UNIVERSITY OF SOUTHERN QUEENSLAND

Affordances of Virtual Worlds for Professional Development conducted using Action Learning

A Dissertation submitted by

Lindy Orwin

(Linda McKeown Orwin)

Dip. T. Grad. Dip. T. Lib

For the award of

Doctor of Philosophy

2011

Abstract

In times of rapid change, lifelong learning is essential. Teachers are no exception to this. Organized professional development has been a traditional pathway for teachers to gain access to new knowledge and skills. Regrettably a lot of value of professional development is not realized when learning is not put into practice. Pfeffer and Sutton refer to this as the 'knowing-doing gap' (Pfeffer & Sutton, 1999). There has been a shift in emphasis from being the recipient of professional development organized by others to the need for lifelong learners to be responsible for their own professional learning. One approach that addresses the knowing-doing gap whilst simultaneously developing skills for professional learning is Reg Revans' strategy called Action Learning in which learners apply what they are learning to real workplace challenges during the learning process. Using Action Learning in an online mode could increase access to this successful strategy for eliminating the knowing-doing gap.

Transactional distance theory suggests that traditional distance learning methods may not effectively support the type of dialogue typical during the social reflection process that happens in the Learning Set during Action Learning. Virtual Worlds are an emerging technology that provides a highly immersive, online learning environment. This study identified the social and technical affordances of a 3D virtual world, Second Life®, for conducting Action Learning. Bannan-Ritland's Integrative Learning Design Framework (Bannan-Ritland, 2003), a participatory Design Based Research methodology, was used to design and implement two iterations of a three month Action Learning Program in a purpose built environment in the 3D virtual world of Second Life®,. A total of thirty-two participants successfully completed the program using the custom made 3D environment.

The study identified the social and technical affordances of the 3D virtual world to provide a learning environment suitable for Action Learning. High levels of satisfaction with the Action Learning Programs and high retention rates indicated that Action Learning could be conducted successfully in Second Life®, High social presence measured on two scales indicated that transactional distance was low for the dialogue element vital for effective Learning Set Meetings. The study identified that the three key barriers to participation in virtual worlds based Action Learning were technical challenges created by access requirements and an unfamiliar interface and busy lives that compete for time to attend any kind of professional development.

Certification of Dissertation

I certify that the ideas, experimental work, results, analyses, software and conclusions reported in this dissertation are entirely my own effort, except where otherwise acknowledged. I also certify that the work is original and has not been previously submitted for any other award, except where otherwise acknowledged.

Signature of Candidate	Date

ENDORSEMENT

Professor Peter Albion	Date
Associate Professor Jon Austin	Date

Acknowledgements

This research is proudly supported by the Queensland Government's Growing the Smart State PhD Funding Program and may be used to assist public policy development. The State of Queensland accepts no responsibility for decisions or actions resulting from any information supplied. The views and information contained in the research do not necessarily represent the views or opinions of the Queensland Government and carry no endorsement by the Queensland Government.

My very special thanks to my husband, Randy Orwin, who provided unwavering support during those times when the challenges of life seemed overwhelming to the point where I would have given up had he not been there to encourage me and to take on other tasks in life that gave me the time to complete this document.

My thanks go to my supervisor, Professor Peter Albion, University of Southern Queensland, Faculty of Education, whose patience, insights and feedback were invaluable.

Thanks to all the "Lab Rabbits" (Action Learners) and Action Learning Facilitators who participated in the study.

Thanks also to the wonderful community within Second Life® and on the Second Life Educators email list (SLED) who have been my sounding board, my inspiration and my support throughout this process. Particular thanks to the members of Decka's Geeks' Club who helped make the island of Terra incognita a beautiful and loved sanctuary for learning. Special thanks to the people behind these avatars:

Loch Harlan
Becca Spotter
Gypsy Paz
Arcanus Projects
Marbles Tokyo
Poinky Malaprop
Biran Gould
Cynibal Corleone
Tamara Zauberflote

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Chapter 1 - Focus of the Study

1.1 The problem of the "Knowing-Doing Gap"

We must all be lifelong learners to cope with the rapid pace of change in today's knowledge society (Organisation for Economic Co-operation and Development, 1996 p.1). Teachers are no exception to this (Fullan, 1991; Hargreaves, 2003). To be lifelong learners, teachers must become more self-managing of their learning to deal with constraints and maximise opportunities for learning (Hase & Kenyon, 2000).

> The increased pace of globalisation and technological change, the changing nature of work and the labour market, and the ageing of populations are among the forces emphasising the need for continuing upgrading of work and life skills throughout life. (Organisation for Economic Co-operation and Development, 1996, p. 2)

Practitioners and leaders in many professions, including teaching, deal with complex inter-related and confusing issues daily. The complex problem of improving professional practice can be regarded as an "ill-structured" problem (Jonassen, 1997). This complexity makes new knowledge, gained during isolated training and professional development activities and courses, difficult to put into practice immediately (Fullan, 2001).

Much time and money is spent on professional development, for example at least $60 billion annually in the US alone (Pfeffer & Sutton, 1999, p. 1). Regrettably much of this time and money is wasted because participants fail to put into practice what they have "learnt" (seen and heard, at least). As Fullan states below, this waste extends to teacher professional development.

> Nothing has promised so much and has been so frustratingly wasteful as the thousands of workshops and conferences that led to no significant change in practice when teachers returned to their classrooms. (1991, p. 315)

This condition of not turning knowledge into action was aptly named "the knowing-doing gap" (Pfeffer & Sutton, 1999, p. 4).

1.2 A strategy for addressing the problem

Pfeffer and Sutton (1999) suggest that if you "*know by doing*" then there can be no gap between what you know and what you do. Action Learning, as developed by Reg Revans (Pedler, 1991; Revans, 1998; Weinstein, 1999; Zuber-Skerritt, 1990) is an active learning strategy for professional development.

Revans described Action Learning using a formula:

$$L = P + Q$$

in which learning (L) equals programmed knowledge (P) plus insightful questioning (Q). Through a cyclic process of informed planning, action and reflection, participants in Action Learning take what is already known (programmed

knowledge) and apply it in their particular context by participating in a workplace project as they learn. By asking insightful questions about what happened and reflecting on their action with the support of a collegial group called a Learning Set, these Action Learners develop and refine their skills, knowledge and understanding within the context of their work. Learning is integral to doing.

The mercurial nature of unstructured problems can be addressed by the cyclic nature of Action Learning. By using a four stage process of explore, plan, act and reflect, participants gradually refine their plans applying new learning in their practice. The collaborative process of reflection and the exploration of the problem, through data collection and the use of programmed knowledge, combine to help Action Learners deal with complex problems with a range of stakeholders.

There are many benefits of Action Learning as a professional development strategy (T. Downes et al., 2001; Marquardt, 2004; Pedler, 1991; Revans, 1998; Weinstein, 1999; Zuber-Skerritt, 1990). Action learners accomplish real work while they learn by addressing real issues, not just case studies. On-the-job learning is always relevant to the learners and Action Learning can be successful even when the selected project is not completely successful. Action Learning is flexible and effective in a wide variety of contexts. Action learning develops the transferable attributes of a lifelong learner. It develops self-awareness amongst participants, and helps them to become more aware of others and increases trust, sense of community and being valued.

1.3 Opportunities and limitations of the online environment

In an time of increasing numbers of connected computers and shrinking professional development budgets (Bonk, 2004), to meet the needs of spatially distant learners (Australian Flexible Learning Framework, 2005), opportunities for learning online are expanding rapidly.

> ICTs are seen by many countries as among the most effective ways of increasing and widening participation in lifelong learning while keeping costs down to an affordable level (Organisation for Economic Co-operation and Development, 2004, p. 6).

However, geographical distance is not the only reason learners are moving online. The culture of web use has changed from passive consumer to active participant with opportunities for participation and collaboration through the read/write web (O'Reilly, 2005) and distributed representation (S. Downes, 2005a). O'Reilly and Downes describe a shift in the use of the web from a place for publishing to a place for participation, community and networking accompanied by a shift in the types of access, software, services and interfaces. The new web provides collaborative services, trusts users as co-developers and harnesses collective intelligence of groups. These principles also underpin the process of Action Learning.

The expansion of distance education over the past several decades has been accompanied by the development of theory associated with this mode of delivery. Moore's theory of transactional distance (M. G. Moore, 1997) has been developed to better understand the changed roles of the teacher and learner in distance education. It states that in distance learning there is more than geographical distance. There is…

> a distance of understanding and perception, caused in part by geographic distance, that has to be overcome by teachers, learners and educational organizations if effective, deliberate, planned learning is to occur (M. G. Moore, 1992, p. 1).

Moore's theory identifies three important variables that will increase or decrease the transactional distance. They are dialogue, structure and learner autonomy. This theory is particularly relevant to the design of online environments capable of supporting a highly interactive and dialogic, structured pedagogy that develops learner autonomy such as Action Learning. The key component of dialogue will be the focus for this study as it is the dialogue in the small reflective group called the Learning Set that is critical for Action Learning (Pedler, 1991; Revans, 1998; Weinstein, 1999; Zuber-Skerritt, 1990).

1.4 Virtual world development

Professional learning community models of online learning aim to increase dialogue and support construction of knowledge (Wenger, 1998). This has occurred online using a variety of tools such as discussion forums, email lists, social networking sites, data conferencing and chat. However, there is no indication that research has considered a combination of these tools to support dialogue for Action Learning online.

In the entertainment industry, 3D social worlds, such as Second Life (2005) and ActiveWorlds ("Active Worlds," 2005), have been developed with the intent of engaging participants in highly social, action based relationships. They use advanced features for identity development through the use of avatars, the online characters that represent users, that exist within an online world that is rich with a sense of place. The use of virtual social worlds for professional development purposes provides new learning environments that use vision and voice for more natural collaboration and communication (Dickey, 2005b).

This dissertation describes the design and development of an online 3D virtual learning environment specifically designed to facilitate Action Learning. Through the provision of a range of tools and services to support dialogue, the design of the prototype aimed at reducing the transactional distance created in online learning for geographically distant participants. The virtual world based version of the Action Learning process was based on the physical world version to maintain the integrity of the model. The study identified the 'perception of affordances'(James Jerome Gibson, 1979; Norman, 2004) of the technology to emulate the physical world process by hosting two iterations (Program 1 and 2) of an Action Learning Program using the prototype. The affordances, shortcomings and barriers to participation in the environment experienced in two trials informed a set of design principles and a description of the technical and social affordances.

1.5 What this research is and is not.

This research is not a comparison of the effectiveness of face-to-face Action Learning as opposed to online Action Learning based in virtual worlds. This was an exploratory study intended to design and create the first virtual worlds based Action Learning environment. The Design Research focussed on identifying the essential

components of an environment for Action Learning using face-to-face and web based Action Learning as a guide and translating these into the design, development and testing of a prototype of an Action Learning environment in a virtual world.

This research was about exploring if it was possible to run an Action Learning program in a virtual world as an option for people who could not or did not want to participate in a face-to-face setting. This exploratory study drew on the experiences of taking other learning strategies into online platforms. It targeted identifying what was possible and highlighting from firsthand experience in a naturalistic setting what researchers, practitioners and designers should be looking for in a platform.

1.6 Research questions

The study was guided by the following specific research questions:

1. In what ways can environments be designed in virtual worlds that can cater for Action Learning to be conducted?
2. What properties inherent in the virtual world support the processes of Action Learning?
3. Can embodiment of individuals as avatars support social presence to create an environment suitable for Learning Set dialogue?
4. Will it be possible to reduce transactional distance that would be indicated by high levels of social presence, high completion rates and high participant satisfaction with the program?
5. What bespoke tools and resources can be built in these environments to support Action Learning processes including:
    a. Various teaching methods employed for the Exploration Phase;
    b. The Learning Set Meeting and the role of the Learning Set Adviser;
    c. Personal reflection such as Learning Journals; and
    d. Program administration and management.
6. What barriers may prevent participation in virtual worlds based Action Learning Programs?

1.7 Matching a methodology to a problem

Participatory Design Based Research was selected for this research because the project grew from a workplace problem, had a design focus, was to be based in a naturalistic setting and would involve creating and testing a new prototype. The growing community of educational researchers using and refining Design Based Research included several who were researching online learning designs (Bannan-Ritland, 2003; Bannan-Ritland & Kelly, n.d.; Bannan, 2007; Barab & Squire, 2004; Reeves, 2000) including some who also work in the field of virtual worlds (Barab & Squire, 2004).

1.8 Context that led to this research

This research evolved from a problem encountered in a complex, real world context of the researcher's workplace. The researcher has worked as a provider of professional development for teachers about curriculum and educational technology for over twenty-five years in a variety of formal and voluntary roles including

education adviser, university academic, consultant, project manager, online learning mentor, project officer and professional association member.

First introduced to the strategy when acting as a consultant to the Northern Territory Department of Education in 2001, Action Learning became a core strategy in the researcher's repertoire from that point onwards after seeing firsthand the successful changes in teaching practice by program participants. A wide array of Action Learning based professional development programs was offered throughout 2002 and 2003 in the local education districts where the researcher was then working as part of a team of professional development staff. Over ten percent of the teaching staff in these two districts participated in an Action Learning professional development program in the first year.

Due to the successful results of these programs, the peak body of the state teacher professional associations in Queensland contracted this researcher and a colleague to spread this methodology through their affiliated professional associations through a state-wide training program called "Action Learning Leaders"(Williams, 2004, 2005a, 2005b). This program was conducted face-to-face across several centres in the state. The scope of this program was widened to incorporate the members of the Independent Schools Association and the Catholic Education System. These programs were all funded using a national grant from the Australian Government Quality Teacher Program.

The state education department also wanted to find ways to conduct successful online professional development using its relatively new Learning Management System (LMS). This was seen as a cost effective way to provide ongoing professional development to staff distributed across the state of Queensland especially the many rural and remotely located staff. The researcher and a content area specialist were tasked with creating an online course about the Middle Phase of Learning that was based on an Action Learning strategy.

The challenge of bending the rigid structure of the management tools in the LMS to cater for Action Learning led the researcher to seek for alternative technologies that might provide an online learning environment capable of and conducive to the reflective dialogue of the face-to-face Learning Set. The engaging, synchronous gaming technologies of the time sparked the search for 3D technologies that might provide an online environment that had comparable qualities to a face-to-face learning environment and this research study was born.

1.9 Structure of the dissertation

The following chapters are framed around the process used as the methodology of the study. The Integrative Learning Development Framework (ILDF) (Bannan-Ritland, 2003) is an iterative design-based research process that provides a roadmap for a study of this kind. The ILDF is described broadly in four stages which are (i) "Informed Exploration", (ii) "Enactment", (iii) "Evaluation: Local Impact" and (iv)"Evaluation: Broader Impact" (2003, p. 22) and can be found illustrated in Figure 3.1. Because the structure of this document follows the process of the ILDF rather than a typical dissertation structure, the alignment of chapters of this study to the ILDF is detailed in Figure 1:1 at the end of this chapter.

Chapter two contains the literature review that was conducted in the Informed Exploration Stage. Chapter three describes the ILDF methodology and its suitability for the design of a learning environment such as this. Based on the recommendations of Bannon-Ritland (2007, p. 54), it also outlines the methods that were employed to collect a variety of qualitative and quantitative data at various points during the study and how it was used to answer the research questions.

