and Blue student D ("don't want to look "stupid" ... I'm worrying about sitting down and can't do it"). One of the Magenta students also commented about being self-conscious within the environment ("felt like a total novice whilst others

are very experienced in SL, blowing fireballs etc"). From the comments made by the students, it appears that the embodiment within the environment that virtual worlds provide may actually reintroduce some of the self-consciousness that causes inhibition in the physical world that is removed through online text-based interaction; for those students who feel embodied within the environment this may counteract the disinhibitive effects of being online and be counterproductive.

Table 4.3 showed the difference in the percentage of time in the focus group expressing negative opinions about virtual worlds, compared to the percentage of students expressing a negative viewpoint in the questionnaire. This indicates that those who felt antipathy towards the use of virtual worlds were far more vocal within the focus group than were those who supported it. The discussion was not indicative of the opinion of the class as a whole, and those who found it a valuable experience remained largely quiet. This does raise doubts about inherent bias in the use of focus groups to gather representative opinions about virtual technologies. It may be that those students who perform better within face-to-face environments are less likely to be in favour of virtual worlds as a means for communication, and vice versa.

Other characteristics raised by students in discussions

The students in the case studies raised other factors that they thought might influence engagement with the virtual worlds.

One factor is that some people will take to the environment faster. Magenta student "I think folk visitng this sapce will have differing levels of satisfaction of simply being here those who dont instantly get it may not come back"

Also Magenta student X said "I think with most people, there is a limit to how far they can abstract or imagine things, which would make it harder to accept what they consider an 'imaginary' space." This echoes Heeter's description of immersive tendencies, i.e. propensity to engage belief in a virtual world (1995; 200).

Blue student F also suggested that participants need to be resilient to some of the negative experiences that may occur. "I would say the biggest thing for anybody who wants to start using it is, you have to keep an open mind. I think if you keep the mind open that ultimately allows you to better develop your avatar, because I think if you shut off after the first time or two, if you have one

negative experience and you close off and say "I don't like this and I won't waste my time on it" I don't think you're going to grow as much in the world."

Blue student D attributed part of her accomplishments with learning to use Second Life as being "a risk-taker and I think part of trying it is not to fight it. ...That part of it I embraced. I really made myself part of it. I also have this attitude ... I'm 51 now and once you pass 50 you have that "I don't give a shit" attitude. I think that's a good way to be."

5.3.5 The role of identity

The creation of an online identity is not something that concerned the students who had only spent a short amount of time inworld (i.e. the Red, Yellow and Magenta groups). Although the look of their avatar was important (see the following section on self-presence) this was not located around creating a new identity for themselves inworld but in projecting their offline identity or in individuating themselves.

For the Blue students, who had spent a longer time inworld, they had thought a great deal about their inworld identities, perhaps because the rationale for being there was to examine human behaviour in those circumstances. Although none of them declared any attempts at identity tourism, some had noted differences between their online and offline behaviours. These differences were a lack of self-assurance and feelings of competence.

The Blue students' statements about their looks reveal that they are working through their self-representation and self-identification inworld, for example: Blue Student L stating that "I think my clothes say I'm not a risk taker", Blue Student M stating "Your stance makes you look confident" followed by Blue Student T ("make you look like you're part of this world") and Blue student B "mine is definitely to have fun". Even those who did not adjust their look very much had considered it and chosen something that corresponded to how they wanted to be seen inworld. Blue student D stated that she "kind of fell into somebody I like right away. ... somebody ... wanted me to change who my avatar was (but) I really kind of liked what I tweaked the original avatar to be." Establishing this identity also enabled her to feel more comfortable inworld. Green student F felt that "it's my little slice of me in that world, even though it's a general avatar, you know what I mean, it's not changed,

it's just the boy next door," so had still felt as if the avatar represented him, even though he had not modified it.

This corresponds to Carruthers's description of body image, i.e. "a set of beliefs, attitudes and perceptions that are about one's body" (Carruthers, 2009; 124). The look of the avatar is an important stage in the development of the students' engagement with the world, it enables them to be identified to others, and to have a sense of identity within the space, a function that de Vignemont states body image fulfils in the physical world (2007; 439). Developing an inworld body image was so important to some students, they made altering their appearance a priority, ("My first priority was to figure out how to improve my appearance", "i want to improve my appearance and that is the only thing i have explored here") even before being able to move properly ("I've figured that out but still cant walk right").

The Blue students also discussed the extent to which they felt able to play with their identities. Student B, whose avatar was the only one of the students to have a non-realistic attribute (i.e. wings) stated "Well, i had started out looking somewhat like myself - then once i figured out how to chang it more, i went with a totally different look - i like the wings becasue i am a big dreamer... well, i always wanted to be blond with big long hair and thin :) - i like the out there look. shows creativity".

For Blue student F, personalising his avatar so that it was able to be differentiated from other similar avatars was important for his sense of identity inworld. Developing this sense of identity also enabled this Blue student to feel more confident.

Blue student D also felt pressure to personalise her avatar, but did not feel the need to make too many changes to achieve the necessary degree of individualisation. After a few minor modifications to her avatar's metrics and the addition of one or two accessories, she felt she had a look that would represent her identity inworld. As with Blue student F, forming an inworld identity helped her form a sense of presence and belonging to the virtual world.

The Green students had had a longer time in Second Life so had more opportunities to consider the role of their identity. The four that had a positive experience of Second Life experienced the transition to the virtual world in different ways. Two felt that their online identity was the same as their offline one, although they had made some alterations to their online appearance. A third,

Green student F, felt inhibited online, in contrast to his offline identity. He had also made no alterations to his avatar's appearance, instead keeping his original generic look. Of the Green students, Green student A had the most complex relationship with his online identities, choosing a range of alts, each operating within a different type of environment, each with a different appearance and each reflecting a different mood or aspect of his identity.

The statements by the students confirm the stages identified by Warburton (2008) in section 2.3.8. The students who had short term experience of the virtual world were close to the threshold of competence, or had crossed it and were continuing to experiment with movement and interaction inworld. Playing activities, such as dancing or taking magic mushrooms, were activities that helped create a connection with their avatar; through interaction with the world via their avatar they became embodied within the environment (discussed later in this chapter) and developed an identity inworld. Many of the Blue and Green students, with more experience inworld, had crossed that care threshold and would talk about the avatar as "I".

However, despite having spent similar time inworld, not all of the Green students had crossed this care threshold; Green student C still referred to his avatar as a character, rather than an extension of himself. On the other hand, the one of these students who had been a resident in Second Life for years before the beginning of the learning sessions (Green student A) not only had developed an extended identity inworld (crossing the third of Warburton's thresholds) but had created multiple avatars to differentiate different inworld identities (the final one of Warburton's thresholds).

5.3.6 Presence

Developing presence over time

Students when first faced with exploring the environment are initially preoccupied with learning the skills required for successfully moving within and interacting with the environment. Once the first of these skills are acquired, then students can begin to build a sense of presence, since their focus is no longer solely on acquiring technical skills but also on exploration and play.

North, North and Coble noted that “The subjective measures of sense of presence in the VE (virtual environment) increased gradually during each session” (North, North and Coble, 2002; 1075). This was borne out through the case studies, for example the Red students displayed increasing levels of immersion and embodiment within the environment throughout the session. Conversations in the early stages of the Red session were typified by:

- The avatar referred to as “it” or “she” or “he”.
- Discussion about manipulating the avatar (“does it not jump forward?”) or how to find the way (“where is everyone?”).
- Discovery about the capabilities of the environment (“oh we just jumped on the stage”).

Conversation at a later stage include:

- The avatar referred to as “I”.
- Observations of the environment (“it’s nice”, “you could break a mirror here”)

By the end of the session some students were:

- Exploring their sense of self and their virtual body within the environment (“it feels right”).
- Blurring boundaries between real and virtual (“how do I teleport to rl?”).
- Displaying a stronger sense of copresence with others and relating to each others’ virtual social presence (“Turbo we like your outfit”, “you look sexy”).

In the case studies that involved students that had spent more time inworld, the students had developed stronger experiences of presence. Those in the Blue case study were focusing more on developing their avatar’s body image, and were more accomplished at movements and at interacting with objects. They recognised each other’s avatars and had shared experiences inworld that they could discuss. The conversations they had a result of this were more social and they were more aware of each other’s avatars’ relative positions and conscious of social conventions. The Green students had even more developed experience and had identified spaces with which they felt an emotional connection, and were able to discuss their inworld identity and relationship with their avatar in more depth.

Social presence

Developing a social presence inworld was also an important step for the students. The look of their avatars was important for the students' sense of identity (see earlier in this chapter), but it was also important for them in signing their identity to each other. The conversations before the session were largely about the look of each others' avatars, for example the student whose avatar had pink tartan pants was instantly recognisable ("Oh wait I know three people. I remember (student J) from the spandex pants! LOL", "I like hot pink spandex!" or student D and her skin-coloured top "you guys were teasing me about my top last week - or what you thought was NO top". Being able to appear as individuals distinct from each other also was important to the students. A homogenous look marked them out as people unfamiliar with the environment and therefore of lower status.

Copresence

Some students felt that the degree to which they felt copresence was limited by the lack of non-verbal cues

Student M: yes but it is difficult for me due to not being able to witness other peoples non-verbal behaviors or reactions to comments

To a certain extent this is a limitation of the environment in not being able to replicate these elements of the physical world. However, the environment can convey non-verbal expressions through paratextual elements, such as emoticons, and through animations. Although not complete substitutes, these can supplement communication. As Becker and Mark (2002; 31-32) and Caspi and Blau (2008; 324) have noted (see section 2.2.5) being able to experience copresence through these means requires learning the conventions through experience and is also correlated with having a high sense of self-projection (Caspi and Blau, 2008; 339). Taking issue with the nature and purpose of the environment may also limit the preparedness to present themselves and perceive the presence of others (see section 2.2.7).

Embodiment

The Blue and Green students had developed the ability to modify their avatars to differing extents, some changing clothes, others changing the basic avatar body through altering the metrics in the "change appearance" functionality; others had learnt how to add items to their inventory to

accessorise their avatar. Blue student F discussed altering his avatar in terms of “editing my appearance”, but when discussing altering his avatar radically (e.g. to the Kool-Aid Man) this was no longer described as altering his avatar’s appearance but as his avatar putting on a costume, indicating that he could feel a human-looking avatar was his extended body within the virtual world, but a pitcher full of flavoured drink with arms and legs was not. This would tend to indicate that, even for those students prepared to experiment with polymorphism, the represented body in virtual reality does have to closely map the person’s body in real life (Murray and Sixsmith, 1992; 325 – 326) to be considered to be part of their extended body.

Consequences of experiencing embodiment

The Blue and Green students had spent longer inworld and most seem to have developed an identification with their avatars, referring to them in the first person (“I’ll try it to show you what happens to me. “ “I didn’t realize our hands type when we type”). However, the use of avatars contributed to the Blue students’ levels of anxiety in several ways:

- Kinesics. Because participants have to move their avatar and interact with objects, sitting on them etc. this becomes an additional set of skills to acquire, and another signifier to others that they are novices within the environment; Blue students used phrases such as “I worry about looking silly” and “don’t want to look “stupid””.
- Appearance. Appearance of the avatars is also a signifier of lack of experience, and the Blue students were concerned that the look of their avatar would reveal this to others through errors in the way they presented themselves (“I am scared to leave! I am worried will end up bald, lost and naked”). The Blue students also wanted to appear confident in the world, and saw appearance as a means to convey this, for example, Blue student B was thought of as “confident” and “part of this world” because her avatar had wings, indicating she had learnt how to acquire and attach extra body parts, and was also prepared to stand out and have fun with the environment.
- Uniformity. The lack of individualism of one’s avatar was also a cause of concern, for example Blue student F being impelled to learn how to edit his avatar’s appearance due to an observation that his avatar was the same as three other Blue students’.

- Harassment. The Blue students' embodiment also exposed them to forms of harassment from griefers inworld ("some people said that they had been put in nets or had people run at them with guns") or of other avatars exposing themselves.
- Self-consciousness. Blue student D described Blue students who may be shy in real life and so being withdrawn, being able to be more interactive in online discussion boards because of the anonymity of those environments. Second Life, in giving people bodies in the online world, removed this anonymity and so reintroduced this feeling of social anxiety.

The Green students did not express this level of anxiety, possibly having passed beyond that stage. For the Blue students, this need to personalise and individualise their avatars took precedence over becoming accomplished at navigation and interaction. For the Green students, navigation was no longer an issue. Those Blue students who had managed to modify their avatars to personalise them did find that this increased their social presence. Students were able to recognise each other inworld when other avatars had a distinctive item of clothing, accessory or body part, e.g. student X's tartan trousers, student D's bracelet, or student B's wings. These personalisations also formed the basis of a lot of social interaction inworld; much of the conversation prior to the session concerned the looks of each other's avatars.

At first, therefore embodiment increases anxiety and exposure. The extended body places more pressure on students to learn the necessary skills, because they have a body in the virtual world, they are more visible and more exposed. Their embodied presence makes them feel more self-conscious and so their need to appear to fit in to the world and appear confident is greater. The existence of a virtual body also adds to the number of skills that need to be acquired, such as learning to edit appearances, attach objects and manage inventories. In combination the greater pressure to acquire skills, and the more complex skills that are needed to be acquired, places large barriers for students learning to use the platform.

In the long term though, possessing extended bodies enables students to develop an inworld identity, project more social presence, establish stronger copresence, and gives students the confidence to move throughout the larger world. For some students, discovering how to personalise their avatars provides the impetus to spend time inworld and become familiar with the platform.

Difficulties in articulating the experience of embodiment

As with the pilot study, embodiment was a difficult concept for the interviewees who took part in the study to articulate. For example, the other Green students, when asked about embodiment (“Did you feel like you were there and moving around within those spaces?”), either responded with a lack of sureness or answered by talking about the environment itself. Green student F describes the sensation and that sense of being doubly located (in the physical and the virtual simultaneously) and also conveys some of the complexity of having a virtual body:

It's a odd thing, you sort of seeing your eyes, you're sort of seeing stuff. You're going through and when you get sat into it, you do sort of get transported there, I suppose. In that sense of ... you can see the little fella walking about but ... I'm obviously not saying that it's me, because it's created, but it's my character, it's my little slice of me in that world,

The distinction between the physical world, the computer screen and a computer-generated model within which one feels embodied can be couched in terms of “real” and “not real” but the inadequacies of these terms is made evident through Green Student F describing the differences between Second Life and Facebook. Social networking sites provide a connection between the real world identities of people, but do this only by providing the opportunity to share photographs and text messages asynchronously; the degree of copresence supported by these platforms is limited to one-to-one text chat. Second Life, on the other hand, connects simulacra of people (and hence are not “real people”) but provides a chance to share an actual (and therefore “real life”) experience. This gives rise to the conflicting usages according to the student, Facebook is “more personal because it’s the picture and generally you know them. It's the real person” but also Second Life has the advantage of over social networking sites of having “this little thing (avatar)” which makes activity in a virtual world “a real life thing”. Virtual worlds could be said to be non-real people in a real dynamic (i.e. embodied simulacral), and social networking sites are real people in a non-real dynamic (i.e. disembodied distal), but terms are difficult to find to describe these different forms of experience.