Chapter four contains the data that was collected during the Informed Exploration phase and reports how it was used to inform the design of the prototype. A descriptive narrative of the building and implementation process in chapter five describes and illustrates the digital artefacts built using the virtual world of Second Life and the social and technical affordances upon which these designs were based. It also describes the logistics of the Action Learning Programs that were conducted.

The quantitative and qualitative data collected from two iterations of an Action Learning Program is collected in chapter six which also justifies any modifications to the prototype between the first and second iterations. The conclusions from the analysis of this data complete the dissertation in chapter seven in the form of a set of design principles, a summary of tools developed and suggestions for further research into the use of virtual worlds as an environment for conducting Action Learning Programs.

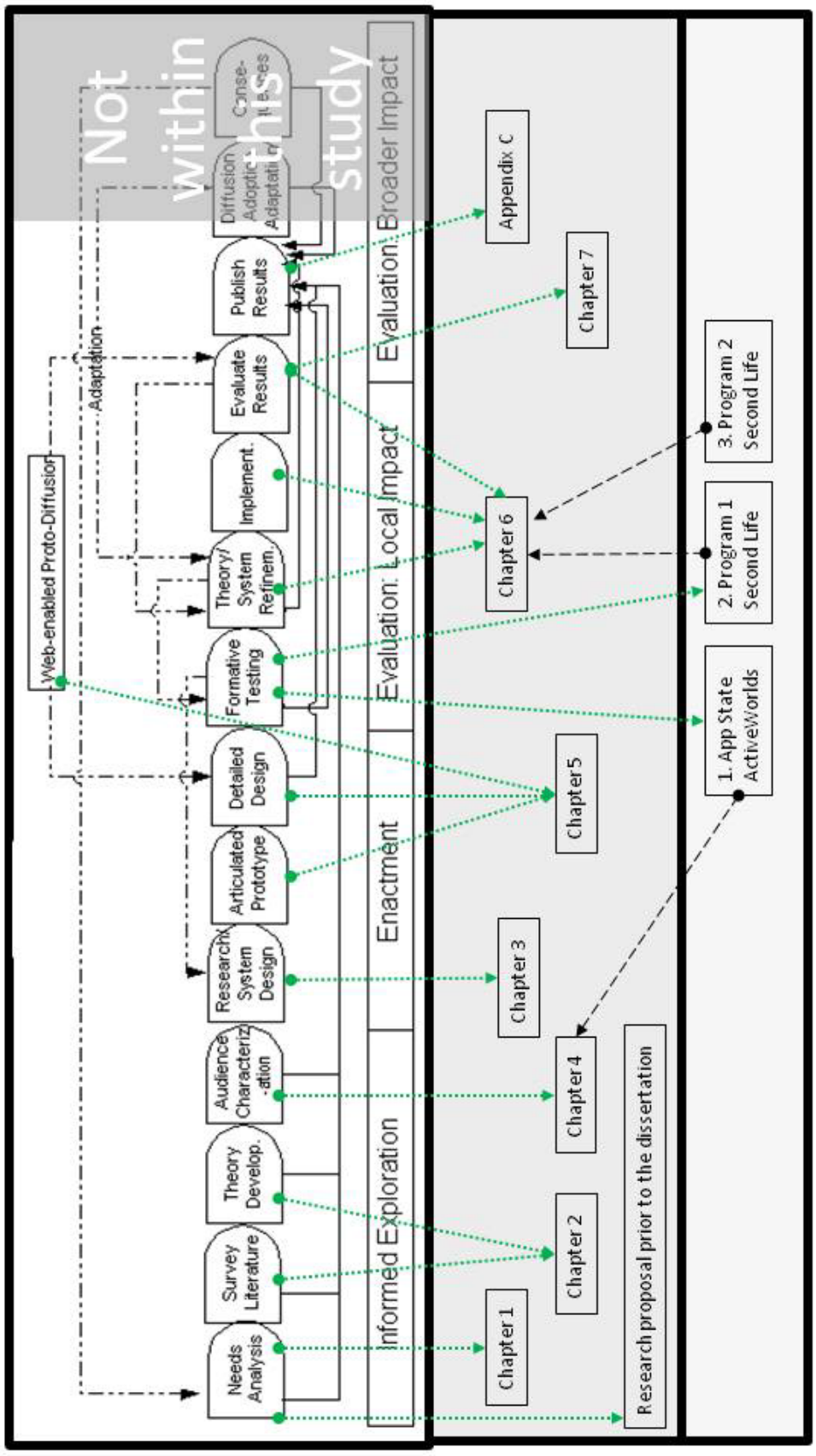


Figure 1:1: Chapters mapped to the ILDF (Bannan, 2007).

Chapter 2 - Literature Review and Scope of the Project

As outlined in chapter one, there is a trend towards online learning to provide more opportunities for lifelong learning in a rapidly changing world and to help cope with the challenges of distance. Teachers are no exception to this need for lifelong learning. A distressing level of ineffectiveness in professional development of all kinds is described as the knowing-doing gap by Pfeffer and Sutton (1999). There is also a shift of emphasis from professional development organized by others for teachers to teachers seeing themselves as learners and taking responsibility for their own continuing professional learning.

Since Action Learning has been shown to be an effective professional development strategy for changing practice in face-to-face environments (S. Downes, 1998), it is timely to investigate taking Action Learning online in a way that takes advantage of the more participatory and collaborative capabilities of the Internet and harnesses of emerging technologies. Action Learning has the added benefit of having the potential to develop the skills needed for lifelong learning (Darling-Hammond & McLaughlin, 1995). Taking this successful strategy online could provide more opportunities for learning that bridges the knowing-doing gap. To effectively conduct Action Learning online requires effective dialogue and Moore's theory of Transactional Distance (1997) is a useful tool to investigate dialogue in online learning. By measuring social presence indicators, it is possible to determine if the medium is capable of supporting effective communication. One emerging technology that could provide immersive opportunities for online Action Learners are 3D virtual worlds. There is potential to design 3D online learning environments that reduce Transactional Distance in online education that uses an Action Learning approach. Gibson's Affordance Theory (1977) provides a useful way to describe what virtual worlds can offer Action Learners and Facilitators.

2.1 Lifelong learning and the changing world

The *Policy Brief: Lifelong Learning* (Organisation for Economic Co-operation and Development, 2004), described a world under constant pressure of disruptive change coupled with knowledge growing at an alarming rate. Compounded by rapid technological change and unprecedented global communication (Burns, 2002; Gates, 1999; Kurzweil, 2001; Longworth, 2003; MCEETYA, 2000), increased complexity and change is found in all areas of life including work, social interaction and leisure (Longworth, 2003).

> Downsizing, rightsizing, voluntary severance packages, and early retirement all add up to the same thing: Displaced workers who want to return to work, whether in the same or a new line of work. Homemakers displaced due to divorce must often join the workforce, and need to learn or update career skills. In an effort to recover, and sometimes restructure their professional lives, greater numbers of people are turning to distance education (Lawson, 2010).

The economic and social implications of the rapidly changing world described in the preceding quote indicate that formal education limited to the early stages of life will no longer meet people's educational needs (Dryden & Voss, 1997; Fullan, 2001, 2003; Hargreaves, 2003; Senge et al., 2000; The World Bank, 2003).

As a strategy for dealing with these conditions, the Organisation for Economic Cooperation and Development (OECD) made the following proposal in 2004:

> Investment in education and training in pursuit of lifelong learning strategies serves to address these social and economic objectives simultaneously by providing long-term benefits for the individual, the enterprise, the economy and society more generally. (Organisation for Economic Co-operation and Development, 2004, p. 2)

Since educators themselves are no exception to this environment of constant change, educational leaders, who are charged with responsibility for professional development, need to promote lifelong learning for teachers, school leaders and policy makers (EQ, 2004; MCEETYA, 2005; NSDC, 2001) as well as for their students (Department of Education Tasmania, 2002; QSA, 2002). Radical technological changes are occurring in formal education as well as the world in which the students and their family live. For educational institutions to cope with so much change, there is a constant need for effective professional development of teachers (Sparks, 2002; Sykes, 1996).

2.2 The 'Knowing- Doing Gap', effective professional development and the role of Action Learning

Professional development efforts, however, do not always lead to changed practice or foster lifelong learning. Pfeffer and Sutton (1999) examined professional development across many industries and identified what they call the "knowing-doing gap" where people fail to put into practice what they "know" after professional development experiences. Their study of a wide range of organisations, found that, although people in these organisations "knew" what needed "to happen to improve performance, they did not do the things they knew they should" (Pfeffer & Sutton, 1999 p.11). They quote Harlow Cohen, the president of a Cleveland Ohio consulting firm (1999, p. 243), who calls this the "performance paradox" in which "managers know what to do to improve performance, but they actually ignore or act in contradiction to either their strongest instincts or to the data available to them."

This position is no different for teachers and their professional development. Sykes, in an introduction to the issue of Phi Delta Kappan devoted to teacher professional development (1996, p. 456) characterized the inadequacy of conventional professional development and the need for improving education by improving teacher quality as "the most serious unsolved problem for policy and practice in American education today".

In the meta-analysis review of the literature on effective professional development conducted by Downes et al. (2001), the researchers found consensus on what works best for teachers includes support for the processes found in the Action Learning approach:

> The research literature continually affirms that teachers learn best by focusing their attention on their own practices, trying new techniques, getting feedback, and observing and talking with fellow teachers in a supportive school environment (T. Downes, et al., 2001, p. 53).

Professional development that delivers content in a teaching-by-telling mode of knowledge transfer is no longer adequate to achieve change in teaching practice. Learning must be experiential, grounded in inquiry, collaborative, sustained and intensive (Darling-Hammond & McLaughlin, 1995). This is confirmed repeatedly in the literature.

> Research has demonstrated that learning is most effective when students work in groups, verbalise their thoughts, challenge the ideas of others, and collaborate to achieve group solutions to problems. (Andreas, Tsiatsos, Terzidou, & Pomportsis, 2010, p. 603)

Henry Jenkins (2006), James Paul Gee (2009), John Seely Brown (2009) and Stephen Heppell (2010) are amongst many voices of those who recognise that the value of knowledge is in its application, and that it is created and devised through collaborative processes.

> In any professional development provided either face-to-face or electronically, the emphasis must move beyond educators' acquisition of knowledge and skills to implementation in the school and the classroom for the purpose of improving student learning (NSDC, 2001, p. 4).

Professional development strategies that are based on inquiry models are recognised as having a significant impact on teacher development and student learning. Darling-Hammond (1998) describes the nature of inquiry based programs in developing teachers as lifelong learners:

> These new programs typically engage prospective teachers in studying research and conducting their own inquiries through cases, action research, and structured reflections about practice. They envision the professional teacher as one who learns from teaching rather than as one who has finished learning how to teach, and the job of teacher education as developing the capacity to inquire systematically and sensitively into the nature of learning and the effects of teaching. This is like the approach to knowledge production John Dewey (1929) sought—one that empowers teachers with greater understanding of complex situations rather than seeking to control them with simplistic formulas or cookie-cutter routines.

Action Learning is regarded as a highly successful learning strategy for achieving active, inquiry-based teacher professional development that incorporates inquiry and reflective practice (T. Downes, et al., 2001). It has gained more widespread support across a range of industries since the 1970s (Howell, 1994; Limerick, Passfield, & Cunnington, 1994; Lloyd & Cochrane, 2005; Marquardt, 2004; Marquardt & Waddill, 2004; Mumford, 1995). Action Learning has been used successfully as a professional development strategy by many types of organisations in Australia and across the world including a diverse range of industries from coal mining to banking, from environmental action to travel agency management (Revans, 1998; Weinstein, 1999; Zuber-Skerritt, 1990). Several Queensland State Government departments in Australia use Action Learning including the Queensland Departments of Communities, Education and Training, Environment and Resource Management, Health, Main Roads, Primary Industries and Fisheries and Queensland Rail

(Queensland Government, 2005 - 2011). Action Learning is also used in universities across Australia and the world including the University of Queensland, Southern Cross University and Appalachian State University (Dick, 2005; Sanders & McKeown, 2007); and schools in the Australian Government Quality Teacher Program (AGQTP) in the Education Departments in Western Australia , the Northern Territory and Queensland (DETYA, 2002; Williams, 2005c).

Action Learning, as originally designed by Reg Revans in the 1940s for the development of managers, is a professional development strategy that builds learning into the process of doing. Revans, a physicist, explained learning as a formula, L= P + Q, in which learning (L) was equal to the sum of programmed (i.e. existing) knowledge (P) and insightful questioning (Q) (Revans, 1998; Zuber-Skerritt, 1990).

In solving complex problems in the workplace where there exists no apparent single solution, Revans supported tapping into existing knowledge (P) but only to inform the creation of insightful questions that could help plan a way forward in adversity. "There is first the need to amass programmed knowledge (technical expertise, functional specialism) or the fruits of authoritarian instruction, here designated as P." (Revans, 1998, p. 29)

To Revans, the Q in the formula that stood for insightful questioning was the key to learning because it required the learner to question the known information and consider how useful it would be in their current context. To Revans, this knowledge would need to be applied in novel ways influenced by the individual's value systems, past experiences and hopes for the future (p. 28). When writing in the latter part of his career, Revans in 1998 comments that insightful questioning has never been more important than today with the rapidly changing nature of workplaces where leaders must "master the taking of decisions in circumstances of change so violent as to be confusing" (p. 29).

Learning, to Revans, requires more than memorising and applying the programmed knowledge, it involves making use of it in a practical application in the current context of the learner to solve complex problems or take advantage of novel opportunities. It is data about the context which determines how and when the knowledge could be applied. He promoted consideration of the learner's context to develop insightful questions about the material being used. The plan for action is then tried out in practice and followed by group reflection after which this cyclic process is repeated. This iterative process develops the understanding and knowledge of the learner while delivering outcomes and developing capability.

Pivotal to Revans' Action Learning process is the Learning Set, a group of between four and six participants, "comrades in adversity" (Revans, 1998; Zuber-Skerritt, 1990), who "give and receive criticism, advice and support needful to develop" (Revans, p. 10).

Although Action Learning was developed for managers in the corporate and government sectors, school administrators and teachers work as learning managers in a highly complex setting and they face many "urgent problems" where no single solution clearly exists and encounter many "enticing opportunities" (Revans, 1998, p. 8). Action Learning provides a powerful way to promote lifelong learning and engagement in a professional community for educators. It embeds learning in

practice while drawing on the extensive body of (programmed) knowledge about the topic of the problem or opportunity they are investigating.

2.3 The process of Action Learning

Figure 2:1: The Action Learning Cycle.

Action Learning, as shown in Figure 2:1, is an iterative cycle of explore, plan, act and reflect focussed on a workplace project. At the heart of this learning strategy is the workplace problem, challenge, initiative or idea that participants tackle. By going beyond mere knowledge development and incorporating action simultaneously in the learning process, Action Learning addresses the "knowing-doing gap" identified by Pfeffer and Sutton (1999). Each of these stages has an important role to play in the overall Action Learning process. Each phase in the iterative cycle is dependent on the others and all are driven by the workplace project. Each of the stages is described below in more detail. These descriptions are based on Revans' descriptions of the stages in his book, The ABC's of Action Learning (1998) and a video interview (Zuber-Skerritt, 1990) with elucidation of their use in practice as developed by the researcher over five years (Lindy McKeown & Obstoj, 2004; Lindy McKeown & Williams, 2004a, 2004b). The practical application was guided by Weinstein in her book, Action Learning: A Practical Guide (1999) and with support from Bob Dick both in person and through his online course, AREOL (2005).

2.3.1 Exploration

The cycle begins with a process of reconnaissance, an exploration of two inter-related aspects of the problem or opportunity: the current state of the workplace and the existing knowledge about the topic of the project (the P of Revan's formula). During this stage, programmed knowledge (information already known about the topic at the heart of the workplace project) is investigated. This can occur in group or individual learning modes and may include both. If the Action Learning program has been organised around a theme or new practice or policy, there may be mandatory content that informs the project. It is the learner's workplace context that will determine if and how any of the programmed knowledge will apply.

The Action Learner will use this research into the topic to inform data collection and investigation within the workplace for relevant information needed in the development of a deeper understanding of the context. So the exploration of the local context and the programmed knowledge go hand in hand during this phase and are revisited with each iteration. The more detailed the programmed knowledge and more rigorous of the audit of the local context, the more insightful questions will be generated leading to a more robust plan being formulated.

2.3.2 Planning

From this data collection within the local context, and analysis of the literature, a plan of action is formulated with the intent of achieving the new state in which the problem is solved or the new opportunity is realised. At the earliest stages of Action Learning, the making of the plan can provide the basis for the first Learning Set meetings. At this stage Weinstein (1999, p. 90) suggests a focus on creating what *is* wanted because it engenders a creative process with "forward-looking results" rather than merely the elimination of a problem that is not wanted.

2.3.3 Action

As the name suggests, central to the process of Action Learning is the action of implementing the plans as they are formulated and modified. It is the contextualised nature of the learning in action that links the content (programmed knowledge) to the authentic context and at the same time builds learners' capabilities. Since participants' practice is changed not merely their knowledge, Action Learning, by its design, can bridge the "knowing-doing gap" identified by Pfeffer and Sutton (1999).

2.3.4 Reflection

Within the larger cohort of a program using Action Learning, the participants form small collegial groups of 4 and 8 participants (Revans, 1998, p. 29) called Learning Sets. Learning Sets as a social learning group that becomes the learning community for the participants (p. 12). These small groups meet regularly for the duration of the project and may employ formal or informal protocols to help each other learn.

Initially these Learning Sets may meet with a facilitator called a Learning Set Adviser who supports the group to develop their skills with the aim of making them self-managing as quickly as possible. This facilitator acts as a guide to the processes of effective reflection. From the beginning, these groups aim to develop a trusting relationship that supports learning and openness where "they learn to give and accept...the criticism, advice and support needful to develop their own managerial powers, all in the course of identifying and treating their own personal tasks" (Revans, 1998, p. 10).

Sparks in his book, Designing Powerful Professional Development (2002, pp. 14-11) identifies the value of dialogue, so important to an effective Learning Set, using the following quote:

> Learning, above and beyond the lab rat level, is a change in a person, brought about through conversation...The best and most memorable conversations are often the most dangerous. They are risky, but just as

> relationships without risk never develop trust, conversations without danger fail to open us up to the potential of change (Zemke, 2001, p. 14).

In these groups, members discuss their progress, critically reflect on their action, surface assumptions, make new plans and help each other learn using questioning. At times the Learning Set may initiate further exploration either by enlisting the services of others to provide access to programmed knowledge (things already known or published or lived experience) to the group (Weinstein, 1999) or by highlighting this need for an individual member. Thus a continuing cyclic process develops as shown in Figure 2:2 below.

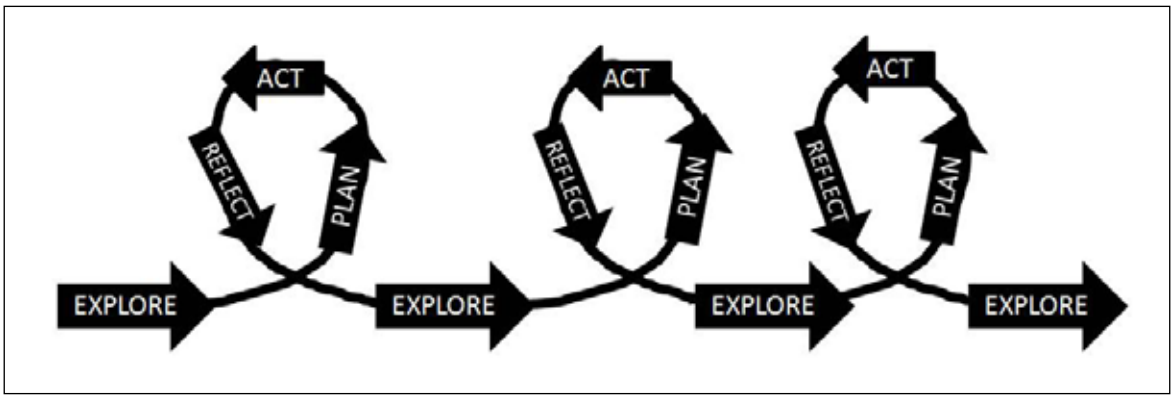


Figure 2:2: The iterative process of the Action Learning cycle.

2.4 The connected world – Accessing learning opportunities online

Two of the barriers that prevent increased participation in Action Learning are access to programs that use Action Learning and time for increasingly busy, distributed groups to travel to meet in Learning Sets. As Internet access expands and a growing number of learning opportunities move online, it becomes increasingly important to take Action Learning online.

The exponential growth of the Internet, fuelled by the continuing growth in computing power often expressed as Moore's Law (G. E. Moore, 1965) and access to high speed Internet connections in homes, workplaces and on smart phones ("The electronics industry yearbook," 2000; Hart, 2005) is influencing how lifelong learners can access learning. The globalisation of both industry and educational offerings has been fuelled by this increased and improved access to the Internet (Dickenson, Pedler, & Burgoyne, 2008a). IDA reports the U.S. corporate elearning market alone reached $11.6 billion in 2009 and the worldwide market reached $17.1 billion (C. Anderson, 2010). The virtualisation of universities through the provision of extensive offerings online is advanced by these trends as well (Adkins, 2011). The following 2009 figures are indicative of this growth within US higher education:

- For the 2009 Fall term, 5.6M students enrolled in higher education took at least one online course, representing 21% increase from the prior year.
- Traditional classroom enrolment(sic) in HE increased 2% for the same period.

- Nearly thirty percent of higher education students now take at least one course online (I. Elaine Allen & Jeff Seaman, 2010, p. 2).

Teachers are amongst the group of learners needing to access online, lifelong, professional development opportunities to maintain currency in their content areas, keep up-to-date with new pedagogies and assessment strategies stay abreast of new technologies as well as changes in curriculum and standards. They are increasingly seeking online access to this learning from institutions across the world.

> Organisations, including government departments, see online learning (e-learning) as another opportunity to provide learning opportunities to staff (2005; EQ, 2004; NSDC, 2001). E-learning is often promoted as the means to meet the needs of geographically separated learners (NSDC, 2001).

Reasons other than geographical distance from learning providers or being a "second chance learner" are prompting people to choose online learning (Lawson, 2010). Some of these reasons include family commitments, disability, other work commitments, personal preference and saving time lost to travel. The growth of online learning is reflected in the following statistics showing "(t)he US market for Self-paced eLearning products and services reached $18.2 billion in 2010. The demand is growing by a five-year compound annual growth rate (CAGR) of 5.9% and revenues will reach $24.2 billion by 2015" (Lawson, 2010)

The mode of delivery of distance learning via the Internet created a significant change in distance education since materials previously delivered in print, broadcast and pre-recorded audio and video formats now include online, interactive formats. Each offers different opportunities for interaction between teachers and students as described below:

> Learning technologies utilised by distance educators can include:
> • print-based media, such as hardcopy study guides or CDs of readings;
> • voice-centred media, such as CD or MP3 recordings, teleconferences, podcasts, webcasts, or VOIP(voice over IP) systems (SKYPE);
> • video platforms, such as instructional videos, DVDs, vodcasts or interactive video-conferencing;
> • web conferencing tools such as Elluminate and Wimba;
> • computer-centred support delivered over the internet or corporate intranet through learning management systems or more interactive Web 2.0 social networking technologies such as blogs, wikis, Facebook, YouTube, Twitter, Flickr, del.icio.us; and/or
> • multimedia systems. (Andrews, 2009)

Technological changes have been paralleled by pedagogical changes (S. Downes, 1998, 2005a, 2005b; Hargreaves, 2003) that reflect a change in the underlying learning theories used when designing the learning experiences to take advantage of increased interactivity between teacher and learner, between learners and their co-learners, and between learners and guests such as experts and practitioners (Fullan, 1991; D Randy Garrison & Terry Anderson, 2003; Siemens, 2004; Siemens & Tittenberger, 2009). A shift has occurred from a knowledge transmission model to a knowledge creation model, based on a shift from a behaviourist to a constructivist or more recently a connectivist theory of learning.

These changes have been summarised into a series of "generations" of distance education technology (D R Garrison & Terry Anderson, 2003) and modified by Anderson (2011). However, Garrison and Anderson warn that this is not a linear progression in which one generation replaces the next (p. 34). Many systems and technologies from earlier generations remain in use long after new technologies are in place. Table 2-1 aligns the salient features of these generations in summary form showing the continuum of approaches.

Table 2-1: Generations of Distance Learning distilled from the book Elearning in the 21st Century (D Randy Garrison & Terry Anderson, 2003, pp. 35-39) and modifications to the generations from (T. Anderson, 2011).

Reference	Initially created by (D R Garrison & Terry Anderson, 2003)			Lauzon and Moore and Taylor 2000	
Original Generations	1st generation	2nd generation	3rd generation	4th generation	5th generation (Proposed)
Reference	Revised by Anderson 2011(T. Anderson, 2011) New 3 generations				
Modified Generations	Behaviourist		Constructivist		Connectivist
Feature	Generation	Generation	Generation	Generation	Generation
Dominant learning theory.	Behaviourism (B. F. Skinner)	Cognitive Learning Theory	Constructivism (Piaget) Social Constructivism (Vygotsky)	Social Constructivism (Vygotsky) Connectivism (Seimens)	Connectivism (Seimens)
Model.	Independent Study Model	Computer assisted instruction	Web based learning	Learning Management System (LMS)	Portal including LMS, social networking, eportfolio
Features.	Division of complex concepts into easily understandable sub-components.	Advance organisers, role models, summaries, simulated peers.	Negotiation of content, assignments and projects. Discussion, collaborative projects, resource and problem based curriculum.	Combines information retrieval of vast amounts of content; the interactive capacity of computer mediated communications (CMC); and the processing power of locally distributed processing via computer-assisted programming.	Intelligent functions included automated responses, searching, navigation and exploitation of the semantic web. Integration of administration, support and content delivery. Teacher and student agents. Totally web based. Can be navigated and processed by both human and non-human autonomous agents.

Dominant technologies.	Carefully designed textbook and associated course guide.	Mass broadcast media including radio, TV, DVD and CDROM. Computer aided simulations, drills and self-paced tutorials.	Variety. Audio and video and asynchronous computer mediated conferencing.	Information retrieval of vast amounts of information. Computer mediated communication (CMC). Locally distributed processing via computer assisted programming (eg. Java). Web only.	Community and collaboration tools: Blogs.wikis, forums, video sharing, shared documents, social bookmarking, micro-blogging.
Interaction between teacher and student.	Mostly indirect via materials. Mail and telephone.	Mostly indirect via materials. Mail and telephone.	Web based synchronous and asynchronous communication.	Web based synchronous and asynchronous communication.	Web based synchronous and asynchronous communication.
Interaction between student and student.	Rare.	None or teleconference.	Individual learning groups using web based synchronous and asynchronous communication.	Individual learning groups using web based synchronous and asynchronous communication.	Flexible learning groups based on need using web based synchronous and asynchronous communication.
Cognitive demand.		Demonstration of comprehension.			Demonstration of application. Metacognition Debate Dialogue and discussion Problem solving and creativity

The Internet is providing more than merely the bridging of distance by gathering together online geographically dispersed students and teachers in formal education courses. It is influencing how we construct and communicate knowledge and participate in society (Brown, 2002). The 'read-write web', with the proliferation of new tools for connecting co-authors, and for contributing content and comment, allow more collaboration than previous flat or even database driven web sites (D Randy Garrison & Terry Anderson, 2003). Web-hosted tools have been developed including weblogs (blogs), wikis, editable content repositories, news feeds, social bookmarking, e-books, discussion forums, instant messaging (IM) , podcasts and screencasts, (S. Downes, 1998) as well as massively multi-user perpetual text-based virtual worlds (Dede, 1995) and three dimensional (3D) social worlds (Dickey, 1999). These are delivered to the virtual desktop of mobile and desk-bound devices by increasingly ubiquitous Internet access to a wider population approaching an 'always connected' state. As an example, the social networking site FaceBook has in excess of 500 million users at the time of writing who spend over 700 billion minutes per month online using Facebook (Facebook, 2011).

Information access is one part of this connectivity, but these technologies also dramatically improve the ability of remotely located people to communicate, share and collaborate through text, voice, images and video via the Internet both synchronously and asynchronously. They are able to go beyond merely finding

resources to mash-up, "narrate, curate and share" what they find (Campbell, 2009). To Action Learning facilitators, it is this ability to do more than merely access the programmed knowledge that can make the Internet both an information source and a venue for Action Learning programs for learners at a distance.

In order for distance education to take advantage of the success of Action Learning as an effective professional development strategy, facilitators need to migrate this strategy to take advantage of online environments and make use of the growing level of connectivity of learners. At the beginning of this study in 2005, there was very limited discoverable evidence that online Action Learning had been tried online with only a few examples found of private training organisations and universities (EQ, 2005; Revans University, 2005). Over the ensuing few years, a growing number of organisations have taken up Action Learning as a participatory, action oriented pedagogy for formal education and professional development (Hauser, 2010; Lloyd & Cochrane, 2005; Sanders & McKeown, 2007).

At the beginning of the study, there was also little research available that identified the models, online tools and virtual learning environments used to conduct Action Learning online or their suitability for doing it. During the early years of this study, Dickenson, Pedler and Burgoyne were in the process of collecting data in a study to map the terrain of online Action Learning and included limited information about this research-in-progress in that investigation as the only example of Action Learning in 3D virtual worlds available (Dickenson, Pedler, & Burgoyne, 2008b). In parallel with this study, Action Learning facilitators around the world were experimenting with the growing diversity of online web based tools for Action Learning at a distance and some of the benefits and limitations became apparent. When published, the comprehensive scan by Dickenson, Pedler, & Burgoyne (2008a) revealed a number of strengths and shortcomings of these approaches in what they term Virtual Action Learning (VAL).

2.4.1 Online learning challenges

Despite the limited amount of research specifically addressing Action Learning in an online mode, there is a considerable amount of literature about online learning trends, strengths and shortcomings (McInnerney & Roberts, 2004; McIssac & Gunawardena, 1996; M. G. Moore, 1990; Taylor, 2001; Tu & McIsaac, 2002). Two key themes within the online learning and distance education discourse relevant to this research are those that address the issue of the distancing effect (Russell, 2004) and transactional distance (M. G. Moore, 1992, 1997). Beyond bridging the geographic distance between participants, bridging the feelings of distance in the relationships between learners who are geographically distant may impact the effectiveness of the dialogue in Learning Sets which are the "central to effective learning" (Revans, 1998, p. 10) using the strategy of Action Learning.