This difficulty is also encountered in the Red students’ recounting of their experience, for example, the Red student who when talking about the advantages of Second Life over email when sharing designs says “you might be trying to describe part of the design and they might not

understand what you mean, whereas (in SL) you could physically, well not physically, walk them up to the bit you were talking about.”

The “physically, well not physically” phrase exemplifies the problem with describing adequately the distinction between the virtual and physical, since the word “virtual” does not adequately convey the embodied experience of the students. “Virtual” could be said to be synthetic but not unreal. For this reason, there is a reticence amongst some researchers to use the word “real” in any of these contexts, since it implies that anything happening in the virtual world is not real. Terms constructed are those such as “visceral reality” as opposed to “virtual reality” (Gilbert, 2009) or atomic as opposed to pixels.

This difficulty in language also occurred in the mixing of first person and third person when discussing the activities of their avatar. For example, not clarifying that it is the virtual that is being discussed in phrases such as “it was about your hair and the way you present yourself rather than your actual features” “you get to fly and you get to fly really, really high up in the sky”. The interviewees would sometimes adopt the first person when describing their avatar: “I ended up having to use more money just to change my skin and hair”. However, when the separation of the two selves required clarification, for example when drawing parallels between the physical self and the virtual, the interviewees adopted the third person to describe the avatar and the first person to describe their physical world self: “I think one of the things is what's she's wearing, because that's what I'm like. I'm really particular about what I'm wearing.”

Sometimes also, the distinction was not adopted even when both selves were separately identified within a sentence, “you” referring to both the physical “you” and the virtual “you” e.g. “But like it's real, instead of controlling other people (largely autonomous characters in The Sims), you control yourself (your avatar in Second Life)”.

Students not experiencing embodiment

An analysis of the transcript of the focus group conducted at the end of the Red session (table 4.2) reveals students had quite differing experiences of the session. Some did not perceive any advantage to visiting the theatres in a virtual world over seeing them as a 3D model or as designs. This indicates that the value of having an avatar within the space was not an aspect that altered the

experience of the 3D models for them, and they had not experienced embodiment inworld. Comments from the students that did not feel there was an advantage were “You don’t have the feeling of it” and “you just feel like you’re just watching a game”. They also felt that a live performance in Second Life would not really be live, because it was not happening physically “At the end of the day you’re still sat in your bedroom, you’re not actually in a theatre”. These were the same students who felt that the environment was lacking in realism. Other students from the same session talked about being the virtual theatres being actual spaces they could visit and walk around and discussed being copresent with other avatars as being able to walk with other people around those spaces. These also were students who thought the technology conveyed realism.

5.3.7 The effect of the object of the activities

Technical skills to use the software

The learning tasks set for the students took two forms, those that were related to the skills needed to become familiar with the environment and those that were related to the subject discipline. In the sessions with the students who were new to Second Life, i.e. those for Red and Yellow Universities, the time taken to acquire the skills took a large part of the session, around 30 to 40 minutes. Even after this time, students were still struggling with some of the skills needed to navigate and communicate. Students with more experience (those in the universities of Blue and Magenta) had acquired most of those skills, but the Blue students still struggled with changing their appearance and managing their inventories. Those students at Green College had the most experience, but still found searching and inventories difficult. Using the platform as a resource for learning and teaching does, therefore, involve a large overhead of time before students can be accomplished enough to use the platform effectively.

Although Green students A, D, E and F all felt they had learnt from the experience of Second Life, they differed in what they felt they had learnt, both with respect to the skills needed to use the environment, and with respect to the subject discipline.

- Green student A, who had the most experience inworld, discussed learning about his own identity, and about learning about the atmosphere of different theatres through performing within those spaces.

- Green student F, hadn't felt the need to personalise his avatar, talked about embodiment and presence, had related experiencing these, and related learning about the Holocaust and the Globe Theatre.
- Green students D and E, were more accomplished with using the software than F, but neither felt they had learned about the theatrical spaces. Although both had visited the theatrical spaces, both had focused on personalising their avatars, one to develop a look for her performance, the other due to a specific interest in fashion. When asked about learning, Green student D referred solely to having learnt about designing her avatar, inferring "learning" to including learning about the system as well as the theatres. When Green student E was asked about learning, she was unsure that any had taken place, apparently inferring that the question related specifically to theatre and performance, and feeling that she had only scratched the surface of this.

The aspects that the Green students felt they could still learn were in part about the software, but also about subject content:

- "Things like all the chat tools and how you can search for people and bring them in. There was lots of stuff I didn't know what it was and I thought I'd leave it alone" - Green student D.
- "I don't know really. I'm still learning really. Every time I go on and see stuff like live performances and the commedia dell'arte. I'm only scratching the surface, so far" - Green student E.

Learning related to the subject content of the course

The case studies employed a variety of teaching approaches and activities inworld. All had an element of an assimilative approach, in that there was information about the software that they had to read and make sense of (Falconer et al, 2006; 16). The students were then expected to experience an element of the environment directly, either through exploring theatres in the form of a field trip or staging a play, or simply by observing their own difficulties with engaging with the environment. All of these would fall under the umbrella term of cognitive teaching approaches in that they would be classified as experiential learning (Falconer et al, 2006; 17). The Blue case study employed a

situative teaching approach, in that the students were asked to co-create their knowledge collaboratively through interaction and discussion (Falconer et al, 2006; 19). Across the case studies, therefore, teaching approaches could be compared, although only in the most generic manner, that is only one type of learning exercise for each broadly defined teaching approach.

The cognitive teaching approaches were only partly successful in achieving the lecturers' aims for the sessions, in that in the Red and Magenta case studies, students were able to discuss their observations of the theatres, i.e. how the theatres that existed only in the virtual world differed from those that were recreations of real world theatres. Similarly, these students were able to draw on their experience to answer the question on the difficulties and potential of the virtual world as a medium for performance. However, when asked to reflect on how performing in the real theatre represented by the model may have *felt*, students had not been able to experience an emotional response to being *in* the space, presumably because their level of immersion was not deep enough to have this form of reaction. In contrast, Green student A, a long term resident of Second Life, was quite able to discuss the atmosphere of the places he was visiting, "you get that atmosphere from actually watching it and your thought processes about what's going on in that space" but this is evidently a level of presence that takes time to acquire.

The tasks based on assimilative teaching approaches were more successful, however. Students were able to absorb most of the instructions regarding the use of the software, since by the end of the session they could navigate and communicate within the environment. The tasks based on situative teaching approaches were also successful in that the discussions about identity conducted by the Blue students were effective in developing ideas and sharing experiences about their development of identity within the virtual world, although this was constrained by some of the inadequacies of the communication channel chosen. Whether the discussions would have been as effective without this level of social presence being established is open to question.

5.3.8 Reflections on qualitative study

Both the qualitative and the quantitative studies reveal the central role of presence in supporting the learning of students. Those students who display a predisposition towards mediated presence, and form an identification with, and development of, their avatar are more engaged and motivated

to take part in the activities inworld, and find the learning a more satisfactory experience. Furthermore this development of presence, and relationship with an avatar, seems to progress through stages, and the stage of development affects the type of learning activity that will be successful.

These separate analyses are drawn into conclusions in the following chapter, and a model that attempts to bring together these separate aspects of the analysis is presented. The final part of this chapter examines a subsidiary study that was introduced to the thesis, that of attempting to identify the underlying reasons behind the resistance displayed by many students who took part in, or refused to take part in, the case studies.

5.4 Analysis of resistance

5.4.1 Development of an additional strand of the research study

As the study evolved it became apparent that there was a resistance to the idea of using a virtual world for learning amongst a sizeable minority of the students. As can be seen from the quantitative data, the students that rated the sessions as low were 25% of the sample. However, three of the five case studies involved a self-selected group of students, and so this does not include students who chose not to take part in the sessions.

Between the second and third case studies, two additional case studies had been planned but failed to be completed. The first of these was an earlier activity at Yellow University, as part of the Theatron project. A revised version of this became the fifth case study. The original version of the Yellow University case study was intended to be an activity using the Globe Theatre in Second Life with second and third year students studying Shakespeare. The course lecturer ran some introductory sessions with the students, which had limited success due to technical problems. However, she was able to obtain feedback from students, both verbally and from written comments and made these data available to me, both to inform this PhD and for the Theatron project.

In all 11 students responded. Eight of these (YOA through YOH) could not register because Second Life sets a cap on registrations from a single IP address, and Yellow University had reached this maximum. Yellow student OJ had two issues with the system. One was the technical limitations of

the technology: she faced issues such as lag. The second was due to the behaviour of some of the community members within the environment:

when spawning (appearing) in a public area it is not at all unusual to 'hear' unpleasant invitations and conversations: Student Y0J

the community seems to tend towards the seedy or the disturbing (I once followed round a spawn point by a 'man' with a virtual penis, which is frankly just creepy no matter how liberal or worldly you are). Student Y0J

Student Y0K actually refused to take part in the session, citing a distaste for the concepts of virtual worlds in general (and Second Life in particular) as a reason.

Please excuse me from the IT session tomorrow. I have thought hard about this idea of virtual travel and experience, and it's not something I am drawn to at all! In fact, I rather think all the opportunities which are available to participants sound rather unhealthy. Personal interaction and real experiences are much more positive. Even my young student colleagues seem very suspicious of the 'second life' merits, and the project has been banned in some schools apparently. Sadly I do feel that much of education is poorer because of the emphasis on technology. Student Y0K.

The project officer at Yellow University also fed back reflections by Student Y0J and another student, Y0L, which included this statement from him:

They also felt that the unregulated environment Second Life offers was not a work-friendly one, given the amount of users who use Second Life to harass other users.

The students also spoke about their feelings that Second Life is a game, and should not be used for education. One went as far as to say "I pay my university fees to learn and acquire relevant skills, not to play a game". Student Y0L, a mature student, mentioned that she doesn't allow her children access to Second Life due to its inappropriate content.

The second of the case studies that did not take place was an introductory session I conducted on using Second Life for MA students on a disaster management course. Due to scheduling difficulties, the introduction to Second Life was the first activity the students faced on the course, and they had not been briefed on the reasons for using Second Life. Also twice as many students were involved in the session as had registered on the course, and there was insufficient space to adequately accommodate them all, which had a negative impact on the students' experience. The

student cohort also contained many opposed to the concept of virtual worlds. One student participant offered this unsolicited written feedback:

How does walking around a fake room or flying around a computer game help us learn about real world issues? Not even a fun way to learn. Creating a second life creates a second set of problems without resolving the first set of problems. It takes up the time of researchers who could be doing useful empirical research instead. We learnt nothing that could not be found out with a picture on Google. There are already very sophisticated climate change models made for real world locations.

Too many technical flaws. Not even good graphics, slow, a time wasting game not an academic tool. Even simple basic demonstration filled with errors. For academics to escape to a virtual world instead of solving issues in the real world. Even a few people overloaded the system. You can not counter vulnerability to society's reliance upon technology using this complicated technology, it just creates a difficult learning environment. Cyan student A

These comments, together with the observations of the focus group discussion (table 4.2) prompted an additional parallel strand to the study that was worthwhile following, which was to understand the factors that disinclined students to participate in learning in virtual worlds.

The data from the first two case studies were re-examined to gather comments from students that were negative about the experience together with the statements from students for the case studies that did not go ahead, and a constant comparative method was used to group these responses into a typology of forms of negative opinions. These were expanded using data from the following case studies and linked to precedents in the literature, where available. The results and analysis of this strand of the study are below.

5.4.2 Literature of resistance to virtual worlds

Thackray, Good and Howland consider the boundary issues that working within a virtual worlds raise. They summarise these boundaries as between

- Institutions with different learning emphases.
- Curriculum disciplines.
- First and second life roles and persona.
- Face-to-face and distance education delivery methods and expectations.
- Safety and risk taking. (Thackray, Good and Howland, 2008; 326)

Thackray, Good and Howland relate those students willing to take risks and be boundary-crossing are also those who fall in the 'innovators' and 'early-adopters' categories laid out by Rogers (Thackray, Good and Howland, 2008; 330). Those who are risk averse are those in the 'early majority', 'late majority' and 'laggards' categories. Furthermore, they suggest a link in the learning context to those practitioners who focus more on the process of the learning experience and so may be more risk-taking and those who focus more on the product of the learning experience and may be more risk averse. "It is perhaps inevitable that a product focus leads to a more risk-averse stance, and even a resistance to exploring a new technology altogether – *if it's not broke why fix it?*" (Thackray, Good and Howland, 2008; 331-332).

Bayne (2008; 199) identifies another boundary crossing in dealing with virtual worlds, this is an ontological one between the real world and an uncanny alternative world, which she relates to Freud's notion of *Unheimliche* (literally "unhomely"). Some participants find this half-world unpleasant, with a division of self between the physical and the digital being reminiscent of feelings of death or of blasphemy, others find it a liberating and enlightening experience (Bayne, 2008; 201).

Trinder (2008; 356 – 358) explores the anxieties felt by people engaging in Second Life and found that the causes of this anxiety were perception of ability, control and discomfort at new social experiences. For the people Trinder interviewed, these feelings of anxiety resulted in withdrawal. However, although these all do cause anxiety, they do not necessarily result in withdrawal. According to the quantitative results, there were no appreciable differences between the perceived ability of those who enjoyed the experience and those who did not with regard to ability to navigate. The issue of discomfort at being in an unfamiliar environment, where one is unsure of the rules or who the people with whom one is interacting are, or where they are really located, would presumably be experienced by all, yet some find it a far more challenging experience than others. Again this may be a preparedness to be risk-taking, or to be boundary-crossing. An alternative explanation may be that some participants do not feel a loss of competence in moving to a virtual world, because they do not feel they have particular competence in the real world, and it is those participants who have a particularly strong degree of social competence in the real world who feel the virtual world to be most alienating.

Running classes with a contingent of students that are disengaged presents difficulties in an educational setting, therefore understanding and identifying strategies for dealing with these groups of students is also a valuable exercise. The following categories of resistance are those that have been identified from the study so far.

5.4.3 The students who aren't embodied

From the statements from students in the Red case study that are laid out in table 3.2 it can be seen that many students did not feel the environment to be engaging. Typical statements were:

"it doesn't feel like actual theatre

"you just feel like you're just watching a game."

"At the end of the day you're still sat in your bedroom,"

"You don't have the feeling of it."

In amongst these statements is one observation of the individual nature of this experience i.e. "someone like me has a disconnect from that kind of environment". This difference in the experience of presence has been discussed earlier (in sections 5.2.1 and 5.2.4). As was noted in those sections, the students had the same tasks, the same software and very similar hardware and yet some felt the environment was unrealistic and unengaging and others felt it was realistic and immersive.