2.4.2 Distance in geography and time

Russell describes the distancing effect as the "separation in time and space that reduces empathy for the well-being of others" (2004, p. 38). So the first distance challenges are geography and asynchronous interaction. This distancing effect impacts all distance learning. In the case of Action Learning, this could affect the important relationship between members of the Learning Sets, the mission critical

reflection groups of Action Learning that usually meet face to face to conduct their discussions using all the richness of that synchronous, physical environment. Without empathetic relationships between those who Revans called "comrades in adversity" (Zuber-Skerritt, 1990), there could be an increased need for facilitation of more Learning Sets by the Learning Set Adviser or a breakdown in the functionality of the Learning Sets altogether. The ability of the facilitator to identify issues due to the lack of non-verbal cues could also impact their capacity to support Learning Set members.

To be most effective as a social reflection process, Learning Sets require a safe forum where mistakes and failures can be discussed openly and frankly (Revans, 1998, p. 10). For online Action Learning to be successful, Dickenson, Pedler and Burgoyne (2008b, p. 5) identified a role for facilitators to help Learning Set members develop "special skills" related to managing the technology and the Action Learning process including skills to:

- understand the expectations regarding collaboration
- appropriately self-disclose and share confidences online
- build the rapport, trust and expertise in the virtual environment
- develop virtual communication skills such as higher levels of listening, the ability to sense what others are feeling without visual clues and the restriction on dialogue caused by a lack of non-verbal cues and a reduction in the exchange of socio-emotional information
- develop reflexivity and social knowledge construction via unpacking and deconstructing the words develop the collective ability to reflect publicly on-line

They found that asynchronous dialogue had its supporters as well as those who felt it impacted dialogue in negative ways (Dickenson, et al., 2008a, 2008b). This implied that the distancing effect was not always present as an issue. It depended on how the technology that was used to mediate the dialogue was put to use in the interactions between Learning Set members and the Learning Set Adviser. It is important to carefully select and implement technologies in the design of online Action Learning to support the processes required for this method of learning to work. A key element was facilitation at the entry threshold to ensure technical barriers were overcome in the early stages and there was support during the transition to new ways of interacting virtually.

> Overall, at the macro and micro levels, the impression is that facilitation is perhaps more important in VAL than in f2f AL, especially in the early stages, to overcome the barriers of using technology and of working virtually.(Dickenson, et al., 2008a, p. 65)

2.4.3 Transactional Distance

The other type of distance to impact the relationship between learner and teacher in all distance education modes is explained by the Michael Moore's theory of Transactional Distance (1997). This theory refers to the relative psychological distance that occurs between teachers and learners and is compounded in an environment having the special characteristic of geographical separation of teachers from learners. It is more than the simple geographic distance that technologies of various kinds attempt to bridge in online learning.

> It is the physical separation that leads to a psychological and communications gap, a space of potential misunderstanding between the inputs of instructor and those of the learner, and this is the transactional distance. (M. G. Moore, 1991)

Although challenged by some (Gorsky & Caspi, 2005), Transactional Distance theory has been the topic of robust discussion for over twenty years in relation to distance education (M. G. Moore, 1991). It will be considered here as it specifically applies to Action Learning settings. In the context of Action Learning, where there may be a number of people in the role of the "instructor", it is important to take into account what a new technology affords the various people in the instructor role to help overcome the transactional distance. Other Action Learners within a program play a vital role as peer teachers, so the transactional distance may also be between members of the Action Learning Set not only between the Learning Set Adviser and the Action Learners. When content (programmed knowledge in Revans' terms) is addressed in the Exploration Phase of the Action Learning Cycle, whoever is delivering this instruction or information, through whatever form of presentation or activity, would also be regarded as the "teacher' in Moore's transaction. This is another relationship that can be affected by the transactional distance as well as the geographic distance.

Moore has described three dimensions of transactional distance: dialogue; structure; and learner autonomy. These are in turn affected by the media selection, design of the course and deployment of the online resources (M. G. Moore, 1997).

2.4.3.1 Dialogue

To Moore, dialogue is "purposeful, constructive communication valued by each party in the development of understanding by the learner" (1997, p. 24). In the analysis of research about communication in distance education, Moore proposes that most of the attention has been given to the medium of communication but other factors including the design of courses, the selection and training of instructors, environmental factors such as class size and frequency, content and the learning styles of students influence the amount and nature of dialogue.

In Action Learning, there are two key points at which dialogue is essential for the process to be successful. The first is during the Exploration Stage when programmed knowledge (P), or what is already known about the topic, is explored and direct teaching may take place between the content area specialists (who may or may not be the program facilitator) and the participants. The second is during the Learning Set meeting when peers take on the role reserved for teachers diverging from the traditional teacher-led, knowledge transmission models of learning.

According to Moore's theory, even though the medium is not the only factor affecting dialogue, it is a key determinant. During face-to-face interaction, dialogue can be carried out using voice with all the subtle nuances of tone of voice and inflection. This is supplemented by gesture, body language, eye contact and other nonverbal cues such as facial expressions. In online learning, various technologies have been employed to make dialogue possible between teachers and learners (Gunawardena, Lowe, & Anderson, 1997). The richness and immediacy available in face-to-face dialogue are often sought after by online educators as they employ

various technologies. The lack of verbal and non-verbal cues has remained an issue raised about many technologies (Rourke, Anderson, Garrison, & Archer, 1999).

However, when Action Learning programs that have employed either synchronous or asynchronous technology to bridge geographic distance were investigated (Dickenson, et al., 2008a, 2008b), Action Learning facilitators found the lack of immediacy was not entirely negative.

> Certain advantages of online programs included:
>
> Not having eye contact can help with clarification;
> As permitting 'continuous set meetings';
> The asynchronous online process allows managers time for to reflection without appearing indecisive;
> The slower pace enables the questioner to design and examine the question before submitting it;
> The slower and more measured communication allows participants have more time to notice the questions being asked, to think, and to write down;
> It enables individualised attention online from colleagues and the learning coach;
> It may facilitate joint working on tasks;
> It may promote disciplined turn-taking;
> Participants develop variety of skills in written expression, reflection and question formation
> The process stimulates the virtual workplace and participants learn how to work in a virtual team with agreed norms and netiquette by asking questions before making statements. (Dickenson, et al., 2008b, p. 5)

At a distance, dialogue requires the use of technology to bridge the geographic and transactional distance between teachers or, in the case of Action Learning, between Learning Set Advisers and content experts and the learners on the one hand as well as between the learners themselves on the other. The opportunity for dialogue is low in recorded or broadcast media and high when the teacher and student are in synchronous and highly interactive media such as teleconferences, videoconferences and personal computer chats. This continuum is represented graphically in Figure 2:3. However, not all teachers and learners take advantage of the opportunities afforded by the media. Factors including personality, student/teacher ratios, funding and frequency of opportunity can also influence the amount and quality of the dialogue.

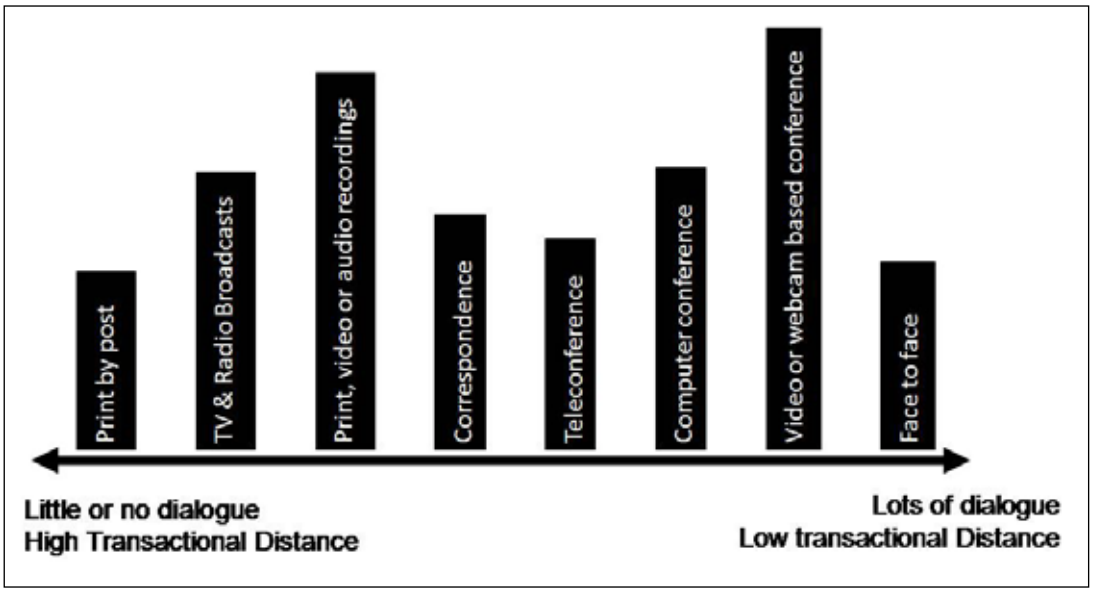


Figure 2:3: Dialogue and Transactional Distance Continuum.

2.4.3.2 Structure

'Structure' is the second dimension Moore describes in relation to transactional distance. In this context, structure describes the rigidity or flexibility of the program's educational objectives, teaching strategies, and evaluation methods and the extent to which the program is responsive to individual learner's needs. Action Learning is highly flexible in the learning objectives as these are determined by the learners as they choose their projects. Teaching strategies and evaluation may be either chosen by a program facilitator or determined by the participants in an Action Learning Program and this choice would impact the degree of structure. In this research, the structure element of the Action Learning Program was extremely similar to a face-to-face program with respect to the educational objectives, evaluation methods and the extent to which the program is responsive to individual learner's needs. A range of tools to mediate the teaching strategies would have to be designed into the environment.

2.4.3.3 Autonomy

Moore's third dimension of transactional distance, learner autonomy, describes the extent to which it is the learner rather than the teacher determines the goals, the learning experiences and the evaluation decisions in their relationship (M. G. Moore, 1997; Shin, 2002). By their very nature all Action Learning programs create high learner autonomy as participants create their own workplace project, devise their own plans and implement them and contribute to determining their own learning needs. In this research, this also remained the same as for a face-to-face program. Action Learning is highly flexible in relation to the educational objectives as each participant identifies their own learning outcomes in relation to their workplace project although programs may be organised around specific themes or topics.

2.4.3.4 Action Learning and Transactional Distance – The dialogue factor and presence

Action Learning relies on Learning Set members developing a working relationship built on trust, effective communication, and an ability to critically reflect on their own work and to support the critical reflection of the other set members (Pedler, 1991; Revans, 1998; Weinstein, 1999). Dialogue is critical to this process of social reflection that lies at the heart of the Action Learning process. Dialogue is regarded by Moore as key to effective relationships that reduce transactional distance and promote learning in distance education contexts as this quote captures:

> Moore (1989) expanded on the dialogue variable and defined three core types of interaction: learner–teacher, learner–content, and learner–learner. Dialogue or interaction was recognized as a crucial variable in a distance education environment, which was not necessarily the case with an industrial design approach. (Garrison & Cleveland-Innes, 2005, p. 134)

The effects of mediation by technology have been studied in relation to television, fax machines, voice mail and audio conferencing and research continues in relation to various Internet-based technologies. Elements of communication affected by mediation by technology are referred to as immediacy and social presence. Immediacy is defined by Mehrabian (as cited in Rourke, et al., 1999) as "those communication behaviors (sic) that enhance closeness to and nonverbal interaction with another". Rourke et al went on to explain that "his research suggested that nonverbal cues such as facial expressions, body movements, and eye contact increase the sensory stimulation of interlocutors. This in turn would lead to more intense, more affective, more immediate interactions" (1999, p. 52)

Social presence is defined by Short, Williams, and Christie as "the salience of the other in a mediated communication and the consequent salience of their interpersonal interactions" (1976, p. 65). When learners move from face-to-face environments with high social presence to online learning environments, the social presence created by the immediacy, intimacy and richness of communication is reduced during mediation by technology (Biocca, Burgoon, Harms, & Stoner, 2001; Gunawardena & Zittle, 1997).

In face-to-face contexts dialogue relies the paralanguage and prosodic elements of speech, non-verbal communication and context cues. The challenge according to Daft and Lengel (as cited in Rourke, et al., 1999) is to go beyond merely transmitting the words proposing that "for receivers to understand ... information that is ambiguous, emphatic, or emotional, a richer medium should be used" that did not lack non-verbal and contextual cues.

Finding the right technology to support the building of relationships and effective communication through online dialogue is therefore of vital importance to the success of migrating Action Learning to the online environment. The computer mediated communication needs to approximate the face-to-face environment in terms of the immediacy, intimacy and social richness possible in face-to-face environments to ensure effective dialogue online. New online tools and interfaces are supporting

the development of e-learning environments that support these qualities and have the potential to support Action Learners and the vital dialogic process of the Learning Set.

Lack of non-verbal cues (Short, et al., 1976) and contextual cues identified by Sproull and Keisler (1986) during the use of asynchronous and asynchronous communication tools were experienced firsthand in Action Learning being conducted in the work context of the researcher. At the same time a richer world with more opportunities for non-verbal communication and contextual cues was being experienced in immersive 3D computer games in the researcher's leisure context in computer games especially Massively Multiplayer Online Role Play games (MMORPG) such as World of Warcraft. The question that led to this research arose, could an environment in a 3D virtual world be designed to provide a richer experience for online Action Learning than was being experienced within forums and text chat? The potential for synchronous 3D virtual worlds technologies to afford users the opportunity to create higher social presence during dialogue than that which was possible within the chat and forum functions of the web or LMS was the reason this researcher investigated alternative technologies to improve opportunities for relationship building and dialogue.

"Social presence is the ability of the learners to project themselves socially and emotionally into the environment" (Rourke, et al., 1999)

Social presence is a way to describe closeness and immediacy interaction and as such to support learning.

> Social presence supports cognitive objectives through its ability to instigate, sustain, and support critical thinking in a community of learners. It supports affective objectives by making the group interactions appealing, engaging, and thus intrinsically rewarding, leading to an increase in academic, social, and institutional integration and resulting in increased persistence and course completion (Tinto, 1987) (as cited in Rourke, et al., 1999).

Immediacy and intimacy are indicators of social presence (Gunawardena, 1995; Gunawardena & Zittle, 1997). If an environment could be created in a virtual world that has high social presence that results in more effective dialogue during the Learning Set Meetings, then there should be lower transactional distance and better learning.

Short, Williams and Christie (Short, et al., 1976) referred to social presence as the awareness of the presence of an interaction partner. Increased social presence leads to a better person perception. Biocca, Harms and Burgoon defined social presence as "sense of being with another" (2003). Embodiment as an avatar was expected to provide additional social cues to improve social presence and, in turn, communication.

Presence research is found in many disciplines including communication, cognitive science, psychology and more but a useful summary developed of Lombard and Dutton cited in Shin (2002)

After presenting a comprehensive review on the usage of the term presence in media and communications literature, Lombard and Ditton find six distinctive ways of conceptualization of the term presence, which can be summarized as following:

1. **presence as social richness:**
   involves the degree to which media are capable of making users perceive other users' sociability, warmth, sensitivity, personality, or closeness in a mediated communication situation;
2. **presence as realism:**
   involves techniques that make non-existent things, people, or events look, sound, and feel as if they are 'real' when they are perceived through media;
3. **presence as transportation:**
   presence is an analogy with which media users' state of perceptions can transcend the boundaries of their realities. 'Welcome back', heard from a television program's host, might sway a viewer's perception from the ground where it is actually located into the world of the television show. Such expressions as 'You are there', 'It is here', or 'We are together', all involve spatial transportation;
4. **presence as immersion:**
   with the aids of technical devices attached to communication media, users can feel that they 'exist' physically, psychologically, and perceptually in a different world. With eyes covered with a head-mounted display, ears covered with headphones, and hands covered by gloves or props could convince users that they are in a different world or virtual reality;
5. **presence as social actor within medium:**
   a para-social interaction falls into this type of presence. People respond, compliment, or experience anger toward characters in a television or computer as if they communicate with real ones; and
6. **presence as medium as social actor:**
   presence involves people's social responsiveness toward a medium itself, not characters within a medium. This type of presence effect is elicited from a medium's characteristics. For example, it is noticed that even experienced computer users treat a computer as a social actor as it uses a natural language similar to human speaking, allowing for real-time interaction, and playing a social role such as a bank teller or a teacher Lombard & Ditton, 1997, pp. 4–9 (cited in Shin, 2002, p. 124).

These provide direction in the design of 3D virtual worlds as they can inform the types of spaces and structures to build; the animation and appearance of avatars; the language a program facilitator might model and encourage to develop social richness, immersion and presence. The ability to create a virtual place in a 3D virtual world that is graphically represented for participants to go where they can be together held the promise of achieving the desired state of "the perceptual illusion of non-mediation" (Shin, 2002, p. 124) conducive to making the "mediated communication seamless".

2.5 3D virtual worlds

One of the emerging 3D technologies, originally created as an online social environment but being adapted for distance education, is the 3D multi-user virtual

environment (MUVE) commonly referred to as a 'virtual world'. Virtual worlds have their history in gaming and sit with games on the spectrum of engagement. "CBT [computer based training] is on the coma end of the engagement spectrum; computer games occupy the other end. Bob Filipczak, Training magazine" (as cited in Corti, 2005 p.1)

Virtual worlds are the focus of this study as virtual worlds have the potential to provide an environment suitable for Action Learning. In a thorough scan of the literature and practice, little previous research exists outside of this researcher's work about the use of 3D virtual worlds for this purpose (Dickenson, et al., 2008b, p. 3). Virtual worlds have the potential to bridge the transactional distance between remotely located Action Learners since they are used extensively for various forms of social interaction especially dialogue. Since the Learning Set requires effective dialogue, this investigation of the affordances of virtual worlds targeted this vital element of Action Learning.

Three dimensional virtual worlds are computer generated, social environments that use real-time, 3D, rendered graphics mapped on a simulated topography to represent a physical place, either mirroring the physical world or representing an imagined place. "Virtual worlds also offer an awareness of space, distance and co-existence of other participants found in real life spaces giving a sense of environment. Virtual worlds..., regardless of scale, offer participants a sense of geography and terrain" (Bell, 2008, p. 3).

They can emulate both natural elements such as sea, land, sky, clouds, water features and vegetation and human-made structures such as roads, buildings, vehicles, furniture and clothing. They can include lighting and time systems that allow daytime and night time. They may have physics engines that allow for such forces as gravity and properties of different materials to interact with these forces so that, for example, rubber balls bounce whilst stone objects do not.

Book (2004, p. 2) describes six features of virtual worlds that assist in describing their qualities:

1. Shared Space: the world allows many users to participate at once.
2. Graphical User Interface: the world depicts space visually, ranging in style from 2D "cartoon" imagery to more immersive 3D environments.
3. Immediacy: interaction takes place in real time.
4. Interactivity: the world allows users to alter, develop, build, or submit customized content.
5. Persistence: the world's existence continues regardless of whether individual users are logged in.
6. Socialization/Community: the world allows and encourages the formation of inworld social groups like guilds, clubs, cliques, housemates, neighbourhoods, etc.

Bell (2008) identifies many of the distinguishing features of virtual worlds when trying to define them. Virtual worlds differ from some other similar 3D virtual environments, such as computer games, in that they are persistent. They cannot be turned off, paused or put on hold like a computer game. Time is ongoing whether an individual is logged in to the world or not. The world continues to exist and function

as users come and go and the actions of the users can affect the world as they interact within it. When the user logs out, their avatar is no longer present in the virtual world but the virtual world continues to persist and change based on the actions of other users or time.

The virtual world provides the backdrop for interaction between the users. The user is embodied in the virtual environment as an avatar, a graphical representation of the participant with each participant having their own avatar that is visible to other users. Figure 2:4 and Figure 2:5 below illustrate what is meant by avatars in this context.

Figure 2:4: A group of avatars during a Learning Set meeting in the virtual world, Second Life.

Figure 2:5: The researcher's avatar.

The avatars are controlled by the user in real time and have agency, the ability to take action in the virtual environment.

> Avatars function like user-controlled puppets. Users command the actions of the avatar, but it is the avatar itself which performs the action. Even forms of communication which come more directly from the user, such as voice chat, are presented as actions taken by the avatar.(Bell, 2008, p. 3)

The visual representation of an environment and the user within it is designed to enhance the sense of presence and improve engagement, participation and satisfaction with the online experience (Bartle, 2004; Cannell, Cossarin, Hetman, & Moore, 2004; Corti, 2001; Dickey, 2003, 2005a, 2005b; Gee, 2003; Gehorsam, 2003; Chris Joslin, Giacomo, & Magnenat-Thalmann, 2004; Christopher Joslin, Pandzic, & Magnenat-Thalmann, 2003; Michael & Chen, 2005; Stapleton, 2004).

Shared activities in virtual worlds rely heavily, but not exclusively, on synchronous communication between avatars. There is also some use of asynchronous communication using document sharing, instant messaging and group messaging systems. Communication in virtual worlds can be in text or voice. By incorporating voice interaction they provide alternatives richer in paralanguage features and prosodic elements than the text based interfaces such as email, discussion forum or text based chat. This puts them on the continuum in the vicinity of video

conferencing where a web cam allows users to see and hear each other (Dickey, 1999, 2003, 2005a, 2005b). At the time of this study synchronous chat was the only medium available in the virtual world of Second Life that was used in this study but voice chat became available after the second iteration of the research cycle was completed. Although many gestures and a broad range of animations are available at the time of writing, they are still lacking the fidelity and fine detail to match the visual cues of the video conference or face-to-face interaction.

Virtual worlds researchers prior to this study (Dickey, 2003) and since this study (Dalgarno & Lee, 2010; Hollins & Robbins, 2008) have worked to identify the affordances of virtual worlds for various roles within education although few if any at the time of writing have targeted the specific strategy of Action Learning (Dickenson, et al., 2008b). Dickey (2003) explored the potential of virtual worlds as constructivist learning environments in which text chat was the major communication tool identifying the need for further research to identify the contexts and resources needed to realize this potential (p. 119).

Hollins and Robbins (2008, p. 174) identified five distinct affordances in virtual worlds that may be conducive to student-cantered learning as Identity, Space, Activity, Tools, and Community. They suggest these "should not be considered in isolation or as being somehow mutually exclusive or indeed as a crude attempt to codify knowledge but more as a framework". These affordances are identified throughout the narrative in Chapter 5.

Dalgarno and Lee (2010, pp. 18-23) proposed that virtual worlds have the potential to be used "to facilitate learning tasks of various kinds including learning tasks that lead to the development of enhanced spatial knowledge representation of the explored domain… for experiential learning tasks that would be impractical or impossible to undertake in the real world…for learning tasks that lead to increased intrinsic motivation and engagement…learning tasks that lead to improved transfer of knowledge and skills to real situations through contextualisation of learning …(and) for tasks that lead to richer and/or more effective collaborative learning than is possible with 2-D alternatives". Although a useful list of potential, the research does not identify, beyond a handful of examples, the contexts in which these affordances might best be realized (Nichols, 2010). This study provided one context in which richer and more effective collaboration through the use of virtual worlds as opposed to their 2D alternatives. Examples such as this can help legitimize their claim on this affordance demonstrated by successful participation and high completion rates within the programs in the study. The roles for virtual worlds in education developed from this study (Figure 7:6 A Typology of the Roles for Virtual Worlds in Education.), first distributed for review in 2008 and blogged as part of the web proto-diffusion (Linda McKeown, 2009) and published in 2009 (Jakobsdottir, McKeown, & Hoven, 2009) provides an alternative perspective on Dalgarno and Lee's list of affordances.

2.6 Gaps in the literature - Action Learning in an online 3D environment

With the advent of virtual worlds, it became possible to deliver almost all previous media within a new virtualised 3D learning environment. In addition, the situation of being 'face-to-face' became virtualised in an embodied form through the use of

avatars meeting in a shared 3D location. This was the exciting element that provides a potential worth exploring to allow Action Learners to learn together in virtual worlds.

Online social worlds differ from computer games in that they focus on the social aspects of human relationships. The competitive and fantasy role-play elements can be minimised to make them a serious workplace less like computer games. Their intent is to cater for the process of social interaction rather than the game-playing objective of achieving pre-determined outcomes such as winning. Social environments are designed to simulate social interaction as closely as possible to the capability of physical world and allow interaction with other participants using various synchronous and asynchronous media. It is this type of virtual social world that could be designed to support the process of Action Learning. For this study an online learning environment purpose-built for Action Learning was developed and tested in the virtual world called Second Life®.

2.6.1 Affordance Theory

The concepts of 'affordances' was developed by Jerome Gibson, a perceptual psychologist (1979). His colleague, Donald Norman, elaborated on Gibson's theory by distinguishing between 'perceived affordances' and 'signifiers' (Norman, 2004) and applied the theory to virtual environments and computer interfaces. Affordance theory was used in this study to describe how the designed environment and tools within the computer-mediated, graphically-rendered, virtual world created a digital environment with a set of perceived affordances capable of supporting the processes required to host Action Learning Programs.

Gibson used the term affordance to refer to the actionable properties between the world and a person or animal. In relation to the physical world, Gibson described the affordances of the various animate and inanimate elements of the world that people and animals use. These include the terrestrial environment such as surfaces and their layouts; the substances such as air and water; the attached and detached objects both natural and manufactured; and the other animals and other people. People provide reciprocal social affordances for interaction. The horizontal, flat surfaces, for example, afford support and so the human sees that as affording pedestrian locomotion. A long, thin, sharp, pointed object may be used as a spear. He described these in terms of what they afforded both animals and humans but this research directs its focus on affordances for people.

Gibson proposed that people may or may not perceive the affordances of elements of the world around them but the affordances were, nonetheless, present. The affordances, being invariant, do not change as the need of the observer changes. This was a very important factor for consideration in the virtual environment as virtual elements would need to be created that afforded Action Learners with appropriate opportunities to meet the requirements of the Action Learners and the process of Action Learning. The researcher would have to design the virtual environment and the virtual objects in it in such a way that their affordance could be perceived and apprehended by the use of conventions, metaphors and signifiers of affordance (Norman, 2007).

2.6.1.1 Affordances in virtual environments as opposed to physical environments

Norman (Norman, 1999, 2007) proposed that designers need to place clues in virtual environments so that users could perceive the affordances in the computer interface and draw on cultural cues and conventions so that users readily perceived these affordances. There are implications for the design of virtual environments to incorporate 'signifiers' of the action potential of virtual objects that by their very nature of being virtual, do not actually have that potential in the same sense as their physical world counterparts.

> What the designer cares about is whether the user perceives that some action is possible (or in the case of perceived non-affordances, not possible). In product design, where one deals with real, physical objects, there can be both real and perceived affordances, and the two need not be the same. In graphical, screen-based interfaces, all that the designer has available is control over perceived affordances." (Norman, 2004, p. 1).

2.6.1.2 Ability

Gibson proposed affordances in terms of a relationship between the human (or animal) and the environment. Ability refers to "whatever it is about the agent that contributes to the kind of interaction that occurs" (Greeno, 1994, p. 338). In a virtual world it is the abilities of the avatar as the embodiment of the person operating it, not the full set of the abilities of the person that need to be planned into the environment. For example, the person might be able to smile, grimace, and lean forward to show paying attention or shake hands in greeting. The avatar may not be able to exhibit all those same behaviours unaided by additional tools. There may be abilities that an avatar possess that the person operating it does not, for example flying or teleporting instantly to another location.

2.6.1.3 The avatar

In the virtual world, the avatar is an object providing the embodiment of the user and a signifier of the presence other people. The use of avatars can signify social affordance in ways that other web based technologies cannot as the synchronous presence of others on the same web page is not always visible except in systems such as videoconference rooms or Learning Management Systems where some icon or text indicates the presence of other users.

> What other persons afford, comprises the whole realm of social significance for human beings.(James Jerome Gibson, 1979, p. 128)

The use of avatars is standard in the virtual world and attention will need to be paid to the identity and access affordances they offer and how customisation of avatars might affect this.

2.6.1.4 Misinformation for affordances

Gibson also warned that misinformation could lead to misperception by the person. This is a significant risk in a virtual environment where things look like their physical counterparts but may not act like they do in the physical environment. There

are many altered affordances in virtual environments. The following list of examples demonstrates some of these differences:

> Cliffs that you may fall off and gravity that makes you fall but don't die on impact;
>
> Water in which you sink but don't drown;
>
> Wind sounds you can hear in the ambient sounds of the virtual world but you don't see the grass waving, tree branches or shadows moving or feel it;
>
> Edible looking objects that are not edible and an avatar that lives without the need of sustenance (as opposed to 3D computer games that may require the user to artificially manage health, spirit and mana); and
>
> Familiar objects that are visible but not able to be picked up and used due to the permission systems and animation limitations of the virtual world.

There are also instances of affordances of virtual objects that don't exist in the physical world or the traditional computer interface. For example, many virtual worlds allow teleporting as a method of almost instantaneous movement of the avatar from one place to another. Since teleporters do not exist in the physical world, awareness of their affordance for transport is unlikely to be detected by the novice user and signifiers that give a clue to their purpose would be essential or they may go unnoticed until another user points them out or deliberately or inadvertently demonstrates their use.

2.6.1.5 Design decisions related to the key research questions

Affordance theory triggered many questions for the researcher and guided design decisions as described in chapters four and five. They relate back to the overall research questions of the study found at 1.6 and serve here to illustrate the types of reflective thinking that was occurring in the researcher's mind throughout the design process as recorded in the Research Journal (Designer Log in ILDF terms). The following lists some of the design decisions that were recorded therein:

> How do you create a usable environment for Action Learning that capitalises on the technical and social affordances of the features of a 3D virtual world?
> What additional affordances can be created using bespoke tools that take advantage of customisation capabilities of the virtual world platform?
> How might misinformation or altered affordances impact the users when visual replicas of physical objects appear in the virtual world without their associated affordances?
> Do the altered affordances confuse users initially and does this impact retention?
> In the longer term, will confusion subside as the users learn new rules of the environment?
> Can the affordances of the design be readily perceived by the users?
> How can cultural conventions from the physical world be used to enhance perception of affordances in the virtual world?
> How else can perception be supported in virtual environments? (Research Journal, Linda McKeown Orwin, 2005).