In section 5.2.4 two students (Green student C and Blue student D) were identified as students who appreciated the value of the virtual worlds, but whereas their peers felt freed and liberated by the movement through the virtual world, these students draw a rigid distinction between physical action and action on a screen, interacting in a virtual world has no interest because they are only ever "present" at their desk, or in their bedroom. The life on the screen is therefore a flat and alienating experience.

With both students, there is perhaps a link between physicality and lack of embodiment. Both students emphasise their keenness for physical activity. This position matches the findings of Heeter:

About one fourth of the population is so strongly situated in the real world and their real body that they have a difficult time becoming involved in a virtual world." (Heeter, 1995; 200).

and Murray and Sixsmith state that a diminishment of awareness of the physical body is required to experience embodiment in virtual reality (Murray and Sixsmith, 1999; 327).

If some participants are always aware of their bodies, and so feel static and sedentary when sitting at the computer in the visceral world, rather than feeling embodied and free-moving within the virtual environment, then this may explain the difference in their experiences and those of the students who did feel embodied. These students will also not value the additional benefit of being in a virtual world through experiencing embodiment, but will judge this experience to be no different from looking at a website or a 3D model.

5.4.4 Students who equate virtual with inauthentic

The other set of statements from the Red case study are normative values concerning what is the proper way of living; that virtual experiences and virtual identities are inauthentic, and that people should all focus on experiences that are located in the physical world. Statements made in this category are :

“it’s the new era of virtual relationships and stuff is quite scary”

“I can’t think that people would actually want to be inworld.”

“I don’t think you should have a second life on your laptop.”

“It seems kind of pointless because in one aspect people can represent themselves however they want to”

Four categories of disapproval were noted, these were regarding

- Relationships in virtual worlds.
- Activities in virtual worlds.
- Living in virtual worlds.
- Virtual identities.

This perhaps also correlates to all of the Red students who disliked the learning activity being disclosurist, whereas only half of those who approved of the learning activity were disclosurist, in that, because they see the virtual as inauthentic, they need to know the person’s offline identity in order to feel they are experiencing an authentic interaction.

The Yellow University students from the case study that did not go ahead also reflected this position, eg. student YOK’s statement: “I rather think all the opportunities which are available to

participants sound rather unhealthy. Personal interaction and real experiences are much more positive.”

This could be due to the anxiety about boundary crossing between first and second life roles and identities, or about the “impersonal” nature of distanced communication (as discussed in 2.2.5), since the students do discuss the “scary” nature of virtual action. However, the statements do also indicate that they are not only anxious about these activities, but actually see them as dehumanising. This view of technology as dehumanising has its roots in what Mitcham (1994; 277) refers to as ancient scepticism. Ancient scepticism is a “distrust of uneasiness about technical activities (that) can be detected in the earliest strata of Western philosophy” (Mitcham, 1994; 277). Mitcham discusses a passage in Plato’s *The Republic* in which the character Socrates states:

Because it cannot convert or emancipate the mind from the cares and concerns of the world, technology should not be a primary focus of human life. The orientation of technics, because it is concerned to remedy the defects in nature, is always towards the lower or weaker. (Mitcham, 1994; 280)

and “For Plato, and the Platonic tradition, too, artifice is less real than nature” (Mitcham, 1994; 282).

Mitcham contrasts these with two other philosophies of technology, that of enlightenment optimism which “argues the inherent goodness of technology and the consequent accidental character of all misuse” (Mitcham, 1994; 283) and romantic uneasiness which “reflects an uneasiness about technology that ... distinct from ancient scepticism and modern optimism, in its parts it nevertheless exhibits differential affinities with both” (Mitcham, 1994; 290). These three attitudes to technology are summarised by Mitcham in a table (table 5.5).

	Ancient scepticism (suspicious of technology)	Enlightenment optimism (promotion of technology)	Romantic uneasiness (ambivalent about technology)
Volition (transcendence)	Will to technology involves tendency to turn away from God or the gods	Will to technology is ordained by God or by nature	Will to technology is an aspect of creativity, which tends to crowd out other aspects
Activity (ethics)	Personal: Technical affluence undermines individual virtue Societal: Technical change weakens political stability	Personal: Technical activities socialise individuals Societal: Technology creates public wealth	Personal: Technology engenders freedom but alienates from affective strength to exercise it Societal: Technology weakens social bonds of affection
Knowledge (epistemological)	Technical information is not true wisdom	Technical engagement with the world yields true knowledge (pragmatism)	Imagination and vision are more crucial than technical knowledge
Objects (metaphysics)	Artefacts are less real than natural objects and thus require external guidance	Nature and artifice operate by the same mechanical principles	Artefacts expand the process of life and reveal the sublime

Table 5.5 Three ways of being with technology (Mitcham, 1994; 298)

These arguments are very similar to those expressed by the students who opposed the use of virtual worlds in the classroom, or their role in society as a whole. The implication of taking on a virtual identity, or taking part in activities in a virtual world, is that these lack authenticity, or are even immoral, and appease those members of society who are weakest, because they are based in the technological. Those students who welcomed the activities in Second Life expressed opinions that blended those of enlightenment optimism and romantic uneasiness.

5.4.5 The students who disapprove of games

Another factor that emerges from those who would not take part is the antipathy towards games. None of the other students in the study even referred to Second Life as a game, yet students Y0J and Y0L did so, and objected to its use. However, Second Life does not meet the essential definitions of a game (e.g. given by Begg et al, 2007) in that it does not have specific goals set, a scoring mechanism or an evolving narrative. Furthermore, the statement that games should not be used for education is an unusual one and the case for using games in education has been made repeatedly, for example

de Freitas, (2006), McFarlane, Sparrowhawk and Heald (2002), Steinkuehle (2005) and Bell, Smith-Robbins and Withnail, (2010).

Whitton and Hollins discuss the problems of using games to teach adults, based on misconceptions that adult learners have that game environments are:

- Frivolous and time-wasting.
- Only for young children.
- Not a respectable thing to do.
- Easy.
- Only able to provide inauthentic learning (Whitton and Hollis, 2008; 223).

If mediated environments, particularly virtual worlds, are seen as games, then they may fall prey to the same misconceptions.

Whitton and Hollins also place the argument against the use of games in education in the context of adult learning theory, which makes the following assumptions regarding how adults learn differently from students:

- Adults need to know why they need to know something before they will put the time in to learn it.
- Adults need to be self-directing and want to take responsibility for their learning.
- It is only at the point when they need to be able to apply knowledge in real-life, that adults are ready to learn it.
- Adult learning is task-orientated (Whitton and Hollis, 2008; 223).

The survey data gathered in the case studies do not support these assumptions; only 4 out of 21 respondents agreed with the statement that “there is no point learning something unless it’s going to be useful”. However, the more open-ended, experimental and disruptive forms of learning that take place in virtual worlds particularly would not meet these criteria. Although only a minority of adult learners conform to the assumptions of adult learning theory, this may explain some of the resistance to the use of virtual worlds.

5.4.6 Students who disapprove of the culture of the virtual world

Students Y0J and Y0L also objected to the behaviour of other residents to which they had been exposed. This seems, however, to have been limited to some public nudity and being in the vicinity of risqué discussions. This is also an aspect referred to from Blue student D reporting on the behaviour she had encountered inworld and how her peers may have reacted to it.

I'm standing in just the original site I went into (i.e. a welcome area for new users of the platform) and a guy comes in with an erection that big (indicates through gesture a large erect penis) next to me and I find those sites that ... It's offensive to some people.

Blue student R also stated “the people i have met own my own have been perverted”. Other references are to “unpleasant conversations” and “creepy” behaviour.

Not all students feel this anxiety from transgressive behaviour. As Blue student D states following the above comment “I don’t really care”. Blue student F states that “I would say the biggest thing for anybody who wants to start using it is, you have to keep an open mind ... if you have one negative experience and you close off ... I don't think you're going to grow as much in the world.”

As Balsamo states (1995: 359), the roots of the culture of virtual worlds are in the cyberpunk movement, which has transgressive and counter-cultural aspects, in addition to its posthumanism. Entering into a virtual world may mean exposing oneself to these counter-cultural communities and transgressive behaviours. Diane Carr (2009) has stated that one of the interesting aspects of Second Life is that it turns usual conventions upside-down. As Trinder (2008; 356 – 358) notes, whereas in the offline world participants adopting conventional value systems are in a position of power, once inworld they are in an environment that is unregulated, and in which transgressive behaviour is accepted as the norm. Those students who are used to being part of mainstream culture in offline society may now feel themselves to be marginalised once in the virtual world, and are unusually placed in a position where their conventions are challenged.

5.4.7 Students’ need for realism

Although not a factor in students’ resistance to virtual worlds *per se*, students who have engaged with the environment may find parts of the world create anxiety. These aspects are usually those that entail the more fantastic and less realistic aspects. During the discussion of non-humanoid

avatars, Blue student L statement that s/he thinks “it's frightening when it's so new to even consider representing yourself as non-human” indicates that although being in a virtual world may be acceptable, if this strays too far from the real, this may cross additional boundaries for some students. Although Blue student C enjoyed teleporting, he found that the freedom this afforded undermined the realism of the environment and therefore was ultimately less engaging. This can also be seen as a conflict between those who desire “authenticity” and maintenance of the distinctions of the real world on one hand, and the drive for experimentation on the other, such as in the augmentationist versus immersionist distinction. This could also be seen as a clash between two forms of immersionism, those who see the virtual world as an opportunity to immerse themselves in an alternative, but realistic world (a simulation or mirrorworld), and those who see them as an opportunity to break free from all constraints of the physical (Boellstorff, 2008; 244).

5.4.8 The categories of resistance

These categories are not mutually exclusive, but can act independently. Where students may report lack of presence alongside a disapproval of the environment, it is not possible from these data to determine cause or effect. Students may feel lack of presence due to having normative values that are opposed to virtual experience and so do not allow themselves to feel presence, or they may have developed normative values that are opposed to virtual experience because of their slower or lesser ability to feel presence. Or there may be no link. However, the occurrence of these differing attitudes and/or abilities presents added complexity for teachers using these environments with students. The typology of student reactions to learning in virtual worlds is summarised in table 5.6.

Category	Characteristics
A. Positive	Students feel presence within the environment, and rate the learning as high. Tend to be risk-taking. Tend to be accepting of crossing boundaries. Find the environment to be realistic. Adjust to the unreliability of some aspects of it.
B. Need realism	Positive regarding the overall experience, experience presence, but hesitant about the non-real aspects.
C. Not embodied	May or may not have a normative stance against the idea of a virtual world, and may be risk-takers, but state that “it’s not for them” and rate the learning experience as low. Their sense of presence is located so strongly within their physical body that they develop no sense of connection with their avatar or the virtual space. Tend to rate the quality of the design as low.
D. Virtual is inauthentic	Have anxiety about boundary crossing, have normative values about the lack of authenticity of the virtual and about the “proper” activity of people being located within the visceral world. They rate the learning activity as low, and even inappropriate or unethical. May or may not experience presence.
E. Don’t like games in education	Identify virtual worlds as a game, possibly focusing on the make-believe aspects of the environment. Gainsay the argument that games have a positive role in education. They rate the learning activity as low, and even inappropriate.
F. Don’t like the culture	Have anxiety about the “creepy” behaviour of some of the residents in virtual worlds. Identify this as a rationale for lack of engagement. They rate the learning activity as low, and even inappropriate or upsetting.

Table 5.6 Typology of students’ reactions to virtual worlds

Students in categories D to F also tend to be unaware of the subjective nature of their responses, which for an educator may make these assumptions more difficult to challenge. Student YOK felt it quite reasonable to not attend the Second Life session run at Yellow University and Cyan student A withdrew from the session, perhaps not considering them legitimate learning activities and hence ones that could be justifiably dismissed and criticised.

Although a generalisation, grouping the sets of reactions by students in this way does provide the first step in describing and understanding the various reactions. With a typology developed in this way, the sets of arguments against the use of a virtual world can be seen to be located within a limited set of arguments. Once these arguments are known and anticipated, it may be possible to counter them through debate within the learning activities. A standard response within psychology

(Richard Gilbert, personal communication) is to allow students to voice concerns, and through initial dialogue express many of their anxieties which the teacher can then assuage, or at least provide a counter point of view.

5.5 Summary

Conducting a combination of qualitative and quantitative analyses of learners' experiences was beneficial, in that, through the quantitative analysis a strong link between presence and satisfaction with learning could be identified, which informed the direction of the quantitative analysis. The results of the survey did not, however, identify the relationship between learners' characteristics and presence using the categories drawn from the literature. The interviews and transcript analyses did propose additional characteristics to that in the conceptual framework that were identified by the students as of being of relevance to their experience in the virtual worlds.

The grounded approach used to develop categories independently of the framework in chapter four proved to be difficult to continue into the cross-case synthesis, so the conceptual framework was employed at this stage. This was effective as a tool in organising and structuring this analysis, and in linking the observations with the literature.

The analysis of the qualitative data of the experience of presence did present some revealing difficulties in interpreting the meaning of the students when they were describing their experience. Both the interviewer and the interviewees occasionally displayed an inability to adequately express, or understand, the experience of the virtual world, or use a consistent terminology. The experience of virtual worlds is a novel one and describing the nature of immersion and embodiment, occupying as it does a position between fully physical and completely abstract, is difficult within the language and concepts developed to describe the physical world.

Conducting a separate study of the resistance to using virtual worlds, using mostly the same data as for the main study proved to be a means to add further value to the data already acquired. Conclusions drawn from this analysis and those of the experience of presence, are discussed in the following chapter together with a proposed application of those conclusions in learning and teaching.

6. Conclusions

6.1 Review of the study

This chapter reviews the following stages of the thesis:

- Development of a conceptual framework.
- Conducting case studies
- Analysis of data
- This review is then followed by overall conclusions to the study.

Development of a conceptual framework.

The conceptual framework was developed in order to organise the various concepts in the literature and structure the data gathering and analysis in the study. It included:

- Identification of an umbrella concept that drew together a common element of various technologies, i.e. the term “mediated environments”
- Bringing together the literature regarding these technologies, establishing a systematic terminology and identifying categories and sub-categories into which to place the concepts.
- Re-organising these categories so that they adhere to a combination of Activity Theory and the Communities of Practice Model

Conducting case studies

A pilot study and five case studies were conducted during the second and fourth years of the study respectively. The original intention was to use different mediated environments across the case studies, but in practice, the five case studies were all of a virtual world environment called Second Life. Hence, the conceptual framework is for mediated environments in general, but the analyses and conclusions are relevant virtual worlds only. During these studies two parallel investigations were conducted. These were:

- A qualitative and quantitative analysis of learners’ experiences of presence during the learning sessions, relating this to their perception of the effectiveness of learning and identifying factors that contributed to this experience of presence.

- A qualitative study of the resistance to learning in virtual worlds displayed by some students. Retrospectively, data from two case studies that were unsuccessful and not completed were included in the study and the qualitative data from the five case studies were further analysed to identify the elements of learners' resistance to learning in virtual worlds.

Conclusions

Six research questions were posed at the beginning of this thesis (section 1.4). The two leading questions were *"What are learners' experiences of presence in mediated environments?"* and *"What effect does presence have on their satisfaction with the learning activities?"* These questions were supplemented by the following subsidiary questions:

- What factors contribute to, or detract from, the experience of presence?
- How does presence develop within mediated environments?
- How do educational activities develop presence?
- Is the development of an inworld identity linked to presence?

The conclusion section revisits these questions and answers them by drawing upon the analysis conducted in the previous chapter. The question on the factors supporting presence is structured using the conceptual framework in chapter two.

The final two of these questions, concerning how educational activities develop presence, and the linking of inworld identity and presence, are answered through the presentation of a model that draws together many of the findings of the study into a sequence of stages through which a learner progresses, based on the idea of that a prerequisite for effective learning in an immersive virtual world is for the learner to develop a virtual body and a virtual identity. The model is developed to meet an additional goal of the research, which was to support educators in their use of mediated environments. The remainder of the chapter considers:

- The effectiveness of the methodology, the strengths and weaknesses of the study and reflections on how the study could have been conducted differently.
- The implication for learners, educators and institutions for the research, and the impact of the study to date.
- The future work arising from the study.

6.2 Learners' experience of presence in virtual worlds

6.2.1 Learners' experience of presence

The research questions explored as the main focus of the study were *"What are learners' experiences of presence in mediated environments?"* and *"What effect does presence have on their satisfaction with the learning activities?"* The analysis of the case study indicates that learners' experiences of presence in immersive virtual environments vary widely (section 5.3.6). Most experience presence in virtual worlds, some do not feel a sense of presence at all, or only a minimal amount, and for the majority of the learners who do experience mediated presence and embodiment, this takes time and practice to develop. Learners also develop a sense of embodiment, and will gradually change from talking about their avatar as "it" to talking about their avatar as "I". However, those learners who do not experience this embodiment will describe the experience as one of simply seeing images on their computers. Their avatar will only be seen as a character on the screen, not as an extension of themselves in the virtual world. The possible reasons for these differences in learners' experience of presence are discussed in the next section.

Embodiment also has a negative quality, in that it can mean that some learners will feel more exposed and self-conscious. This places additional demands on them to learn to modify their appearance and learn the techniques of movement, and will raise their anxiety of coming into contact with strangers within the virtual world.

The learners repeatedly found difficulty in finding the language to precisely describe the experience of embodiment and virtual presence, since the virtual experience for many lay in an intermediate experience between physical and non-physical. Learners would self-correct if they used the word "physical" or "real" yet were not able to find a word to convey the sensation of being embodied within the virtual environment, and associating with their avatar's movement within that environment. They would therefore lapse into using those words, yet need to acknowledge their awareness that it is not real, and they are not their avatar. Similarly, the nature of the avatar as an extension of self was also difficult to describe. For those learners that felt embodied, the avatar was not just a game character; they were controlling "themselves".

6.2.2 The role of presence in learning

The correlation between the satisfaction with the learning activity and the learners' experience of presence clearly shows that a learner that does not experience presence will almost certainly not be satisfied with the learning activity; a learner who does experience presence will almost certainly be satisfied (section 5.2.4). This supports Biocca's statement (1997) that cognitive processes are linked to presence. Identifying means to encourage and develop presence therefore needs to be part of the learning and teaching strategy.

Depending on the learning activities being attempted, different degrees of presence are required for students to be able to successfully engage with tasks set for them (section 5.3.7). Since the development of presence appears to go through particular stages, to be most effective, these different learning activities are better taking place once the required level of presence has been reached (discussed further in section 6.4).

6.3 The factors that affect presence

6.3.1 The research questions

Subsidiary research questions were related to the factors that influence this experience of presence. These questions emerged as the study progressed and two are addressed here, i.e.

- What factors contribute to, or detract from, the experience of presence?
- How do educational activities develop presence?

The factors influencing presence are structured according to the conceptual framework. Each of the categories of the framework is considered in turn, and their influence on the experience of presence is considered. However, a cautionary note (raised by Green student C in an interview) is that "it's just simply that for some people it works; some people like it, enjoy it. You don't necessarily always have to have a reason, an answer to something."

6.3.2 The role of the tools and implements

One conclusion of the study is that the design of the technology has a smaller impact on the experience of the participants than does the willingness or ability of the participant to engage with the technology (section 5.3.1). Although technology forms the medium in which the experience and the learning takes place, the perceptions of the environment differ considerably from one participant to another.

Creating an environment that has more detail and engages more senses may enhance the experience for participants; added realism has less influence on the experience of the participants than the willingness, or ability, of the participants to engage their belief in the virtual world. Indeed, it can be argued (Biocca, 1997) that describing the technology in terms of the effect it has on the observer is itself flawed, since it conflates two separate processes. An environment cannot be objectively described as “realistic” or “vivid” and the focus on improving design of environments may not be as important as encouraging more effective ways to encourage participants’ engagement with the environment.

This also applies to the idea of promoting engagement by making the environment more interactive. Dreyfus (2000; 57) describes this sense of being in touch with the virtual world as the ability to make changes within it. The participants in the study describe their interaction with the environment quite differently. For the learners, interaction is not a matter of clicking on objects; it is the ability to experience an emotional connection with the space. This may mean dancing on a stage, or viewing a recreation of something that has an emotional resonance or stimulates the imagination, such as the kristallnacht simulation. In short, interaction, like realism, is something that occurs within the mind of the learner, not on the screen. Encouraging learners to engage, therefore, depends more on being able to find emotional connections with the environment than increasing the number of things that are clickable.

Similarly, the literature regarding mediated environments indicates that unobtrusiveness and transparency is a contribution to the experience of presence. Second Life contains many obtrusive elements that disrupt the direct experience of the environment and these can be exacerbated by the insufficient specification of many of the computers with which the case studies were conducted.

These include the difficulties with operating the interface, delays due to lag and render times and the intermittent crashes of the computers. However, as with experiences of realism and interaction, the functionality of the technology had less influence on the perceptions of the learners than the nature of their own engagement with the technology. The obtrusiveness of the technology had less impact on the learners' experience when those learners were accustomed to the technology; for these students the delays experienced were accepted as part of the experience of the world.

Ease of navigation of the technology also did not make a difference to the satisfaction of the students. The learners who enjoyed the sessions were no more likely to be able to navigate the virtual world than those who did not enjoy the sessions.

6.3.3 The subject category (characteristics of learners)

The learners did generally (with one or two exceptions) fall into two groups, those who experienced a high degree of presence and enjoyed the learning activities and those who experienced no, or only a low level of, presence and did not enjoy the learning activity. Few observable factors regarding how the previous experiences of learners, and their relation to other media, predispose or disincline them to learning in virtual worlds emerged from the study (section 5.2.4).

Previous exposure to technology did not predispose learners to the use of virtual worlds. Some learners who previously were not interested in technology and had little exposure to different technologies still enjoyed the sessions. One link with other technologies was with games; learners with previous exposure to games all fell into the group of learners who felt presence/enjoyed the sessions. Transferability of skills in navigation did not seem to be relevant; gamers struggled just as much with the navigation as did those with experience of games. The connection may be that these learners were those who could experience presence; those who could not experience presence would have little interest in games. Those with experience of navigating other 3D technologies also recognised their stage of lack of competence as one of peripherality, not marginality.

Another factor in the difficulties some learners face in making the adaptation from learning in the physical world to the virtual one may be that those learners that are particularly accomplished within the physical feel disempowered as a result of the move (section 5.3.4). For example, a learner that has particular skills at reading facial expressions and body language would feel their loss more

keenly than one who is less accomplished. This may explain why the move from working in the physical world to the virtual affected learners' feelings of inhibition in different ways. Some felt more introverted in the virtual world, for example Green student F stated that although he is an extrovert in the physical world, he is more introverted in the virtual. Others felt safer in the virtual because of the degree of anonymity conferred by interacting through an avatar. Counting the greater amount spoken in the Red focus group against virtual worlds than for them, compared to the questionnaire results in which the majority of the class favoured it as an environment (table 3.7), suggests that a virtual classroom is one that is preferred by learners who are less accomplished in face-to-face situations. Learners also reported that the feelings of self-presence inworld added to their feelings of self-consciousness. It may be that for some learners, embodiment may not be beneficial, at least before they become accustomed to the virtual world and have built up a degree of competence and an established appearance for their avatar.

Learners' perception of others in these worlds seems to be a central factor in their engagement with the world. Although copresence was the most common experience of presence (in the questionnaire those learners who only agreed with one of the statements about experiencing presence all agreed that they felt they were sharing a space with others) learners who struggled with the environment found the aspect of relating to others difficult. This appeared to be a combination of several factors:

- Experiencing a lack of social cues: Statements such as "it is difficult for me due to not being able to witness other peoples non-verbal behaviors or reactions to comments" indicate that for some learners, the different forms of social cues that are present in virtual worlds are either not being read and performed, or are insufficient to replace those they experience in the physical world.
- Needing to know who each other "really are": Although both groups expressed an interest in roleplay, those who did not experience presence were all disclosurist. Those who did experience presence showed no overall tendency towards or away from disclosurism. This may link to a belief in those opposed to virtual worlds that virtual relationships are inauthentic, or dehumanising. Knowing someone only as an avatar is therefore "unhealthy".

- Insecurity: Second Life is a social world, and learners can be exposed to the communities that exist outside of the immediate classroom environment. Some learners react more strongly to some of the behaviours they encounter than others, this behaviour is then reported as “creepy” or “perverted”.

These factors may tend to reinforce each other. For example, learners may feel more anxious in the virtual world because they have a reduced ability to read social cues. Because they consequently are not experiencing the avatars around them as embodied people the space feels impersonal. They therefore seek to know who those around them “really are” for reassurance and are more sensitive to negative experiences of contact with others. This then reconfirms their opinion of a virtual world as an unhealthy environment and so they are therefore less likely to learn the social conventions of the space. Their behaviour may be seen to be inappropriate in the wider community and so the learners will be particularly targeted as “noobs”, rather than only “newbs”.

On the other hand, those learners who are more open-minded about others’ behaviours, more resilient to negative experiences, who experience greater embodiment, or have learnt the conventions that convey social presence will find these experiences reinforcing each other. This is a circle identified by Caspi and Blau (2008; 339): “Those who are sensitive to others’ manifestation of themselves, and perceive the “others”, are more highly motivated to project their own self onto the group” conversely the learners who continue to feel it is an impersonal medium “limit the amount of this type of information ... which in turn creates a barrier to communication” (Barrett, 2002, 35).

These differences may therefore arise from one or more of many different factors. They could be cultural, due to differences in attitude to transgressive behaviours inworld, they may be value-driven, due to differences in beliefs about the role of technology and it having a dehumanising effect on society, or neurological, in that there may be psychological differences accounting for why some people experience presence and some do not. It may even be one simply of not knowing how to read non-verbal cues in a virtual environment. If the use of public virtual worlds is to become more mainstream within education, then finding ways to address these issues will be an important part of educators’ engagement with their learners. This may cease to be an issue as institutions move towards private virtual worlds; however this move towards private space could be a missed

opportunity to address some of learners' misconceptions and prejudices. Identifying strategies for dealing with these challenges will be a further development of this research.

Of the separate categories of the conceptual framework, it is the subject category that requires revision as a consequence of the study. The framework as conceived before the study began is shown in figure 6.1. The subjects' characteristics that influence the likelihood of experiencing presence are identified as a set of tendencies or traits intrinsic to the learner, together with their degree of experience of using that technology. However, the study of resistance of students indicates that these need to be considered in parallel with the attitudes and values of the students, both with respect to technology, and with respect to the nature of virtual worlds, for example, the distinction between "noob" and "newb", essential to the difference in acceptance by inworld communities, is one of attitude and behaviour rather than one of experience. The degree of naturalisation can be more precisely defined in terms of where the learner is in terms of the stages of increased development of presence within the virtual world (discussed further in section 6.4).

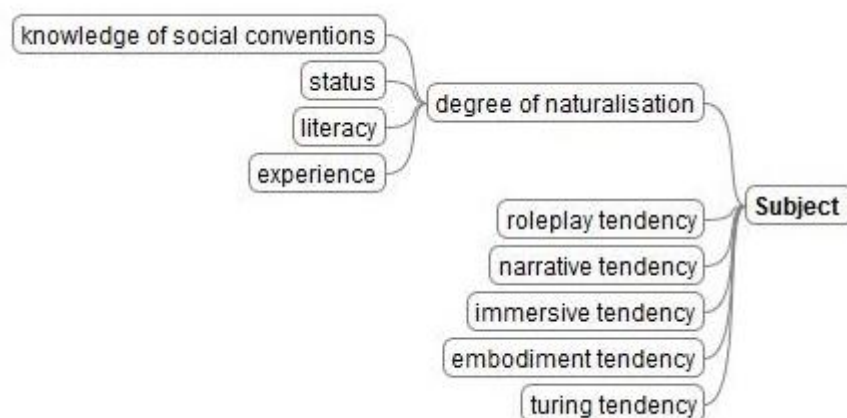


Figure 6.1 The subject category as informed by the literature review

Revisiting this framework and incorporating the findings of the study indicates a more complex set of indicators (see figure 6.2). As with any conceptual framework, the taxonomy of the framework is open to further review, and so this representation is only a snapshot of an evolving set of concepts.

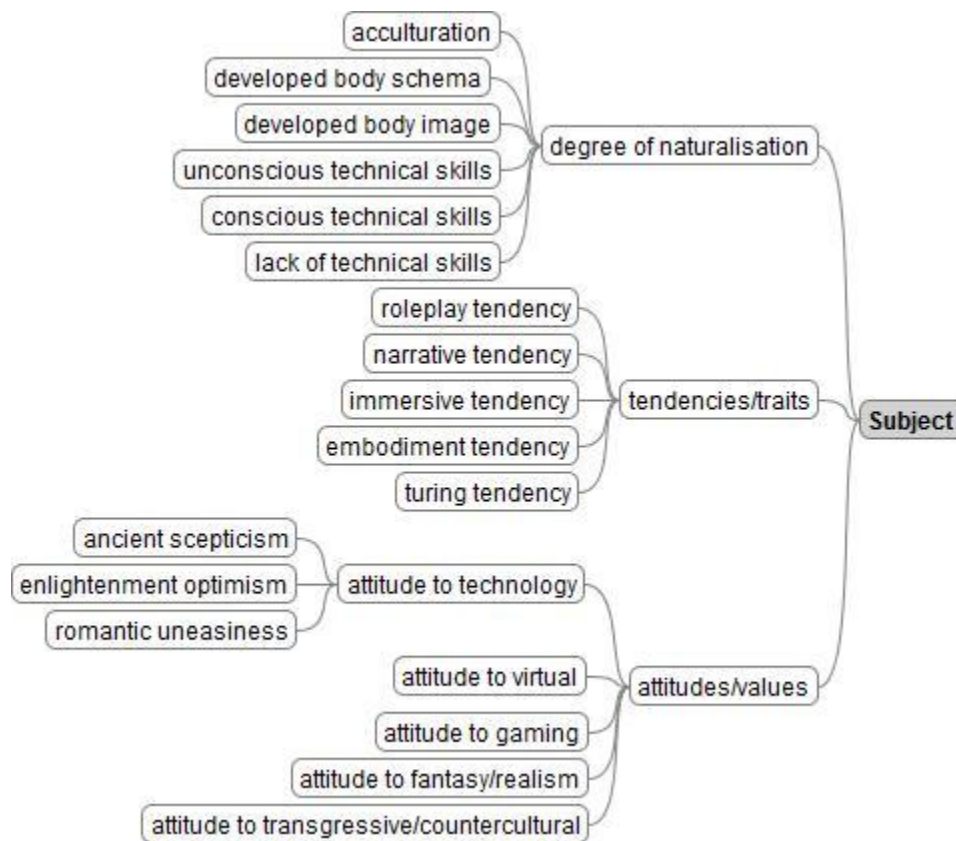


Figure 6.2 The revised view of the subject category

6.3.4 Remaining factors affecting presence

The three remaining factors, those of community, rules and conventions and division of labour were not as thoroughly explored in the study. Few learners came into contact with the virtual communities in Second Life, and these connections were rarely successful (section 5.3.3). Some learners did report receiving help from other members of Second Life, most were rebuffed and several were grieved. Most preferred to explore without coming into contact with others. The learners did report the importance of the community of learners of which they were part, feeling more secure with those people whom they knew were other learners, with similar goals and rationales for being inworld, and this feeling of added security added to their experience of copresence, and mediated presence.