2.7 The approach of this study

This study explored the social and technical affordances of a computer-mediated 3D virtual world to support Action Learning pedagogy for teacher professional development, a process that is dependent on high levels of dialogue and low transactional distance. The study used social presence as a key indicator of effective communication in the virtual world that is mission critical to the functioning of the Learning Set and as such to Action Learning. Satisfaction was another measure of the program's effectiveness to achieve the state goal.

The study documents the design decisions and the construction of artefacts in a purpose-built location in the virtual world of Second Life. This virtual world provided a location to represent a physical space and avatars as the graphical embodiment of the participants. Learners and facilitators were able to view their virtual surroundings and each other and interact in this virtual world via the Viewer software on their computers.

Chapter 3 - The Research Methodology

The study used a Design Based Research methodology developed by Bannan-Ritland called the Integrative Learning Design Framework (2003). Three of the four stages of the framework provided a guided design and research process from informed exploration through design and enactment and evaluation of local impact. This chapter outlines the specific process that was planned and implemented.

3.1 Design Based Research differs from psychological experimentation research methods

> Educational design research is perceived as the systematic study of designing, developing and evaluating educational interventions, - such as programs, teaching-learning strategies and materials, products and systems – as solutions to such problems, which also aims at advancing our knowledge about the characteristics of these interventions and the processes to design and develop them (Plomp, 2007, p. 9).

In a systematic process of designing, engineering and observing a learning environment in a virtual world, it was the aim of the researcher to create a workable online experience for Action Learners and generate evidence-based claims about the affordances of this virtual environment for this process of Action Learning with a particular focus on teacher learning.

A more detailed comparison of empirical and Design Based research was summarized in table by Barab and Squire (2004) shown below in Table 3-1. In design research, the context is important and the research is carried out in a naturalistic setting.

Table 3-1: Comparing Psychological Experimentation and Design-Based Research Methods (Barab & Squire, 2004).

Comparing Psychological Experimentation and Design-Based Research Methods

Category	*Psychological Experimentation*	*Design-Based Research*
Location of research	Conducted in laboratory settings	Occurs in the buzzing, blooming confusion of real-life settings where most learning actually occurs
Complexity of variables	Frequently involves a single or a couple of dependent variables	Involves multiple dependent variables, including climate variables (e.g., collaboration among learners, available resources), outcome variables (e.g., learning of content, transfer), and system variables (e.g., dissemination, sustainability)
Focus of research	Focuses on identifying a few variables and holding them constant	Focuses on characterizing the situation in all its complexity, much of which is not now *a priori*
Unfolding of procedures	Uses fixed procedures	Involves flexible design revision in which there is a tentative initial set that are revised depending on their success in practice
Amount of social interaction	Isolates learners to control interaction	Frequently involves complex social interactions with participants sharing ideas, distracting each other, and so on
Characterizing the findings	Focuses on testing hypothesis	Involves looking at multiple aspects of the design and developing a profile that characterizes the design in practice
Role of participants	Treats participants as subjects	Involves different participants in the design so as to bring their differing expertise into producing and analyzing the design

Note. Adapted from Collins (1999).

3.2 Selection of a methodology to fit the research context

As this study developed from a workplace problem into a research project, a suitable methodology was needed that was the right fit for the purpose, context and desired outcomes. There was an immediate need to solve a practical problem in an educational context: What could virtual worlds afford distance learners so they could access online Action Learning based professional development so they experienced a high fidelity Action Learning experience? This would involve bringing together, for the first time, knowledge about Action Learning process with distance education theory and the emerging technology of virtual worlds to interact in such a way that the resulting learning environment was usable by both facilitators and participants.

> Design experiments ideally result in greater understanding of a learning ecology—a complex, interacting system involving multiple elements of different types and levels—by designing its elements and by anticipating how these elements function together to support learning. (Cobb, Confrey, diSessa, Lehrer, & Schauble, 2003, p. 9)

As described above by Cobb et al in the above quote, Design Based Research (DBR) provided a methodology that could, by its very nature, meet the needs of a design project that would bring together all the aspects of the design of this system for Action Learning in a virtual world especially for a study that would be exploratory in nature where little previous research existed about the specific environment to be created.

3.3 Congruence with Design Based Research

This study had all the attributes that indicate DBR was a suitable methodology compared to other research methodologies. It was a pragmatic study intended to begin as research to solve an educational problem but continue as a fully functional, ongoing working environment suitable for use by Action Learning Facilitators around the world.

Wang and Hannafin (2003) proposed five basic characteristics of design-based research: "Pragmatic, Grounded, Interactive, iterative and flexible, Integrative, and Contextual". These were used as an initial test of the suitability of the methodology.

3.3.1 Pragmatic and contextualized

Because the goal of design based research is to solve real-world problems through the designs created by it, DBR is pragmatic and contextualized by the environment in which the problems and the designs applied to their solutions occur. In this way the research informs theory and refines design principles. This project was intended for use in the researcher's ongoing work and the research outcomes were to be used to inform the funding body with the potential to impact government policy. The design was to be shared with the worldwide Action Learning community through participation in online communities, publications and presentations for Action Learning professional associations including ALARA, the International Foundation for Action Learning (IFAL) and the World Institute for Action Learning (WIAL).

3.3.2 Grounded

Grounded in both theory and real world context, theory in DBR is being continuously developed and refined throughout the research process and acts as a guide to the implemented innovation. This study would be grounded in theory as Action Learning is already a well-established teaching strategy for professional development and there is a body of research about some of the key challenges to online distance learning. The opportunities for new approaches to address these challenges of learning online were afforded by the emerging virtual worlds technologies. These rich, immersive environments were yet to be extensively explored for their potential in education but they were experiencing enormous uptake in gaming (e.g. MMORPGs such as World of Warcraft[1]). It was just after the commencement of this research in 2006 that their game forms were predicted to make a mark in the education sector in the Horizon Report (Johnson, Levine, & Smith) and virtual worlds made it into the predictions for wider uptake in 2007 (Johnson, Levine, & Smith, pp. 18 - 20).

[1] World of Warcraft is a Massively Multiuser Online Role Play Game (MMORPG) created by Blizzard Entertainment. http://us.blizzard.com/en-us/games/wow/

3.3.3 Interactive, iterative and flexible

Requiring interaction and collaboration between researcher and participants, DBR is iterative and flexible in that through the iterations, the designs are modified based on their effectiveness as fed back by participants and observed by the researcher. Like Action Learning, DBR is an iterative process that values and embeds lived experience, the learner in their context, iterative planning and action in its cycle. DBR paralleled the experience the participants would be living through making their involvement in the research process familiar and overt. Table 3-2 is based on a PowerPoint presentation by Bannan-Ritland and Kelly (n.d., pp. 12-13) that compares traditional teacher professional development and Design Research. The alignment of the Action Learning Process to the DBR process has been added by the researcher. Participants could make valuable contributions to this study as it was not one where a readymade intervention could be taken from the existing literature, applied and tested. In such an emergent field of technology, feature additions, software refinements and hardware glitches were a part of the daily use of the rapidly developing software. Changes were a constant part of the user experience and flexibility was vital to manage the ground changing underfoot. The research design, as well as the environment itself, would need to be agile and responsive to the changing conditions and the findings that emerged during the research process. Participants were aware from the start that this was a work in progress and they came on board expecting an iterative process in which they would have a voice in the design decisions and refinement of the prototype.

Table 3-2: Alignment of Teacher Design Research and Action Learning as compared to Traditional Teacher Professional Development. Based on Bannan-Ritland and Kelly (Bannan-Ritland & Kelly, n.d.).

Traditional Teacher Professional Development	Teacher Design Research	Action Learning
In-service workshops	Intensive involvement in integrated design and research processes	Intensive involvement in integrated design and research processes
Emphasize private, individual activity	Collaborative problem solving	Collaborate planning and reflection
Brief, one-shot sessions	Long-term, intensive, immersive experience	Long-term, intensive, immersive experience
Offer unrelated topics	Focus on meaningful problem in classroom for teachers	Focus on meaningful problem in classroom for teachers
Rely on an external "expert" presenter	Involve expert as resource for design research, teacher's expertise is paramount	Involve expert as resource for design research, teacher's expertise is paramount
Expect passive teacher-listeners	Design activity driven by teachers demanding active involvement and meaningful integration of all resources (expert, research, practice, etc.)	Design activity driven by teachers demanding active involvement and meaningful integration of all resources (expert, research, practice, etc.)
Emphasize skill development	Reconsideration of practice to design an innovation for other teachers/children	Reconsideration of practice to design an innovation for other teachers/children or self

Traditional Teacher Professional Development	Teacher Design Research	Action Learning
Are theoretical	Grounded in cognitive theory as well as teacher practical knowledge	Grounded in cognitive theory as well as teacher practical knowledge
Expect quick, visible results		
Focus on "training" teachers away from job site	Intensive involvement in integrated design and research processes	Intensive involvement in integrated design and research processes
Respond to expressed teacher needs rather than explicitly linked to what schools expect students to know and be able to do	Collaborative problem solving	Collaborative problem solving
Collinson, 1996; Sparks, 1995 summarised by Brenda Bannan-Ritland and Anthony Kelly	*By Brenda Bannan-Ritland and Anthony Kelly*	*Adapted from column 2 by Linda McKeown Orwin*

3.3.4 DBR and the educational application of virtual worlds

There was a history of using DBR with the development of educational environments that demonstrated the value of this methodology for the task at hand. The large, award winning educational virtual worlds project entitled Quest Atlantis was developed using a Design Based Research methodology (Barab & Squire, 2004). Barab identified the value of DBR for developing a virtual world based learning environment because of the iterative nature of the process; the social collaboration with the end users (teachers and students) in the design of the environment; and its usefulness in validating a design whilst at the same time providing the opportunity to develop and refine theory.

3.4 Absence of prior research

DBR was deemed as a suitable methodology as opposed to an experimental model since there were no blueprints to work from when building a 3D virtual environment for Action Learning. When this research study commenced in 2005, there was very little research and understanding of 3D virtual worlds as learning spaces but a small, but growing number of individuals and institutions had begun using them for educational purposes in the public arena. A few research studies from a small number of institutions at the leading edge of the use of virtual worlds were beginning to emerge that identified the potential for these environments to add value as a distance learning environment (Dede, 1995; Dede, Salzman, & Loftin, 1996; Dickey, 1999, 2003, 2004, 2005a, 2005b; Riedl, Tashner, & Bronack, 2004). A small group of enthusiastic higher education leaders in the field of virtual worlds had formed an

informal association called The League of Worlds in 2004 (Kelly, 2010). The researcher joined this group and attended their annual conference in 2005.

No organisations could be found in 2005 who were writing publicly about their use of 3D virtual worlds specifically for Action Learning. The apparent void was confirmed three years later in a study of the practices of 'Virtual Action Learning' (VAL) by Dickenson, Pedler and Burgoyne (2008b). Dickenson et al conducted an extensive literature review and survey of practice in which the only reference to the use of virtual worlds for Action Learning was to this research study as a work in progress.

To establish a 3D virtual space capable of hosting Action Learning programs required understanding the existing process, creating a suitable virtual location and conducting a number of iterations of programs to determine the capabilities and limitations of the environment. Without a vast pre-existing, publicly available, shared knowledge about this, the researcher had to determine what was possible during use of the environment. It is in this context of construction of the design, hosting a number of iterations, evaluating them and then modifying the design, that DBR was selected as the appropriate methodology.

3.5 The Integrative Learning Design Framework (ILDF)

Within the emerging methodology of DBR, Bannan-Ritland developed the Integrative Learning Design Framework (ILDF) that "attempts to integrate the systematic processes of the related fields of instructional design, software engineering and product design" (2007, p. 53) for the purpose of creating teaching interventions that use educational technology. This integration is illustrated in Figure 3:1 with the ILD Framework at the top and, below it, the corresponding processes of Product Design based on the work of Ulrlich and Eppinger (2000), Instructional Design based from Dick and Carey (1990), Usage-centred Design from Constantine and Lockwood (1999), the diffusion of innovation (labelled Innovation Development) by Rogers and educational research methodologies drawn from Isaac and Michael (1990) (as cited in Bannan, 2007).

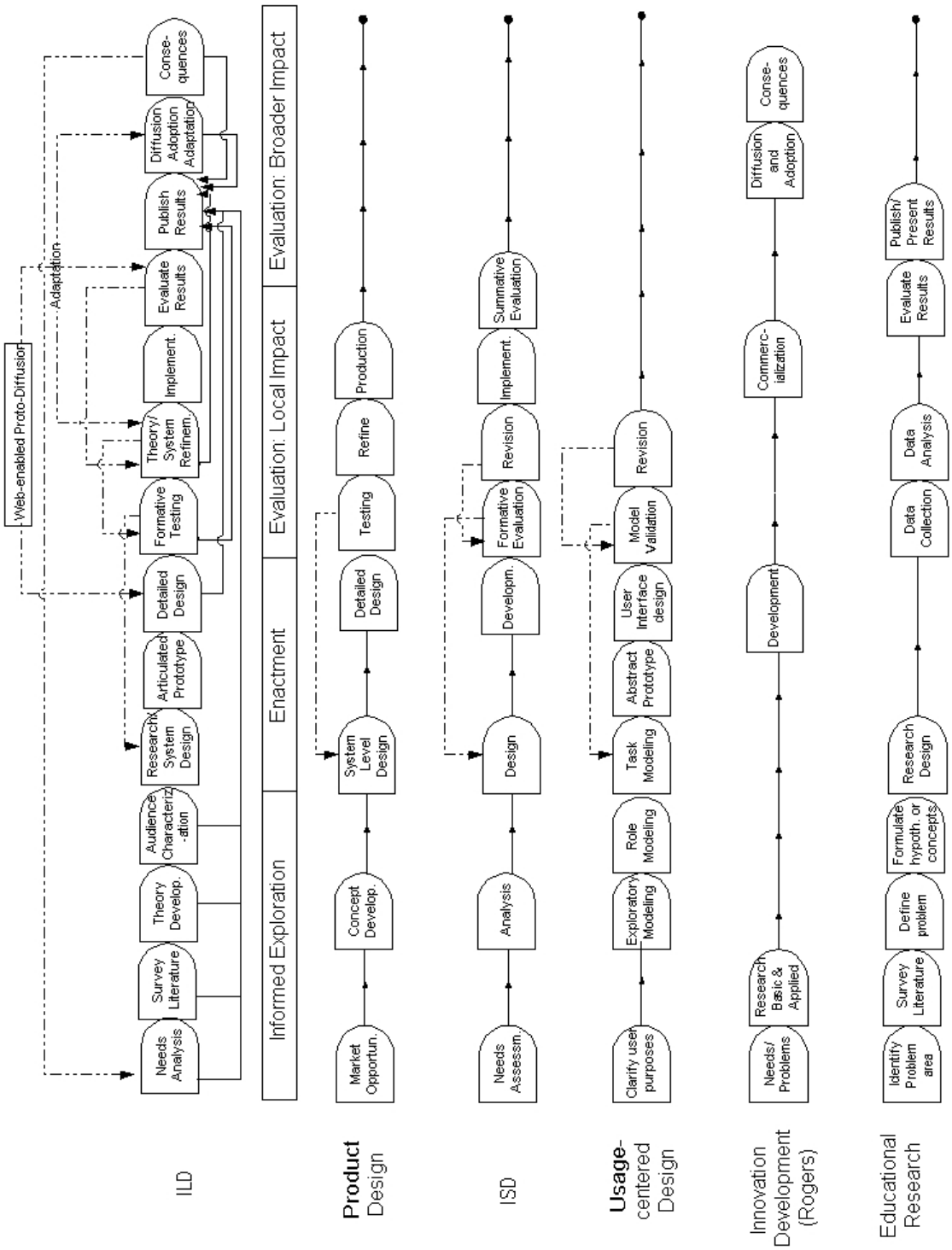


Figure 3:1: Integrative Learning Design Framework (Bannan-Ritland, 2003, p. 53)

The framework blends making the propositions about learning and teaching with the goal of creating workable designs that could be used in practice. It integrates processes from "instructional design, object oriented software development, diffusion of innovations and educational research" (Bannan, 2007, p. 53). As such it is a comprehensive model to guide designing, developing and assessing the impact of an educational technology innovation from initial conceptualization through to diffusion and adoption whilst simultaneously contributing to educational theory.