There were also few opportunities to observe the activities under varying rules and conventions (section 5.3.2). All of the activities were augmentationist, and only one employed a logic of immediacy rather than of hypermediacy. Operating under the conventions of immediacy did add

additional challenges to the activities, since this required greater control and flexibility in the motion of the avatars, which was not possible to apply.

There were also few changes in the division of labour employed in the study (section 5.3.2). Learning activities within the virtual world still employed the same status and roles as those in the physical world. Reading the images of teacher and learner within the world (e.g. figures 4.3 and 4.4) still reveals a difference in status between these two roles, due to the additional signifiers of a more developed avatar and a greater employment of navigation and animation techniques from the lecturer as opposed to the learners. Investigating changes in roles with learners with more experience, or in immersionist activities, may be an aspect worth introducing in further studies.

One status change that did occur was the greater tendency of the learners to be distracted by the environment. Learners were far more likely to ignore directions from lecturers while taking part in inworld activities than would have been in a classroom. Off-subject comments dominated the conversations. This could be because of the game-like properties of the world connoted a lack of seriousness to the learners (one of the ethical considerations highlighted by Pasquinelli [2010; 209]). This aspect only dominated for a short while, after the first hour learners were more prepared to focus on the subject-specific learning.

6.4 A model for engaging learners in virtual worlds

6.4.1 Developing a model for educators working in virtual worlds

The final two research questions concerned how particular educational activities can help promote presence, and the role that identity can play in presence. During this study, the identification of a possible sequence of stages of progressive degrees of presence suggested that these research questions could be answered in the form of a model that would indicate specific educational activities that would be appropriate at different stages, and that these stages could be linked to a developing sense of identity and embodiment within the learner. As one of the original goals of this study was to produce guidance for educators, this model offers the potential to provide educators with a structured approach to learning and teaching. Since particular learning tasks were appropriate to different stages of this development, and different conventions and capabilities were

appropriate to different stages, then this model also provides an opportunity to pull together many of the various theories and disciplines drawn upon during the study.

This model does not describe the process for all learners; some learners who took part in the case studies do not develop a sense of presence, a small number develop a sense of presence very quickly. The model is conjectural at this stage, due to the small number of cases it draws on, particularly cases involving students with a longer term experience of virtual worlds. However, the data gathered from the case studies do fit within this model and the following does provide a starting point from which to develop a deeper understanding of learners' progressive development of presence and identity, and the role that these may play on the design of learning activities.

6.4.2 The evidence for progressive development of presence

Several factors indicate that the development of presence in virtual worlds is a protracted process that develops through stages and with which learners may struggle at different points. The first of these is the considerable length of time required to become accustomed to using the Second Life interface. For example, most participants found navigation to be particularly difficult. All aspects of navigation, motion, wayfinding and manoeuvring were skills that took a long time to become competent at. Learners felt that the focus on movement prevented their ability to feel immersed and to take notice fully of the environment. Finding effective ways to provide learners with the correct support to acquire the skills required to fully function within the environment is an essential aspect for teaching in Second Life, and many guidance instructions to teachers focus on this aspect. Learners need both time to practice on their own and direct instruction and help from a more experienced user.

Learners also found that the environment was highly distracting. Although this has many positive benefits, encouraging exploration, providing opportunities to become engaged with the environment, introducing a playful element that encourages participation and breaking down role divisions between teacher and learner, this does delay the point at which conducting the subject-specific tasks can begin.

An added complication occurs when learners develop a sense of embodiment inworld. At this stage they can begin to feel exposed and self-conscious because the look of their avatar is not

individualised, their avatar's movements can be seen as ungainly and inexperienced or they have not mastered some of the techniques (for example the Blue student who said ""I'm worrying about sitting down and can't do it""). Time therefore needs to be allocated to allow learners to build an inworld body image, individualise their avatars and become more fluent in their interactions with inworld objects.

Learners that had spent longer periods inworld, such as those in the Green case study, made no mention of difficulties with navigation and distraction, or their avatar's appearance, indicating that once accustomed to the environment these are no longer an issue. However, while learning to use the environment, it appears that the elements of virtual worlds that make them engaging environments for learning and teaching (the sense of immersion they provide and the sense of embodiment they create) not only add to the amount of skills required for the learners to acquire (and hence time allocated to the activity before the subject-specific elements can be begun), these also add to the feelings of anxiety learners have in the stages before they have acquired the necessary skills.

These elements indicate that at least one session, dedicated solely to the students becoming accustomed to introductory activities (such as navigation techniques, communication, inventory management and avatar design) and inured to the distractions within the virtual world, needs to be run before attempting to expose the students to any subject-specific learning tasks.

As learners spend longer in virtual worlds, for most of them their experience of identity, of presence and of embodiment develops. As the learners become aware of their virtual bodies and how they are perceived, they then develop a virtual self-image. Some experiment with different ways to represent themselves, others find that the original look is one that suits them. The learners' relationship with their avatars changes too. For most the avatar stops being merely a character on the screen and becomes their representation inworld. As their exploration of their virtual self expands many begin to reflect on their inworld identity, although this is usually an extension of their offworld identity, few, if any, experiment with identity tourism.

The experience of presence also becomes stronger. Learners struggle with answering questions regarding the emotional connection to spaces after only one session; in both the Red and Magenta case studies, discussions regarding the look of the theatres and the difficulties of the environment

were lengthy, the questions regarding the feel of the spaces and the communities that built them were either not discussed or were met with bewilderment (Red Student D's "I'm confused" and Magenta Student H's "this question has me stumped"). However, those with a long experience of engagement with a virtual world can discuss the "atmosphere" of the virtual spaces they see.

These stages could be seen across the five case studies: with those who had only an hour or two acquiring navigation skills and making the first experiments with appearance; those who had several hours taking note of their avatars' presence and being conscious of their virtual bodies, and those who had longer (around 10 to 12 hours) having passed the stage of having to focus on navigation and self-representation exploring and immersing themselves in the environment and, forming emotional responses to the environments they encountered. The one learner who had spent longer in there also reported feeling "atmosphere" as he moved through the virtual world and created different alts to represent parts of his identity.

6.4.3 Introducing the model

In all forms of learning that use technology, learning is more effective if competency in that technology is achieved first. Salmon (2004) breaks these competencies into five stages and links these stages to appropriate learning activities. These stages are:

- Access and motivation.
- Online socialisation.
- Information exchange.
- Knowledge construction.
- Development.

Within virtual worlds in particular, Warburton (2008) presents stages in the development of empathy with one's avatar. These describe different levels of immersion within the virtual world; passing from one stage to the next requiring either the acquisition a particular skill set, or redefining one's relationship with the virtual world (see figure 2.7). The stages are:

- Prior to technological and competency threshold.
- Technological and competency threshold passed.

- Threshold of care passed.
- Avatar as extension of one's self.
- Avatar has own identity (with social and cultural capital).

There are overlaps between these two models, and the model presented here took as a starting point the merger of these two pre-existing models. The model was then expanded through

- Observations of the tasks that learners accomplished and could not accomplish in the Red and Magenta case studies, indicating that some forms of presence had been attained, but other tasks would require deeper levels of presence to be accomplished.
- Through the analysis of interviews and conversations with learners in the University of Blue who had focused on their development of an inworld identity and used these identities to inform their sense of social and copresence.
- Interviews with learners in Green College who had spent longer inworld and so therefore *had* developed some of these deeper levels of presence.
- The suggestion of a colleague (Katherine Rowe, personal communication, 2009) that her learners' engagement required their development of a form of proprioception.
- The work of de Vignemont and Murray and Sixsmith (section 2.2.6) regarding the role of bodies in the physical world.
- Dobson's definitions of hypermediacy and immediacy and their application to the relationship with technology (section 2.7.3) and the experiences of the Yellow University students.

After these iterations, the final model is that as shown in figure 6.1.

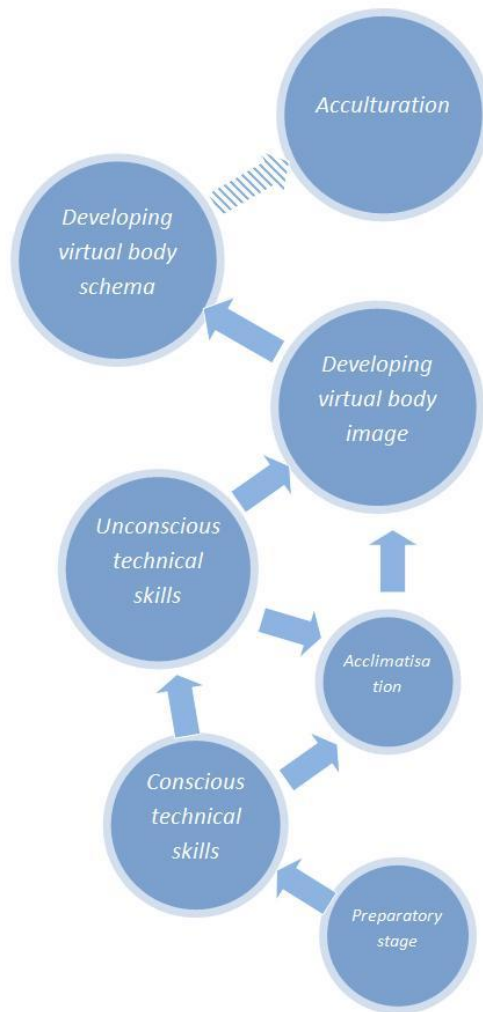


Figure 6.3 The stages of learners' participation in virtual worlds

6.4.4 Stage 1 Preparatory stage

These elements are the initial ones required to get learners to the place where the learning is to take place and are the minimal practical requirements for all the remaining learning activities to begin. This equates with Salmon's access stage. These are simply knowledge of basic technical requirements but are essential prerequisites for activity inworld and are:

- Avatar name and password.
- How to log on.
- How to accept teleport requests, use SLURLs or find and use landmarks stored in the inventory.
- Recognising initial error reports and knowing how to respond to these.
- Recovering from a crash.

These items are best distributed through handouts, since they then require no experience of the technology in order to access the necessary information.

6.4.5 Stage 2 Conscious technical skills (logic of hypermediacy)

Description of the stage

This is a stage where the learners are focused on learning the skills to engage with the environment itself and are not concerned with the curriculum content. The learners are at a stage of conscious incompetence and are not yet ready to focus on any subject-specific content. The technology can provide a “window at”, but not yet a “window through” to the virtual world (Dobson, 2009; 3).

Developing prerequisite skills

Learners focus simply on acquiring the skills required. In the case studies instructions were given to the learners on a handout that divided the acquisition of skills into the following steps:

a. Interacting with the world

- Motion.
- Manoeuvring.
- Wayfinding.
- Changing camera positions.
- Using mouselook.

b. Interacting with others

- Using local chat.
- Using private chat.
- Using the minimap to find people and move to them.

This equates to Salmon’s online socialisation stage. These are important to accomplish early on, since it is the sense of copresence with other users that is the element that more participants respond to than the other features of virtual worlds.

c. Interacting with the avatar

- Changing the appearance of the avatar.

- Creating new folders to save different appearances.
- Animating the avatar.

d. Finding and searching

- Creating a landmark.
- Finding a landmark in the inventory.
- Teleporting to a new location and back again.

These elements give the participants a sense of themselves within the space, and also provide a means for them to feel ownership over an aspect of the world. Providing students with a space in which they can practice away from the public orientation spaces appears to help with this process.

Learning activities appropriate to this stage

Treasure hunt

A possible activity to encourage learners to explore and acquire the technical skills is a treasure hunt (Christa Appleton, personal communication, 2009). Learners can be set the task of finding objects within the virtual world which tests their ability to wayfind and move. Some of these could be set in inaccessible places to test their ability to move the camera independently of the avatar.

Reflecting on experience

Even at this stage, learners are in a position to reflect on their experiences of the environment, identifying areas which may create problems for a new user, or identifying immediate responses to their feelings about the environment, since this reflection is supported by the technology being foregrounded. For example, the question “what would be the challenges for actors and designers working in the virtual theatre in Second Life?” is appropriate for this stage.

Case studies represented by this stage

The reflection on experience question was effectively answered by the Red and Magenta learners i.e. those who had only had one one-hour session inworld. The Yellow learners in their session also passed through this stage, indicating that it is at the most 30 to 40 minutes.

6.4.6 Stage 3: Acclimatising

Description of the stage

An oversight of the learning process can be the step between acquiring the necessary basic technical skills and the level of experience inworld that needs to be accrued to reach the point at which the learners are ready to focus on the curriculum-focused learning tasks. Once learners have begun to acquire some of the basic skills they usually just want to play. This playing accomplishes three aspects:

- Learners make the transition from conscious competency to unconscious competency with the various technical skills required to navigate and communicate.
- Learners begin to learn the communication skills and social conventions that maximise their feelings of copresence.
- The novelty wears off.

Giving learners an extended period of play with the technology means that issues such as struggling with the mechanisms for moving and manoeuvring or learners being distracted, by for example, their avatars dancing or consuming magic mushrooms, have been worked through (to a large extent). Estimating the length of time required for this phase would require further trial and error, but in the experience of the Red case study this could be another 20 to 30 minutes.

Learning activities appropriate to this stage

There are no set tasks that learners will focus on (in the experience of these case studies). Learners will be experimenting and discovering elements for themselves.

Case studies represented by this stage

All of the Yellow and Magenta learners passed through this stage during the session. Most of the Red learners passed through this stage.

6.4.7 Stage 4: Unconscious technical skills (logic of immediacy)

Description of the stage

This stage indicates a point in the mastery of technical skills where the skills have been internalised and can be performed without having to focus on them (Warburton's technological threshold). The learners will not be distracted by operating the features and functionality of the software. Learners can then engage with a range of activities that employ these skills.

Learning activities appropriate to this stage

Basic associative activities such as exploration, observation, reading notecards and watching inworld media can be conducted, since learners are more likely to stay on task, and be able to find their way around and have the skills to interact with the interface. The question "how do these theatres/ auditoria differ from real life theatrical spaces?" could have been asked at this stage, since learners are not focusing on the technology itself, but on the spaces that are represented in these stages. In the Red case study some, but not all, of the learners had reached this level of engagement within the time allocated, i.e. at the end of an hour. The learners in the other case studies had more experience inworld than this, and all managed to interact with learning related to the subject-specific content of the course. This is equivalent to the stage of information exchange in Salmon's model.

Case studies represented by this stage

All of the Yellow and Magenta learners passed through this stage during the session, however, these were both case studies that included a self-selected sample of learners so they may have had a predisposition towards using the software. Of the Red learners, only one third of the learners, when asked in the questionnaire, stated that they felt as if they were really there. Heeter (1995; 200) found that one quarter of participants could not feel embodied within mediated environment. This indicates that somewhere above one hour is needed for these introductory stages in total and it may be found that there will always be a certain number of participants that do not reach the required level of immersion.

6.4.8 Stage 5: Developing a body image

Description of the stage

Once learners felt comfortable with the basic techniques of navigation and communication (and with some learners even before they had accomplished these stages) they feel the need to personalise their avatars (see section 5.3.5). This is possibly because they are becoming aware of the social presence they have inworld, and begin to feel self-conscious about the appearance of their avatar and recognise the need to be distinguishable from other avatars as well as aware of the status that avatar appearance can confer. This is Warburton's Threshold of Care stage. The look of their avatar then becomes a body project; skills such as inventory management become important. The feelings of self-consciousness can be an additional motivation to acquire some of the movement and interaction techniques but also adds extra skills to learn, and a higher level of anxiety, since the learners feel more exposed as "newbies". This can be exacerbated by grievers who may recognise and target those with "newb" status.

Learners at this stage will preferably have learned the social conventions required to maximise their sense of copresence. This, coupled with their self-awareness of their image, and their work in developing an individualised look is linked to the need to promote their self-presence, and this self-presence will in turn promote awareness of social communication cues (Caspi and Blau, 2008; 339). All of these will form an effective platform for conducting situative learning activities and forming groups for groupwork. Conversely to this, lack of adoption will create a cycle of lack of engagement and skills at non-verbal communication. Learners who are not developing these skills may feel that they feel difficulty in relating to their peers due to the absence of non-verbal cues they are receiving from the avatars around them, and so feel the lack of body language and facial expression they are used to in physical world interactions. The environment will therefore at best still feel impersonal to them and at worst seem threatening and alienating.

A useful task to set learners at this stage is shopping. This reinforces many of the basic skills requirements, exposes the learner to the larger world of Second Life and also enables the process of personalisation of the avatar.

Learning activities appropriate to this stage

Situative learning is effectively supported at this stage since the learners have the necessary social and copresence. Class discussions inworld can be conducted at the point at which learners have a strong enough sense of self and of each other within the virtual world. This stage relates to Salmon's knowledge construction and development for this reason, although this stage does not require the development of a virtual body image in other technologies.

Case studies represented by this stage

Most Blue learners had reached this stage after an introductory session and a one-hour subject-related session. Some of the Red and Yellow learners had begun to indicate that they were aware of each other's appearance and social presence.

6.4.9 Stage 6: Developing a body schema (approprioception)

Description of the stage

The neologism *approprioception* is a compound word, implying a combination of two processes; that of appropriation, in which the use of a tool becomes internalised (the 'making the tool one's own' described by Littleton, Toates, and Braisby [2007; 203]), and proprioception. This latter is a characteristic identified as being an important stage in learners' engagement with virtual worlds (Katherine Rowe, 2009, personal communication). Before a learner feels comfortable with being able to easily move their avatar, being able to manoeuvre without colliding with objects and other users, and being able to manipulate objects easily, then they can feel anxious about interaction. The ability to experience proprioception of their extended body, being able to judge the position of their avatar and how they inhabit the space, may be part of becoming accustomed to the use of the tools. This is the process that Murray and Sixsmith (1999; 324) refer to as the technology "drawing into the architecture of the body". It is also a prerequisite for the merging of action and awareness that Järvinen, Heliö and Mäyrä (2002; 22) state is an essential part of the experience of flow. At the point at which the body schema extends to that of the avatar, the participant is no longer "aware of themselves as separate from the actions they are performing" in the virtual world (see section 2.2.2).

Part of this stage is learning the social conventions of the space (McVey, 2008; 179) or rather, learning to apply the social conventions of the real world within the space. McVey (2008; 179) concludes that “Time to explore is time well spent” within Second Life, i.e. that these are necessary prerequisites to any curriculum-focused learning activities. This exploration is more effective if it includes exposure to places that have a real emotional connection to the learner and in which the learner can act since “it is through a performance of the body ... that one is rooted in the virtual environment” (Taylor, 2002; 42).

This stage occurs alongside having spent sufficient time inworld that they feel embodied within the space, Warburton’s “avatar as extension of self”. This level is required for sensory impressions of the space to have an emotional impact on the participant, as opposed to the learner observing them detachedly.

In combination, it is suggested that the merging of action and awareness, the feeling of bodily connection with the avatar, and the awareness of the space that the avatar inhabits, gives rise to a fuller sense of embodiment, and in that state experiences inworld will be perceived more as direct personal experiences, with more emotional resonance.

The precedence for linking the experience of embodiment and processing of information in this way is found in the concept of embodied cognition as it is related to learning in the physical world. Wilson (2002) reviews embodied cognition, describing its essential elements.

Cognition is situated. Cognitive activity takes place in the context of a real-world environment, and it inherently involves perception and action

Cognition is time pressured. ... cognition must be understood in terms of how it functions under the pressures of real-time interaction with the environment.

We off-load cognitive work onto the environment. Because of limits on our information-processing abilities ... we make the environment hold or even manipulate information for us ...

Cognition is for action. The function of the mind is to guide action, and cognitive mechanisms such as perception and memory must be understood in terms of their ultimate contribution to situation-appropriate behaviour” (Wilson, 2002; 626)

Wilson also concludes that “off-line cognition is body based” (2002; 626), implying therefore that online cognition is not. The implication of this study is that, where online bodies and online spaces can fulfil all of the requirements above, online cognition too could be seen to be body-based, and until learners have acquired that sense of body within those spaces, cognition can be impaired.

Learning activities appropriate to this stage

Cognitivist activities, particularly those drawing on experiential learning, depend on this level of embodiment for their success. The question “what do you think the challenges for actors and designers would be in the real theatre this model represents?” requires this level of immersion, since it requires the learner to project themselves within the space, as if it were real, and report back on that experience.

Case studies represented by this stage

Of the case studies, only the Green learners had spent long enough inworld for any to be able to discuss the atmosphere of the places. Learners reported experiencing an emotional connection to the exhibitions they had seen, and blurred the distinction between themselves and their avatars. These learners had spent approximately 10 hours inworld.

6.4.10 Stage 7: Acculturation

The final level equates to Warburton’s “avatar has own identity (social and cultural capital)” and requires a level of participation in the society of the virtual world in order to understand the social constructions that exist there, and the context for the activities and designs relating to the cultural aspects within that environment. The identity of the learner is then developed in the context of a set of sociocultural contexts (Murray and Sixsmith, 1999; 315) which also affects the “sensorial body” of the avatar. The question “what can you determine from the stage design (and any other surrounding spaces) are the nature of the performances, and the communities that built the stages?” requires this level of experience. This requires a far greater depth of understanding of the nature of Second Life as a world in which communities are built and in which roleplay is engaged. This could take much longer for learners to achieve, and in fact it may not be reasonable to expect learners to engage at this level, unless the subject content of the course is the social structure of virtual worlds. No learners were found who had accrued this level of experience inworld within this study, though follow-up activities have indicated that participants with longer term use of Second Life were able to interpret cultural signs and respond to the question.

6.4.11 Implications for learning

If this model of progression does hold true, then this has implications for educators using virtual worlds as it will help identify many of the issues students need to address at different stages in their participation in virtual worlds, and help educators understand and support their students. If virtual worlds are planned to be used in learning and teaching, then students would require more than training in the use of the technology, but would also require support in learning to develop an online identity, develop their social presence through their avatar and participate in inworld communities. The model could be used to design a prerequisite development course for students to take, providing them with experience of the virtual world before engaging in subject-orientated learning courses.

Without this support, some students may feel alienated from the environment, may not be aware of the social conventions required to communicate effectively with others and have difficulties in conducting the learning activities. These extra tasks add considerably to the time required to learn the use of the technology and may present an additional barrier to those students (and educators) who have an antipathy towards learning in virtual worlds (Kirriemuir, 2010; 2).

One implication of the model is that some tasks would best be deferred until students have developed a greater degree of presence. However some educators may decide that tasks requiring deeper levels of immersion are not attempted at all, or at least not attempted with all students, since it is likely that some students will never develop a virtual identity and virtual body to this extent. Alternatively, educators may simply accept that not all students will be able to learn to the same degree of effectiveness once deeper levels of presence and embodiment are required, and that “teaching and learning activities shouldn’t be compromised for the sake of people who have the wrong mindset for the technology” (Kirriemuir, 2010; 5).

6.5 Reflections on the study

6.5.1 Effectiveness of the study

The study overall was attempting to identify learning and teaching within a relatively new field, with a limited range of case studies from which to draw data. The design of the study therefore aimed to be as effective and draw as much information as possible from the opportunities that were available. The discussion below identifies some of the limitations under which the study operated and demonstrates how the research design was created to mitigate these effects as much as possible.

Limitations in case studies

The case studies had the following limitations:

- 1) There were few cases. Although many more academics were approached to allow me access to the work they were doing using virtual worlds, most of these requests were denied. Preferably more case studies would have been included
- 2) They are short. Of the five case studies, three were of students who only participated for one session. Of the remainder, one group had a series of five sessions and one had 10. During the period of the study conducting teaching in virtual worlds was a relatively high risk activity. There were few guarantees that the technology would work, or that the sessions conducted inworld would be productive learning activities. Unsuccessful learning activities would have had an impact on learners' learning by reducing the amount of time available. For this reason, sessions conducted inworld were kept to a minimum, so longer term longitudinal studies were not possible.
- 3) The limited range of technologies. The original intention was for the study to examine the experience of students in a range of mediated environments. However, all the case studies that were able to be set up were using Second Life as a platform for the activities. This was due in part to the developing interest of the educational community in virtual worlds over the period of the study, and partly due to the arrangement whereby I was granted access to activities. The perception amongst the teachers using Second Life was that I had specific expertise in this field, which they

lacked, and I would be offered access to students in exchange for providing this expertise. There were no similar requirements for support using other technologies.

4) The limited range of teaching activities. Only one of the activities used a situative teaching approach (in which students developed knowledge through discussion and participation), the others used cognitivist approaches (in which students experienced the environment and reflected on their experiences). This gave a small range of examples of learning activities from which to draw comparisons.

5) The self-selected samples. Of the five cases, only one, the first, had only a minor element of self-selection, in that only 14 of the 15 students responded to the questionnaire. With the remainder of the case studies, the students either took part in the activity as a mandatory part of their course, or then volunteered to be part of the evaluation, or the activity was a voluntary one and inclusion in the evaluation was then mandatory. This then means that the samples are not representative. However, the aims of the studies were to find the range of experiences of learners, not necessarily the percentages of these different categories of learners. Where the study would have been strengthened would have been to include more qualitative data from students who did not engage.

6) Inconsistent access to students. Having no direct teaching opportunities myself, I was reliant on the collaboration of practitioners allowing me access to their learners and facilitating the evaluation. This meant I had no overall control over what evaluation would be permitted, and no access to objective data about successful learning (for example assessment marks), as these were confidential. This meant that evaluation methods could not be systematic. Since I could only apply those that would be possible with the access I was permitted, this meant that the qualitative data from each case study were gathered using different tools and none of the qualitative methods were applied across all five case studies.

The research design elements that mitigate the limitations

Despite the small number of cases, the same activity was able to be replicated once, and the case studies that were analysed did include a range of different degrees of experience, so that the effects of longer term involvement in the virtual world were able to be observed. The effect of a small number of cases was also mitigated by using a range of evaluation methods, involving chat

transcripts, interviews and surveys. Including both a qualitative and a quantitative strand enabled the findings to be triangulated, and the same correlation between learner satisfaction and experience of presence was found from both strands. Although the number of respondents altogether was small (around 35) the key finding, of the relationship between satisfaction with learning and experience of presence, produced such a strong correlation that this number was sufficient to indicate a link.

The model of progressive presence that was developed did appear to apply across all of the case studies that were conducted, indicating that it was reliable. The model was also tested by employing a theoretical replication, i.e. after the first case study, predictions were made that longer term exposure to a virtual world would enable students to experience an emotional connection with the space, which was borne out by later case studies. These case studies were also of several different subject disciplines and different cohorts of students, which indicates that it is generalisable across learning activities within virtual worlds. However, the reduction to a single technology does mean that generalisability across all mediated environments cannot be assumed from the study.

Despite different tools being employed for different case studies, the three “primary” case studies (Red, Green and Blue) all generated a large amount of qualitative data. These data were analysed separately and individually produced similar ranges of data and similar categories (as a separate “grounded” process was used to develop categories for all three studies). This implies that, although different tools were used, comparable data were produced as a result.

6.5.2 The contribution of the research and impact on the academic community

Several papers and presentations have arisen from the study; these are listed in the section at the beginning of the thesis. I have been invited to present the findings at seminars in Coventry University, the University of Warwick, the University of Leicester, the University of Derby, the University of Plymouth, the London Institute of Education and the Said Business School in Oxford. The contribution to the community through seminars, conferences and print publications of this work to date falls into the following aspects:

The conceptual framework

The conceptual framework has two main features, the development of a consistent terminology to describe the various aspects of mediated environments and bringing together the various elements of the literature into a single framework that combines Activity Theory and Communities of Practice. This framework has been published as Childs (2010).

The framework proved useful in organising and making sense of literature and it proved very easy to absorb new categories and information into the framework. There are aspects of using a conceptual framework that are problematic, in that it can mean the researcher looks particularly for elements that fit within, or challenge, the framework, rather than being more led by the data, i.e. “consciously, or unconsciously, informs thought and practice by increasing personal sensitivity to notice particular occurrences” Smyth (2004). This may have led the analysis to attribute patterns in the learners’ experiences, for example matching de Vignemont’s categories of physical embodiment to that of the students experiences of virtual embodiment. The design of the survey aligned with the conceptual framework well in the set of questions on satisfaction with learning and the experience of presence and the correlation between these categories was demonstrated by the data (section 5.2.4). The framework was less effective at developing questions for the characteristics of the learner and linking this to presence and this is discussed below.