Both qualitative and quantitative methods are used in the four stages of the ILDF allowing the strengths of both qualitative and quantitative approaches to be used where their strengths can be maximized and the risks mitigated.

3.5.1 Aligning this study and the ILDF

This research involved constructing a new learning environment by repurposing and customising virtual worlds software to suit the instructional design of Action Learning by creating a new online product (the Action Learning Virtual World Environment). The ILDF was a suitable framework to bring together all the aspects of this design process and address all aspects of the interrelated processes of product design, research methods, evaluation of the effectiveness of the design for Action Learning and user experience. Bannan-Ritland (2003) notes that the intention of the ILDF is meant for program-level perspectives as opposed to short single study applications. Figure 3:2 illustrates how this study fits a broader research and practice agenda of the researcher in the conduct of her past and intended future use of the Action Learning strategy as a professional in the field of teacher professional development. The ILDF will remain the preferred strategy for ongoing refinement of the virtual world environment for Action Learning.

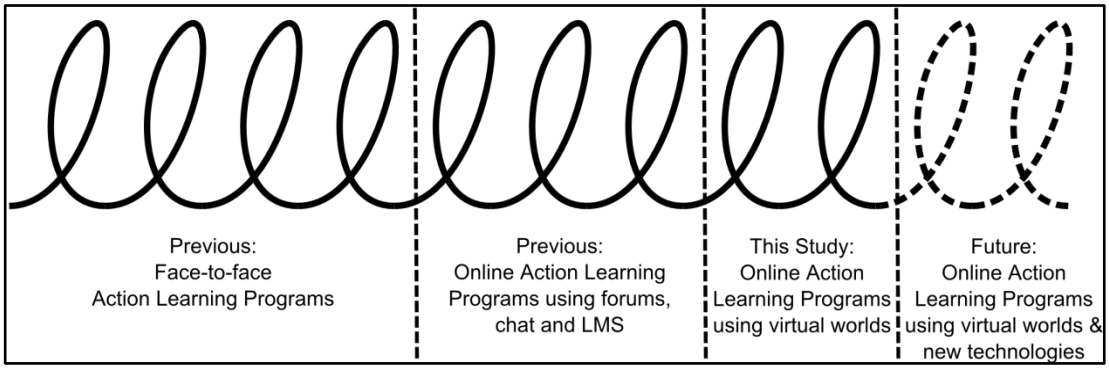


Figure 3:2: Program level trajectory of Action Learning within the professional work of the researcher as a provider of teacher professional development about educational technology.

3.6 ILDF and research methods

The iterative process of the ILDF parallels the simpler iterative process of Action Learning in many ways and like in Action Learning, decisions are driven by data. The ILDF allows for the integration of a variety of data collection and analysis methods, both qualitative and quantitative, based on the needs of the research project. Data should be collected from multiple sources. Selecting the research methods and data sources for this project was guided by the suggestions by Bannan-Ritland (2003) found in the ILDF research diagram in the following Figure 3:3.

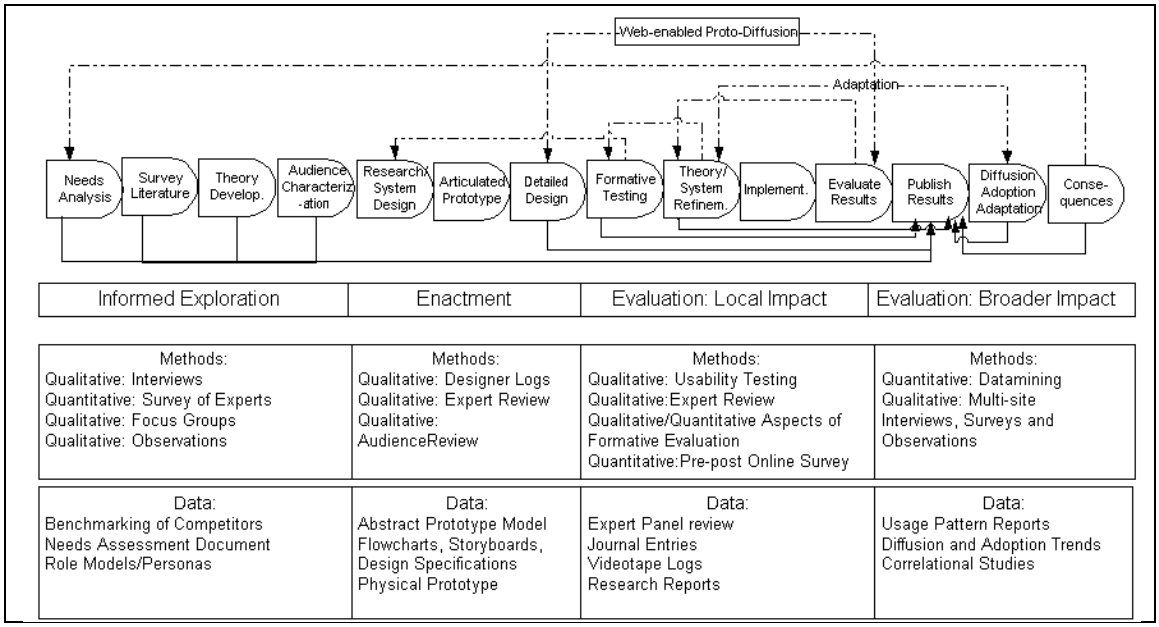
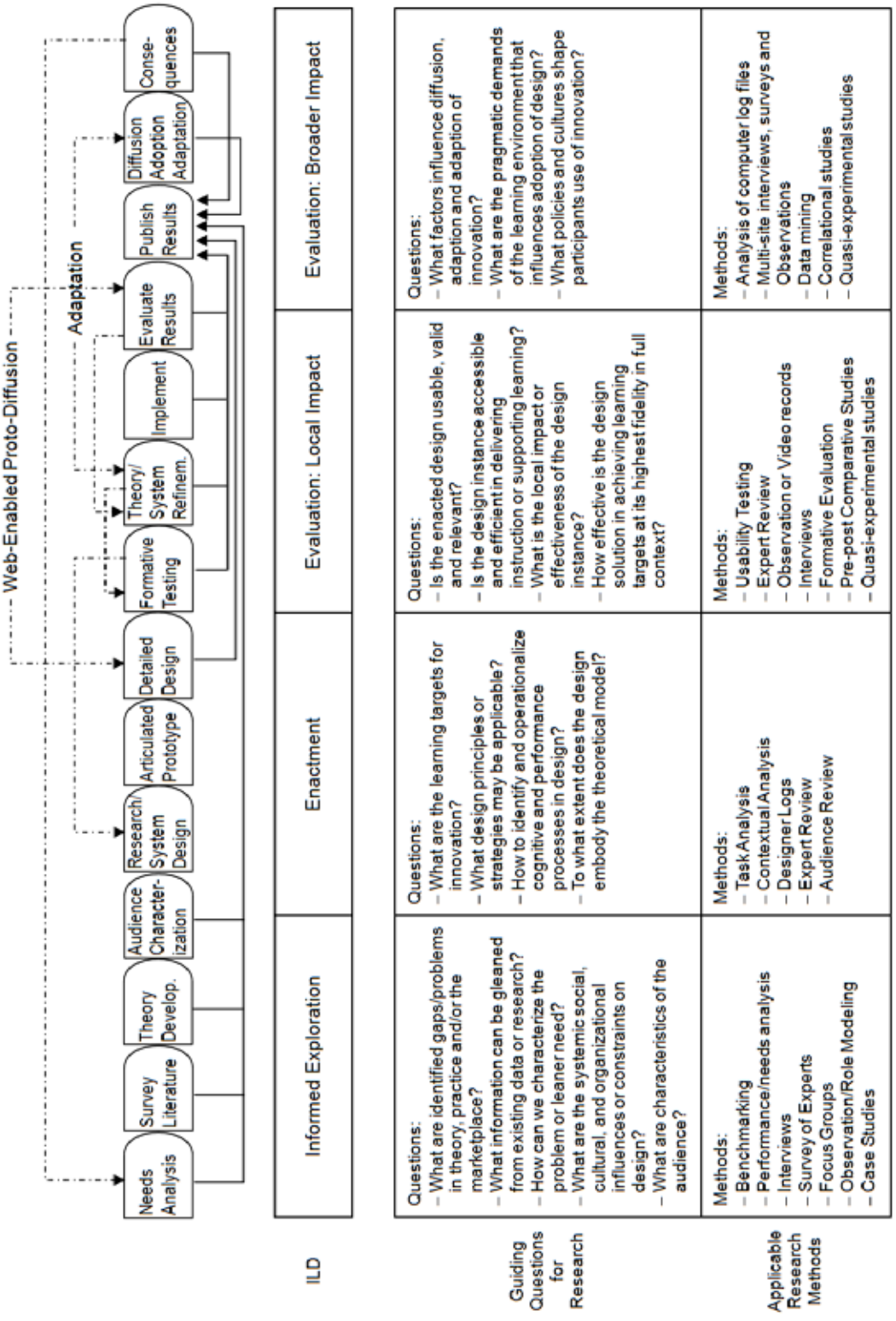


Figure 3:3: ILDF with suggested research methods and data sources (Bannan-Ritland, 2003).

The ILDF provided a roadmap for the research plan. Specific research methods were developed for each stage of the framework using the above table as a guide. The ILDF is a "meta-methodology" (Bannan, 2007, p. 58) that suggests multiple data collection and analysis methods and the range of sources in this research included interviews, logs, dialogue analysis, usability testing and a questionnaire. Using this as a guide a range of data collection and analysis tools was selected to suit each stage of the process as they related to Action Learning and the design of the learning environment in the virtual world.

In this study, the processes of data collection about and in the virtual world examined a range of artefacts using various processes that would be followed by an analysis of that data. Using the prototype of the learning environment for its intended purpose was the most effective method of determining whether the expected technical and social affordances of the virtual world environment were evident to the users and provided a workable environment for Action Learning. The design would need to draw on the knowledge and understanding of past Action Learning processes and online learning designs to create the prototype in a 3D virtual world. Formal and informal interviews, a survey, chat logging and usage patterns would provide a range of data for analysis. The outcomes of the research would be design principles, description of affordances and constraints distilled from practice and a prototype that could be reused and modified over time. Table 3-3 identifies the guiding questions for research within each phase of the ILDF and maps them to the research methods suitable for gathering the data to inform decisions and determine success.

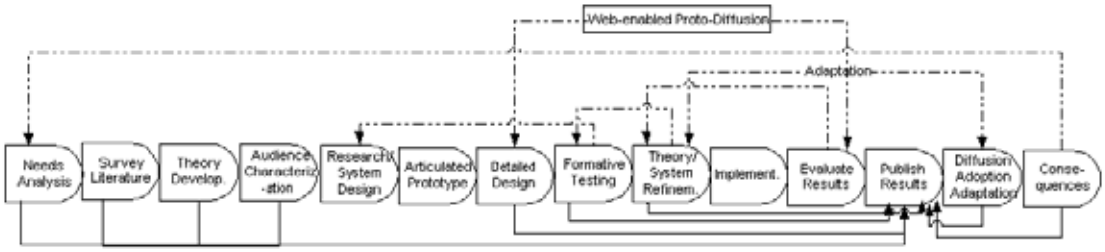
Table 3-3: Questions and methods of research by Integrative Learning Design Framework Phase. (Bannan, 2007, p. 54)



Following on from these recommendations, Table 3-4 maps the actual data collection methods used in this study to the ILDF phases. As both practitioner and researcher, the lived experience of the researcher was used to inform the design in a similar way to the interviews with the experienced Action Learning Facilitators during the

Informed Exploration Phase. Access to the professional association for Action Learning provided a source for data.

Table 3-4: Data collection methods mapped to the ILDF Phases (Bannan, 2007)



INFORMED EXPLORATION	ENACTMENT	EVALUATION: LOCAL IMPACT	EVALUATION: BROADER IMPACT
Needs Analysis. Survey Literature. Theory Development. Audience Characterization.	Research/System Design. Articulated Prototype. Detailed Design.	Formative Testing. Theory/System. Refinement. Implementation. Virtual world enabled proto-diffusion.	Publish results. Diffusion, adoption, adaptation. Consequences (Not within the scope of this study).

Needs analysis from the researcher's work history.	Research Plan based on ILDF.	Questionnaire – Modified GlobalEd questionnaire (Gunawardena & Zittle, 1997)	Presentations at conferences. Publications including journal articles and book chapters.
Literature review – Action Learning; virtual worlds; Transactional Distance Theory; Design Based Research including ILDF. Reading blogs, wikis and websites about virtual worlds.	Researcher Journal including reflections, drawings, diagrams, photographs taken in virtual worlds.	Transcripts of Learning Set Meetings coded to determine the Social Presence Density (Rourke, Anderson, Garrison, & Archer, 2001).	Smart State Report to Queensland Government (Sponsor of the research).
Attendance at educator and business meetings in virtual worlds to gather ideas.		Semi-structured in-depth interviews with the facilitator about the relationship between the tools, the environment and the Action Learning processes.	Blog posts. Informal conversations.
Attendance at Action Learning, Action Research Association meetings and conferences.		Transcripts of Action Learners' and Learning Set Advisers' personal reflections in Learning Journals, Blogs (if participants elect to use them), and participants' email.	Dissertation. Tours of the environment for groups and individuals.

3.7 ILDF for an Action Learning environment in a virtual world

The following sections detail the processes used in the Informed Exploration Phase in detail. This includes needs analysis, literature survey, theory development and audience characterization.