Even if this specific framework is not adopted, the idea of using a framework, to indicate to other researchers simply and visually where one believes one’s own research findings fit into the overall field would be a practice worth adopting for researchers. Developing a map would help other researchers make sense of one’s research and place it within its relevant context unambiguously and effectively.

Identifying gaps in the literature

Where the conceptual framework did not support the quantitative study was in the area of the characteristics of the learner (section 2.4). The conceptual framework suggested that characteristics such as tendencies to become immersed in other media or roleplaying tendencies, or other factors such as risk-taking, would contribute to an experience of presence, but the data that were gathered did not indicate this (section 5.2.4). This could be due to the difficulty in establishing questions that

identify these characteristics, or because the assumption that generic tendencies for immersion or roleplay (for example) in other media transfer to virtual worlds is an erroneous one. The questionnaire may have identified predispositions towards engagement in virtual worlds if it had drawn on previous research into learners' characteristics, for example, personality types or learning types, instead of the characteristics outlined in the literature and included in the conceptual framework. However, the concept of "personality types" is itself flawed, e.g. as seen in the research of Annetta, Klesath and Holmes (2008).

Another possibility could be that, because the nature of the effects being investigated are so subjective, and some of the experiences of virtual worlds are so new (and so there is not a well-developed language to describe them) objective statements expecting an agree/disagree response will not be effective at profiling participants. The interviews enabled concepts to be explored and explained and the participants to have an opportunity to express themselves. These allowed the students an opportunity to identify the characteristics they thought were relevant, such as open-mindedness, imagination and willingness to participate. Identifying the characteristics of learners that make them more likely to engage in virtual worlds is an area that can be explored in future work.

The role of presence and factors supporting presence

Although the number of participants in the study was low, the link between satisfaction with learning and experience of presence is shown by the data to be a strong one. This is a valuable contribution to the community, in that it highlights the significance of a development of presence in virtual worlds, and suggests that supporting this will be a key element to creating positive learning experiences.

Other findings about the factors supporting this experience of presence have a useful contribution to the debate. These challenge presumptions about the type of learners who will be predisposed to virtual worlds i.e. this predisposition is not related to previous exposure to, or preference for technology, and does not particularly appeal to so-called "textroverts". It appears that the majority of students have embodiment tendencies and these students will take to learning in these environments. Not all students have these tendencies, and those who do not will find the

experience of virtual worlds unsatisfying. Identifying why some students find embodiment in the virtual more challenging is difficult, but students who seem particularly connected to the physical may fall into this category. Within the limits of this study there appears to be no correlation to roleplay tendencies or risk-taking.

The model of progressive development of presence

The organising of the experiences of learners into discrete stages in a developing experience of presence is conjectural. The numbers are small, and the experiences too individual, to be able to derive a sequence that is true in all cases. Although it was not possible to have access to a single group of learners through a long study, having a range of cases meant that different groups of learners could be observed at different points in their developing experience of the virtual world. The statements and observations of these learners did reveal that there is change in the degree of presence felt over time, and that this change occurs with the development of a virtual body image, and a virtual body schema. The evidence for this is that learners who were new to the virtual world did contribute to the discussions relating to a sensory experience of the spaces less than they did to questions simply about their observations. The Blue learners, with only a few more hours' experience, did consider much more the aspects of their appearance and identity (and the Green learners even more so) than did those in the other three case studies. Whether this is in part due to the nature of the learners or the subject discipline cannot be determined from these case studies.

Although the division of what is a continuous and complex development, which may take place in a different order from learner to learner, into a series of clearly-defined steps is an oversimplification, part of the goal of the study is to provide some structure for teachers using these environments in their work, and clarifying the progress through reducing it to a few key stages will be of value to practitioners. This has already informed my own teaching in Second Life, and these sessions now have a technical familiarisation stage, a playing stage and an avatar design stage in order to support learners' initial steps. These induction activities are common amongst practitioners, but few theorise this as a development of a virtual body image and body schema. A contribution of this research to the community is to introduce the idea of virtual bodies as tools for learning to educators in virtual worlds and to relate ideas of bodies and performance (for example, reading

proxemics and kinesics to support non-verbal communication) to behaviour in the virtual world and therefore presence and embodiment and hence learning.

The typology of students' resistance

The study in which the qualitative data were re-examined to look for attitudes that indicate resistance to virtual worlds identified a number of types of resistance. The process of identifying unique categories to describe these responses is, again, arbitrary to some extent. Types of response can be grouped differently to produce different categories, however, the categories identified do characterise the types of learners seen within a very few categories, are mutually exclusive and exhaustive (Merriam, 1998; 184) i.e. they contain all the data, which indicates that they have some validity. The categories are also at the same level of abstraction (Merriam, 1998; 184) and reflect the purpose of (this part) of the research (Merriam, 1998; 183). The self-selected sample of learners for most of the case studies, and the small number of the learners who contributed data even though they did not want to take part in the case studies, meant that there were few data concerning the nature of the resistance to learning in virtual worlds. These categories can therefore only be provisional, although correspondences have been found between some of these categories and the literature and have been confirmed by other educators (e.g. Childs and Peachey, 2010).

Of the contributions made by this study to the educational community, this has received the most notice (for example, Kirriemuir [2010; 25]). When this research began there was little reference amongst educators who use virtual worlds of the causes of lack of engagement, for example, the impact that failing to experience embodiment will have on learning in virtual worlds, or research that some participants may not be able to experience embodiment. The historical roots of technical scepticism and the rationale behind this are also not part of the usual discourse. Practitioners who have struggled with learners' resistance have found reassurance in seeing these learners categorised and explained. There appears to be a gap in understanding between those who "get" virtual worlds and those who do not and this part of the research makes some initial attempts to bridge this gap.

6.5.3 Implications of the study for learners and educators

As stated in the introduction (p. 20), the technological imperative of simply using a technology for its own sake has little or no value, and if virtual worlds are to be used in learning and teaching then their added benefit needs to be shown. This study does demonstrate the educational potential of virtual worlds; learners, in the main, perceive sessions that employ them to be worthwhile learning activities, and for the more experienced students, the recreation of theatrical stages, or historical events, provides for learners an opportunity to have experiences that would not otherwise be possible. Virtual worlds are also effective as a medium for providing a valuable perspective on the discussion of identity issues and development. The issue is not “are virtual worlds beneficial?” it is “do the benefits of virtual worlds outweigh the additional effort?”

The difficulties are, firstly, that the techniques required to operate the technology take time to acquire. This acquisition can take an entire session and when contact time is at a premium in many courses, dedicating an hour to learn a technology that may only be used once is a considerable overhead. Secondly, the greatest benefit of the technology requires more of learners than simply acquiring the necessary techniques, it requires them to fully inhabit the virtual spaces and experience their avatars as lived embodiments, and consequently this takes a much longer time to achieve. Thirdly there is opposition from some students, and other educators, about the value, or even the propriety, of using virtual worlds as educational platforms. It is the essential nature of the technology as an embodied experience and inhabited space that both makes the technology valuable, and also makes it divisive.

The implications for educators of this study are that when conducting learning sessions with students, the following are considered:

- The rationale for using a virtual world is established for the students.
- Embodiment and presence are not necessarily experienced by all students, and that these students may need more reassurance that the use is valid.
- Students are given an opportunity to express their concerns about the use of virtual worlds, but their preconceptions are also challenged.

- Sufficient time is set aside for students to acquire the technical skills, and also become familiar with their avatars and the virtual world.
- The level of presence and embodiment required by the task set and whether the students will have reached that particular level at that stage.
- Students are made aware of, and are supported in their learning of, some of the additional skills required, such as conventions in communication, developing a social presence, etc.
- As a precursor for all of these considerations, educators need to establish what balance they feel to be appropriate between being flexible to accommodate learners' needs and concerns, and ensuring that legitimate learning goals are not compromised by students' and colleagues' prejudices.

The implications for students are that of the technologies they are likely to encounter at some point in their studies, virtual worlds may be the most challenging and may be particularly time-consuming to learn. For most students, this is an experience they will enjoy. For the remainder, the use of the technology will mean that:

- Some learning sessions will be conducted in a learning environment in which they will be disadvantaged compared to their colleagues due to their lack of experience of presence and embodiment.
- Their learning inworld cannot be as effective if it is simply instrumental, i.e. entering the world just to obtain information. Time must be allocated to activities they may seem as peripheral or of no value, such as avatar design and exploration.
- The distinctions made between real and not-real, for example, the disclosurist drive to identify who the person with whom they are communicating "really" is, are no longer entirely valid.
- During their time inworld they may be confronted with behaviour and communities with which they feel uncomfortable.

For these students, the use of virtual worlds can be a learning experience in itself, if students are encouraged to reflect on their values and consider in what areas they are inappropriate.

The focus on institutions' response to virtual worlds has largely been on their provision (or lack of) adequate resources. One implication of this study is that, if the learning design is properly

thought through, and the students are sufficiently engaged, minor glitches with the technology are not disruptive. Institutions do not therefore need to have state-of-the-art computers. This study indicates that the support educators particularly need is in having additional time allocated for students to become sufficiently familiar with the technology. At the moment this time is taken from the individual module in which the virtual world sessions take place, however, when virtual worlds are used several times during a students' education, institutions may then require students to attend an induction course in the use of virtual worlds. This would then ensure that students were proficient in navigation and communication, and had a pre-existing virtual identity, before beginning the module and remove the impact on the time allocated to learning and teaching.

Because some students have value-based opposition to virtual worlds, and because some students do not experience presence and embodiment, there is a question as to whether virtual worlds can be used with all students. In the short term, while the advantages and disadvantages are still being researched, it may be appropriate to only use virtual worlds in optional modules. However, as the benefits and appropriate uses of virtual worlds become clearer and their use more widespread, then their use in mandatory courses becomes likely. Institutions need to formulate an appropriate response to those students who believe their refusal to take part in these activities is warranted or who may raise complaints about their use (see sections 5.4.4, 5.4.5 and 5.4.6), which takes into account students' diversity but does not accept their position. Sheila Webber (personal correspondence, 2010) notes that in her courses in virtual worlds, which are mandatory, few students object since the use of Second Life is presented as a normal, mainstream activity. The implication for institutions is that if activities in virtual worlds are treated by institutions as valid as other forms of learning, then opposition to them may still occur, but the students will not feel so strongly that their opposition is justified.

6.6 The future of mediated environments

This study has provided me with the opportunity to find a role and a voice within the academic community through the publications and seminars described above, and through the networks and contacts I have been able to make. One of the problems with conducting the study has been access

to case studies. It is hoped that once the PhD is attained, opportunities to experiment and test further the conclusions of the study will be more readily found. In retrospect, the study may have been stronger if it had focused on the role of virtual bodies and virtual identities in learning, rather than identifying appropriate learning activity design. The links between virtual bodies and learning only became apparent towards the end of the study and, as of writing, this is still an area under-explored by educators. Models have now been developed for designing learning activities in virtual worlds that are comprehensive in scope (for example Scopes [2009]) and so this aspect of the study is of less value to the community. Exploring virtual bodies and identities could then have entailed experimenting with techniques to develop and strengthen the experience of presence, embodiment and identity, as opposed to only observing the activities and recording learners' comments across all the categories of the conceptual framework or attempting to identify generic good practice.

The areas this future work will hopefully focus on are:

- Continuing to develop the conceptual framework. Although the overall categories are now fixed, the "characteristics of the learners" category in particular needs to be rethought. Identifying the personal aspects of the learners that influence the experience of mediated environments will be a valuable development. Some aspects of the framework, such as the influence of division of labour is also underdeveloped.
- Applying the framework to other mediated environments. There is still the need to test the applicability of the conceptual framework to other technologies such as webconferencing in order to identify its generalisability.
- Testing the model of progressive presence. The importance of the development of social presence and body image to social constructivist activities, and the connection between identity and the feeling of presence within the world still needs to be tested thoroughly. The ability to draw emotional inferences from the spaces is also an element that can be investigated. "Is this as a result of developing a virtual body schema, or are these different steps, or simultaneously occurring stages?" are all questions that will help in understanding learners' developing ability to function in virtual worlds. These will require learning sequences of many more weeks than took place in these cases studies, and may not be possible.

- The role of communities in developing a virtual identity, and this role in being a learner in a social virtual world is also of interest. In the future there may be a move away from teaching in public social virtual worlds, and take learners into institutional private worlds. This will mean that these sorts of opportunities will be missed.
- Further investigation of learners' resistance. As virtual worlds become more adopted, and more mainstream, virtual worlds will become involved more frequently in mandatory learning activities, no longer being a mode of delivery only for learners who have self-selected those courses. The opportunity for resistance may therefore increase. Understanding the causes of this resistance, and identifying tactics for minimising this resistance will become more important. Developing the typology of resistance, and becoming involved in the debate about how to address the bridge between the pro- and anti- virtual worlds contingents will also be an interesting area to develop.

It is hoped that all of these studies will involve more comprehensive and more systematic evaluations, perhaps through teaching my own learners in virtual worlds. The models conjectured within this study have much more testing, but will, if valid, would contribute considerably to my own and others' practice.

Overall, though, the real value for me of the study is its timeliness. In the five years since the study began, virtual worlds have become far more widespread, and the field has become a vibrant and exciting area of research. Beyond this, the introduction of virtual worlds on such a scale is a widespread social phenomenon and this study has, I believe, laid the groundwork for further investigations on the most problematic aspects of this social change.

Essentially, virtual worlds are not simply about the creation of a 3D computer world; the use of avatars means they are about the creation of a 3D computer-generated *us*. The elements investigated in this study are about the sense of presence and embodiment, about the avatar being an extension of ourselves and blending the human, machine and the abstract virtual into a single architecture. In other words, the more advanced the technology gets, the more human it gets, as long as one is prepared to accept a redefinition of what being human means. The cultural underpinnings of the cyberpunk movement are essentially transgressive and transhumanist, and the widescale adoption of virtual worlds are thrusting these philosophies onto society as a whole. To be

a learner within a virtual world requires the adoption of a virtual body, and hence to absorb these philosophies to a certain extent. Some of the learners who resist are simply learners who feel too located in their physical bodies to make the connection, but many users are ancient sceptics or cultural conservatives who are threatened by this new virtual experience on a moral, philosophical and perhaps even neurological, level. All of these factors act to polarise our learners, and may explain why virtual worlds seem to create a stronger aversion amongst learners than other technologies. Although this presents a challenge in the classroom, it also offers an opportunity to confront the unease that many learners have with these social changes. As virtual worlds become more commonplace and these transhumanist and transgressive philosophies become more widespread in society, the divisions being played out in the virtual classroom may well become a microcosm of the divisions played out on a larger scale. Hopefully as a researcher attempting to understand the nature of being (a learner or a resident) in a virtual world, this field of research will have a role to play in what may become one of the central social discourses of the 21st century.

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Appendices

Appendix A: Quantitative survey data

The survey was modified twice as the study developed and as questions were discarded and replaced with new ones. In the following appendices the versions of the surveys are displayed, followed by the data collected.

Version 1 used at University of Red

Version 2 used at Green College

Version 3 used in remaining case studies

Data gathered from Universities of Magenta and Blue conducted online

Data gathered from Yellow University conducted on paper

A1. Red Case Study

About you

Profile

Male ☐
Female ☐

Age ____

agree	disagree
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About you

I use instant messaging (MSN, Yahoo Chat etc.) regularly
I play computer / console games regularly
I've used Second Life before
I regularly use social networking sites (e.g. Facebook, MySpace)

I sometimes lose track of time when I'm reading
I prefer not to talk while a TV programme / film is on if it's one I really like
Some of my friends are people I only know online
I daydream

I don't like to communicate with people online unless I know who they really are
I always behave the same way, it doesn't make any difference who I'm with
I sometimes wonder what it would be like to be a completely different person
I'm never really myself in front of other people

About Second Life

It was far too difficult to find my way around
It was too difficult to move the way I wanted to
I just felt too detached from the space
I didn't feel like I could relate to my avatar
I felt like I was there
I felt like I was sharing a space with other people in the virtual world
I felt I learnt something about the theatrical spaces
It was a fun experience
I'd like to try it again
I couldn't see the point of it

sex		M	M	f	m	f	f	f	f	m		f	f	f	m	m
age		20	20	19	20	20	19	19	19	19		20	19	19	19	19
<i>naturalisation</i>																
IM	y=1	y	Y	y	n	y	y	n	y	y		n	y	y	y	n
games	y=1	y	N	y	y	y	n	n	n	y		n	n	n	n	n
SL	y=1	n	N	n	n	n	n	n	y	n		n	n	n	n	n
social networking	y=1	y	Y	y	y	y	y	y	y	y		y	y	y	y	y
<i>immersion</i>																
reading	y=1	y	Y	y	y	y	y	y	y	y		y	y	y	y	y
movies	y=1	y	Y	y	y	y	y	y	y	y		y	y	y	y	n
online friends	y=1	n	N	y	n	n	n	n	n	n		n	n	y	n	n
daydream	y=1	y	Y	y	y	y	y	y	y	y		y	y	y	y	y
<i>roleplay</i>																
disclosurist	n=1	n	N	n	n	y	y	y	y	y		y	y	y	y	y
singularity	n=1	n	N	y	n	n	y	n	n	m		n	n	n	n	m
possible other	y=1	n	Y	y	n	y	n	y	n	n		y	m	y	y	n
hidden true self	y=1	n	M	n	n	y	n	n	n	n		n	n	n	m	n

navigation

wayfinding	n=1	y	M	m	n	y	n	n	n	y		n	n	y	n	y
motion	n=1	n	M	y	n	y	n	y	y	n		n	y	y	n	y

presence

mediated presence	n=1	n	N	n	n	n	n	y	n	y		y	y	y	y	y
avatar dysfunction	n=1	n	N	y	y	y	n	y	y	n		y	y	y	y	y
presence presence	y=1	n	Y	n	n	n	y	n	n	y		n	n	n	n	n
copresence	y=1	y	Y	y	y	y	y	y	y	n		y	y	y	n	y
		3	4	2	2	2	4	1	2	2		1	1	1	0	1

A2. Green Case Study

About you

Male ☐
Female ☐

Age ____

agree	disagree
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About you

I use instant messaging (MSN, Yahoo Chat etc.) regularly

I play computer / console games regularly

I've used Second Life before

I regularly use social networking sites (e.g. Facebook, MySpace)

I only like to use a technology if I can be sure that it's going to work

I think there's no point imagining other worlds, this one is enough

I don't like to communicate with people online unless I know who they really are

There's no point learning something unless it's going to be useful

I think communicating using technology is too impersonal

I prefer writing things to saying them

I usually find I listen more than talk in social situations

Some of my friends are people I only know online

I sometimes pretend to be someone else when I'm communicating online

I always behave the same way, it doesn't make any difference who I'm with

I sometimes wonder what it would be like to be a completely different person

I'm never really myself in front of other people

About Second Life

It was far too difficult to find my way around

It was too difficult to move the way I wanted to

I just felt too detached from the space

I didn't feel like I could relate to my avatar

I felt like I was there

I felt like I was sharing a space with other people in the virtual world

I felt I learnt something about the theatrical spaces

It was a fun experience

I'd like to try it again

I couldn't see the point of it

Student		A	D	E	F	C
Sex		m	f	f	M	M
Age		23	19	21	29	20
naturalisation						
IM	y=1	n	y	y	N	N
Games	y=1	y	y	n	N	N
SL	y=1	y	n	y	Y	Y
social networking	y=1	y	y	y	Y	Y
risk-taking						
tech must work	n=1	n	y	n	Y	Y
Mundane	n=1	y	n	n	N	N
Discosurist	n=1	n	y	n	Y	Y
functional learner	n=1	n	n	n	Y	N
Textrovertism						
online too impersonal	n=1	n	n	n	N	N
online preferable	y=1	n	n	n	N	N
introvert offline	y=1	n	y	m	N	Y
online only friends	y=1	n	y	n	N	Y
Roleplay						
Tourism	y=1	n	n	n	N	N
Singularity	n=1	n	y	y	Y	Y
possible other	y=1	n	y	y	Y	N
hidden true self	y=1	y	n	n	N	N
Navigation						
Wayfinding	n=1	n	n	n	N	N
Motion	n=1	n	y	n	N	N
		2	1	2	2	2
presence						
mediated presence	n=1	n	n	n	N	N
avatar dysfunction	n=1	n	n	n	N	Y
presence presence	y=1	y	y	y	Y	N
Copresence	y=1	y	y	y	Y	N
		4	4	4	4	1
Effectiveness						
Learning	y=1	y	n	y	Y	N
Fun	y=1	y	y	y	Y	N
Repeat	y=1	y	y	y	Y	N
Pointless	n=1	n	n	n	N	Y
		4	3	4	4	0

A3. Magenta, Blue and Yellow case studies

About you

Male ☐
Female ☐

Age ____

agree	disagree
-------	----------

About you

I use instant messaging (MSN, Yahoo Chat etc.) regularly

I play computer / console games regularly

I've used Second Life before

I regularly use social networking sites (e.g. Facebook, MySpace)

I only like to use a technology if I can be sure that it's going to work

Imaginary worlds can't help me learn about the real world.

I don't like to communicate with people online unless I know who they really are

There's no point learning something unless it's going to be useful

I think communicating using technology is too impersonal

I prefer writing things to saying them

I prefer to learn by talking to others rather than reading it in a book

Some of my friends are people I only know online

I sometimes pretend to be someone else when I'm communicating online

I'm never really myself in front of other people

Playing games is just for children and teenagers.

I like to have fun when I'm learning

About Second Life

It was far too difficult to find my way around

It was too difficult to move the way I wanted to

I just felt too detached from the space

I didn't feel like I could relate to my avatar

I felt like I was there

I felt like I was sharing a space with other people in the virtual world

I felt I learnt something about the theatrical spaces

It was a fun experience

I'd like to try it again

I couldn't see the point of it

Location		Mag	Mag	Mag	Mag	Mag	Blue	Blue
		A	B	C	D	E	F	D
		m	m	m	f	m	male	female
		25-34	18-24	45-54	18-24	25-34	25-34	45-54
I use instant messaging (MSN, Yahoo Chat etc.) regularly	y=1	y	n	n	y	y	n	y
I play computer / console games regularly	y=1	y	y	y	y	y	y	n
I've used Second Life before	y=1	y	n	y	y	y	n	n
I regularly use social networking sites (e.g. Facebook, MySpace)	y=1	y	n	n	y	y	y	y
I only like to use a technology if I can be sure that it's going to work	n=1	n	y	n	y	n	n	n
Imaginary worlds can't help me learn about the real world.	n=1	n	n	n	n	n	n	n
I don't like to communicate with people online unless I know who they really are	n=1	n	n	n	n	n	n	n
There's no point learning something unless it's going to be useful	n=1	n	y	n	n	n	n	n
I think communicating using technology is too impersonal	y=1	n	n	n	y	n	n	y
I prefer writing things to saying them	n=1	n	y	n	y	y	n	n
I prefer to learn by talking to others rather than reading it in a book	Y=1	y	y	n	y	y	y	y
Some of my friends are people I only know online	y=1	y	n	y	y	y	n	n
I sometimes pretend to be someone else when I'm communicating online	y=1	y	n	y	y	n	n	y
I'm never really myself in front of other people	y=1	y	n	n	n	n	n	n
Playing games is just for children and teenagers.	n=1	n	n	n	n	n	n	n
I like to have fun when I'm learning	y=1	y	y	y	y	y	y	y
<i>It was far too difficult to find my way around</i>	n=1	n	n	n	n	n	n	y
<i>It was too difficult to move the way I wanted to</i>	n=1	n	y	n	n	n	y	y
<i>I just felt too detached from the space</i>	n=1	n	y	n	n	n	n	y
<i>I didn't feel like I could relate to my avatar</i>	n=1	n	y	n	n	n	n	n
<i>I felt like I was there</i>	y=1	n	n	y	n	y	y	y
<i>I felt like I was sharing a space with other people in the virtual world</i>	y=1	y	y	y	y	y	y	y
<i>I felt I learnt something about the theatrical spaces</i>	y=1	y	y	y	y	y	y	n
<i>It was a fun experience</i>	y=1	y	y	y	y	y	y	n
<i>I'd like to try it again</i>	y=1	y	y	y	y	y	y	n
<i>I couldn't see the point of it</i>	n=1	n	n	n	n	n	n	y

Location All Yellow U		A	B	C	D	E	F	G	H	I
<i>I use instant messaging (MSN, Yahoo Chat etc.) regularly</i>	y=1	y	n	n	y	y	y	y	y	y
<i>I play computer / console games regularly</i>	y=1	y	y	n	y	n	y	y	n	n
<i>I've used Second Life before</i>	y=1	n	n	y	y	y	y	y	y	n
<i>I regularly use social networking sites (e.g. Facebook, MySpace)</i>	y=1	y	y	n	y	n	y	y	y	y
<i>I only like to use a technology if I can be sure that it's going to work</i>	n=1	n	y	y	n	n	n	n	n	n
<i>Imaginary worlds can't help me learn about the real world.</i>	n=1	n	n	n	n	n	n	n	n	n
<i>I don't like to communicate with people online unless I know who they really are</i>	n=1	y	y	y	y	n	n	n	n	n
<i>There's no point learning something unless it's going to be useful</i>	n=1	y	n	y	n	n	n	n	n	n
<i>I think communicating using technology is too impersonal</i>	n=1	n	n	n	n	n	n	n	n	n
<i>I prefer writing things to saying them</i>	y=1	y	y	n	y	y	y	y	y	n
<i>I prefer to learn by talking to others rather than reading it in a book</i>	Y=1	y	n	n	n	n	y	n	n	n
<i>Some of my friends are people I only know online</i>	y=1	y	n	n	n	y	y	y	n	y
<i>I sometimes pretend to be someone else when I'm communicating online</i>	y=1	n	n	n	n	y	y	n	n	y
<i>I'm never really myself in front of other people</i>	y=1	y	n	n	n	y	y	y	n	n
<i>Playing games is just for children and teenagers.</i>	n=1	n	n	n	n	n	n	n	n	n
<i>I like to have fun when I'm learning</i>	y=1	y	y	y	y	y	y	y	y	y
<i>It was far too difficult to find my way around</i>	n=1	n	n	y	n	n	n	n	n	n
<i>It was too difficult to move the way I wanted to</i>	n=1	n	n	y	y	n	n	y	n	n
<i>I just felt too detached from the space</i>	n=1	n	n	n	n	n	n	y	n	n

<i>I didn't feel like I could relate to my avatar</i>	n=1	n	n	n	n	n	y	n	n	n
<i>I felt like I was there</i>	y=1	n	y	y	n	y	y	y	n	y
<i>I felt like I was sharing a space with other people in the virtual world</i>	y=1	y	y	y	y	y	y	y	y	y
<i>I felt I learnt something about the theatrical spaces</i>	y=1	y	n	y	y	y	y	y	y	y
<i>It was a fun experience</i>	y=1	y	y	y	y	y	y	y	y	y
<i>I'd like to try it again</i>	y=1	y	y	y	y	y	y	y	y	y
<i>I couldn't see the point of it</i>	n=1	n	n	n	n	n	n	n	n	N

Appendix B. Interview protocol

B.1 Description of interview process

The interview protocol was semi-structured in that an outline plan was developed for the interviews, based around six of the eight categories of the conceptual framework (rules and conventions and division of labour were less developed aspects of the framework and were not covered). These were preceded by an opening question asking the students to recount their specific activity in the virtual world. However, the questions were modified *ad hoc* depending on answers to previous questions, in order to pursue lines of thought introduced by the student, or to clarify statements they had made, and were adapted in order to fit naturally into the conversation at that point. Questions were also modified from interview to interview as particularly productive questions were identified. Only the opening question was therefore identical for each student. The following protocol is therefore presented as sets of questions for each of the categories, taken from transcripts of four of the interviews, indicating the type of question asked and the content.

B.2 Opening questions on activities

What were you doing in the project? What were you doing in Second Life?

B.3 Questions on presence

You said a couple of things there. You said creating the atmosphere and the audience experiencing it. Do you think that Second Life actually does create that sense of atmosphere?

So you didn't feel you were there in any way?

Did you feel like you were there and moving around within those spaces?

So when you say you're losing yourself in it, what do you think are the things that help you lose yourself in it?

B.4 Questions on the subject (the individual student's characteristics)

Do you reckon that (the experience of presence) is you or do you reckon that's anybody?

What's your background with things like this, with games or virtual worlds? Have you done this sort of thing before?

So would you say that's your general attitude to technology? That you give it a chance and like to play with it a bit and see what happens?

I'm interested in why some people engaged and why some people don't so what is it that makes that difference?

Do you play computer games?

Have you done any of this online interactive stuff like this before?

Do you think that's important for getting on with this sort of stuff, just playing and see what happens?

B.5 Questions on tools and instruments (the platform itself)

So the space there, is it realistic enough?

What other things are there about it that make you feel you've got that atmosphere?

So what about the design of the environment itself? Was it good, bad, were there things that got in the way?

So what about the interface itself. Did you find that easy to use?

B.6 Questions about community

Have you got to know a lot of people within Second Life as well?

Did you communicate with anyone else inworld while you were there?

B.7 Questions about identity

Are you the same online as you are offline?

So you have different accounts for these different spaces? And then you create different avatars for those different spaces?

So what sort of things did you want to change to?

So have you played with your identity online? Have you created different sorts of identities?

B.8 Questions about the object (the learning task)

So what do you think you've learnt from doing it? First of all about the theatres?

And what do you think you've learnt about yourself from doing it?

Did you feel you learnt anything from what you were doing?