3.7.1 ILDF Phase: Informed Exploration Phase

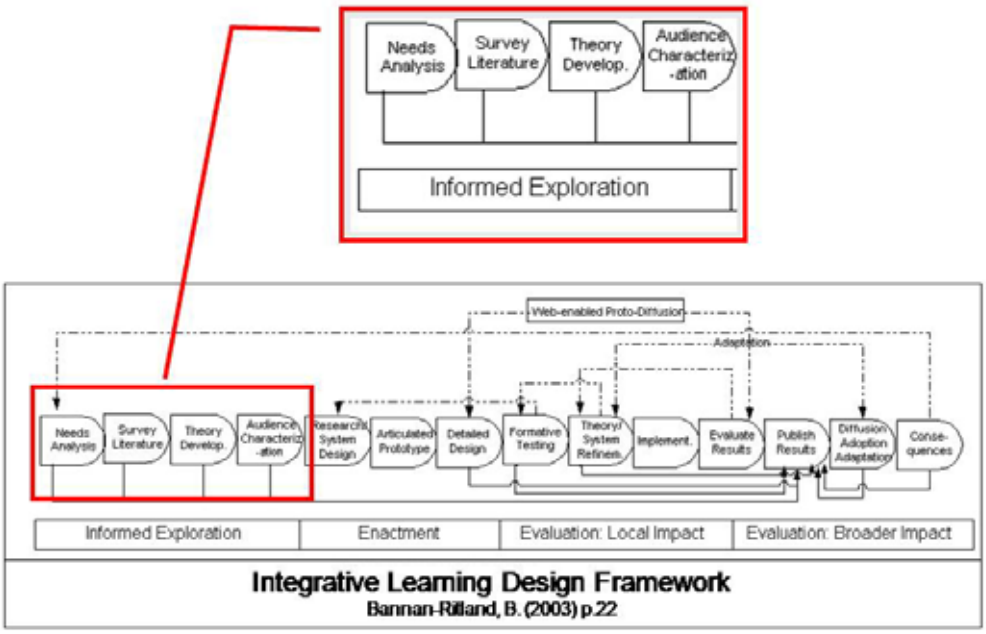


Figure 3:4: ILDF Informed Exploration (Bannan, 2007).

3.7.1.1 Needs analysis of users and stakeholders and audience characterization

In the first phase of the ILDF pictured in Figure 3:4, the purpose was to explore what was already known drawing on a literature review but also tapping into the lived experience of expert practitioners. This broadened the researcher's understanding of the needs of Action Learning Program Facilitators, Learning Set Advisors and participants in Action Learning Programs by going beyond the researcher's current personal experience. Needs analysis of stakeholders and users was conducted which included using scripted interviews with highly experienced Action Learning Facilitators many of whom also fulfilled the role of Learning Set Advisers in their programs.

Scripted interviews were used to consistently align data collected from all interview to the Reg Revans based Action Learning process of explore, plan, act and reflect as well as address administration issues. By identifying other online technologies used by the interviewees, the researcher would be able to determine what previous experience these informants had with other online technologies. See Appendix A for a list of the questions used to guide these interviews and chapter four where the impact of the data collected in these interviews on the design is detailed. The questions addressed all the components in each of the stages of Action Learning Programs identified in the literature review. They also included some questions about

the hypothetical use of 3D virtual worlds. To prevent the scripting of the interview form limiting access to potentially useful data, there was an opportunity at the end of the interview for free discussion by the informants to allow unrestricted input if they determined any vital element of their process had not been covered in the questions.

By carefully choosing practitioners working across a range of work contexts beyond the personal experience of the participant researcher, the interview questions were also used to elicit the customisation of these components of Action Learning and approaches taken across a range of contexts and formats. These Action Learning Facilitators were all members of the Action Learning Action Research Association (ALARA). The examples included large and small programs varying from formal academic programs in undergraduate, postgraduate and research degrees; community action groups; corporate professional development and leadership programs; education department state-wide professional development programs; face-to-face and web-based, online Action Learning Programs. Interviews were conducted in addition to drawing on the participant researcher's own experience. All interviews were conducted in person except one that was done by email as the interviewee was located in the UK.

To tap into a wider expert group, a structured group interview was conducted with members of the Brisbane Chapter of ALARA. This contributed to the needs analysis and audience characterisation that combined with the personal experience of the researcher to triangulate the data from the individual interviews.

These three methods of individual interviews, group interview and literature review were intended to identify operational characteristics of Action Learning programs that would be incorporated into the design of a prototype of an online environment. They were also used to identify any existing uses of online tools and services to support Action Learning. Building on the personal experience of the researcher, the data collected would also aid in the definition of user personas (Who will use it and how?) and the requirements (What does it need to do?) and construction of representative workflows. Data from the Informed Exploration Phase of the ILDF and the design decisions based on this data are outlined in Chapter 4.

3.7.1.2 Survey of the literature and theory development

The literature review, elaborated in chapter two, targeted the themes of Action Learning, professional development especially for teachers, social and gaming oriented virtual worlds, transactional distance theory, and affordance theory. Structured interview questions about Action Learning strategies were developed from the Action Learning literature especially the works of Reg Revans (1998), the original creator of the Action Learning strategy, and Weinstein (1999) as well as drawing on the lived experience of the researcher. Combining this theoretical perspective with the data from the interviews with other Action Learning Facilitators grounded the design. This yielded a rich description of the technological requirements and their intended purpose for creating social presence, immediacy and physical presence whilst meeting the expected needs of learners' needs as identified by stakeholders.

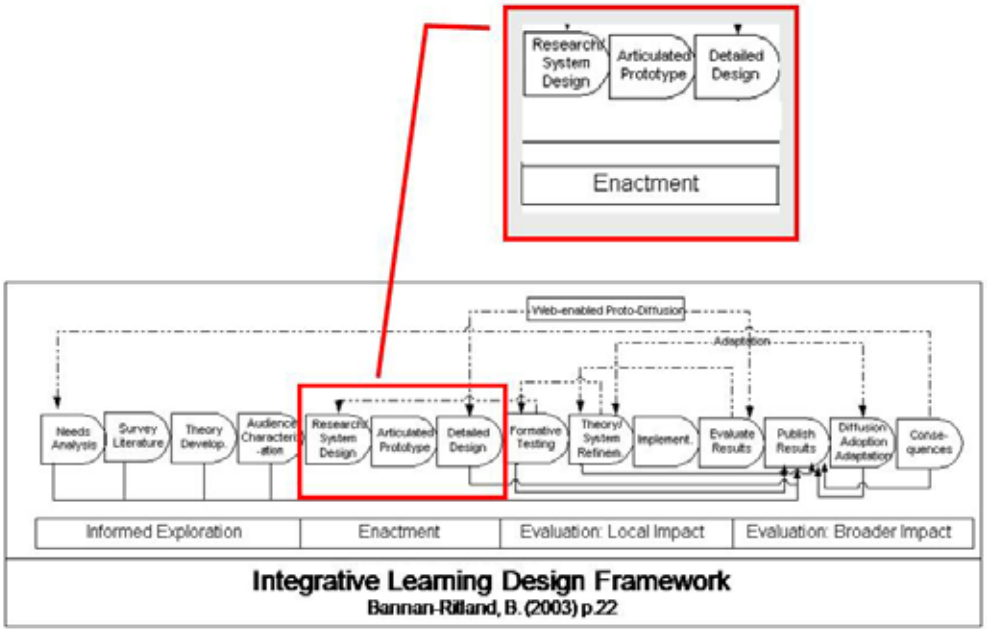


Figure 3:5: ILDF Enactment Phase.

3.7.2 ILDF Phase: Enactment

> The ILD framework views an intervention as a socially constructed object that must be systematically articulated and revised over a number of cycles rather than as a standard "treatment" intended to test hypotheses. (Bannan-Ritland, 2003, p. 23)

During the Enactment Phase, a description was created of the form and role of 3D environment as a learning environment suitable for Action Learning. Over a period of two months, the prototype of the 3D virtual environment was built based on the descriptive drawings and plans of the articulated prototype (detailed in Chapter 5.1) using the in-built construction features of the virtual world. Some ready-made objects were purchased. Some bespoke tools were commissioned to meet identified needs beyond the standard tool set and those already available in Second Life. Customised structures were developed and decorated with readymade items to create a learning environment capable of hosting Action Learning Programs. The detailed description can be found in chapter five.

Data collection tools for the research component of the design also formed part of this phase. Where data collection was to occur in the virtual world, these tools were blended into the environment as unobtrusively as possible. At all times care was taken to minimise the impact of the research process on the Action Learning processes so as not to compromise the validity of the evaluation of the Action Learning environment. A complete list of research tools is described in chapter five. Some teaching tools that identified but not implemented in these two iterations are also outlined there as examples of the potential of Second Life to cater for a diverse range of learners an teaching strategies especially as they relate to the Exploration Stage of the Action Learning Cycle.

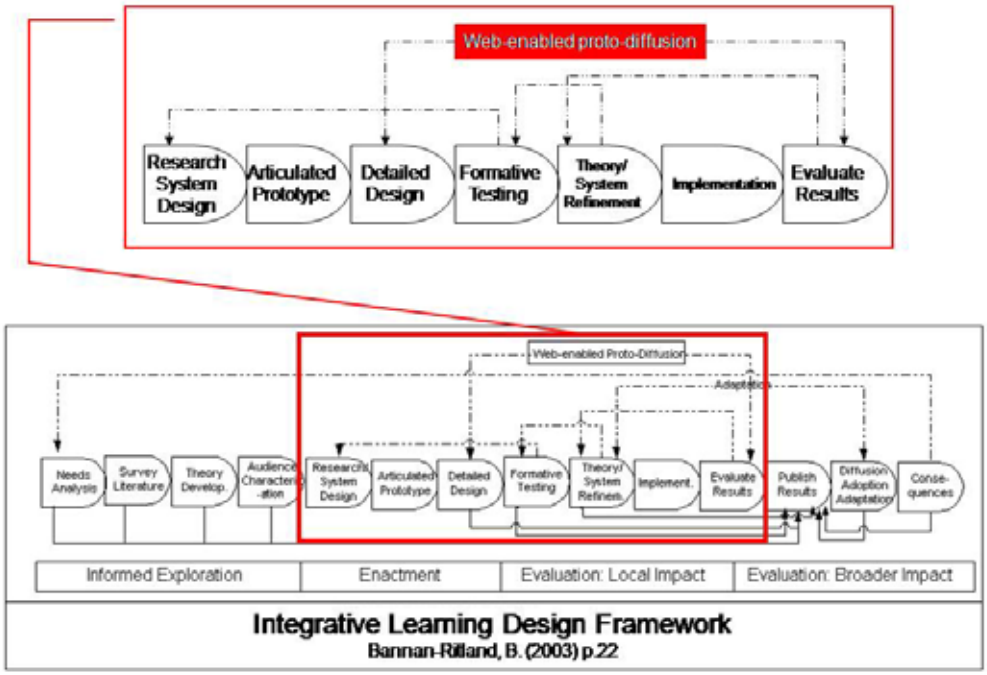


Figure 3:6: Web enabled proto diffusion phase of the ILDF.

3.7.3 ILDF Phase: Web Enabled Proto-diffusion becomes virtual world enabled proto-diffusion

In the next phase of the ILDF, the prototype was to be shared on a web site and comment invited from the wider community. Although the plan included using a wiki hosted y the university to share the prototype and progress in the web enabled proto-diffusion phase, a serious of malicious hacking attacks on the project wiki before any significant amount of content had been created led to reconsideration of this process. One important community who could provide informed feedback was virtual world based. Although there was a potential risk of bias towards the positive aspects of the environment, this community provided valuable informed opinion and in this study, aimed at designing a functional Action Learning environment, the ideas and opinions of the community could be useful in creating that design. Risk was mitigated by during the evaluation phase so that any bias by this group affecting the design would be tested by the users and shortcomings or constraints would become evident through use. The following modified proto-diffusion process was developed for use within the virtual world.

The virtual world based proto-diffusion used in-world presentations, seminars, synchronous and asynchronous tours to engage the broad education community of higher education, school education, professional development professionals and corporate trainers. These sessions allowed hundreds of members of the Second Life educational and business communities with a range of virtual worlds experience from novice to expert to provide feedback and engage with the prototype first hand. An experimental visitor tracker was intended to log the number of daily visits to the island by the community and the locations frequented however the prototype system did not work as intended and the data was unavailable. Pre-recorded 3D tours conducted by using flying pods like small flying saucers and recorded audio demonstrations provided asynchronous information to visitors when the researcher was unavailable to provide these.

Several channels were available to provide feedback to the researcher about the educational community's reaction to the prototype post tour. Many tours and presentations were conducted in person by the researcher or participants in the program and so direct feedback was given during the tour or in debriefing sessions. The built-in notecard system and in-world Instant Messaging provided two asynchronous feedback channels for people to contact the researcher with feedback, questions and suggestions. Two custom tools were provided to allow asynchronous feedback. The first was a blogging tool that when touched by a visitor, allowed them to type in the chat field and it would send the contents of the chat to a blog. This tool is illustrated in Figure 5:42 (C). Some visitors also blogged on their own sites about their visits. The second was a bell, pictured in Figure 5:15, that showed the online status of the researcher's avatar and would send an Instant Message if online and an email if offline.

3.7.4 ILDF Phase: Evaluation: Local impact (Formative Evaluation)

In the 'Guiding Questions for Research' section of the "Questions and Methods for Design Research by ILDF Phase" figure, Bannan (2007, p. 54) suggests the following questions to guide research at this phase of the ILDF.

> Is the enacted design usable, valid and relevant?
>
> Is the design instance accessible and efficient in delivering instruction or supporting learning?
>
> What is the local impact or effectiveness of the design instance?
>
> How effective is the design solution in achieving learning targets at its highest fidelity in full context?

These types of questions were used to guide the evaluation which was undertaken during and after each iteration of the Action Learning Program in the virtual world. The formative evaluation was based on Nieveen's four quality criteria for educational interventions reproduced as Table 3-5.

Table 3-5: Criteria for High Quality Interventions (Nieveen, 2007, p. 94).

Criterion	
Relevance (also referred to as content validity)	There is a need for the intervention and its design is based on state-of-the-art (scientific) knowledge.
Consistency (also referred to as construct validity)	The intervention is 'logically' designed.
Practicality	**Expected** The intervention is expected to be usable in the settings for which it has been designed and developed. **Actual** The intervention is usable in the settings for which it has been designed and developed.
Effectiveness	**Expected** Using the intervention is expected to result in desired outcomes. **Actual** Using the intervention results in desired outcomes.

The relevance criterion was met because this study met an identified need for the researcher's business as an Action Learning Facilitator. It was also a response to the expressed interest from academics at the League of Worlds (Melbourne 2005) that led to the early trials at Appalachian State University. The ongoing need for better online learning environments was supported in the literature review. In addition, during the interviews and the ALARA meeting there was consensus that more opportunities to use Action Learning in online modes would present themselves as the use of the Internet spread and global organisations wanted professional development for their dispersed teams without the added expense of wasted travel time. The IFAL conference in London in 2011 themed Action Learning in the Virtual World is additional evidence that the research was timely.

The loss of quality of interaction online was consistently identified as the major risk factor for programs going online by those with or without online experience. This made effective communication a top priority in the design process. This study addressed this research priority by drawing on existing knowledge about presence and online learning.

The logic of the design was based on replicating an Action Learning process that had been in use for over sixty years as a strategy in non-mediated environments. The design for the prototype was grounded in theory and practices that had been tested in person by the researcher in multiple learning contexts. Expert advice was sought from a range of other Action Learning Facilitators with experience in a range of contexts where Action Learning was used face-to-face and online. This was augmented with both literature about distance education and experience with computer games.

Two iterations of the Action Learning Program were conducted using Second Life. Usability testing, dialogue analysis, observation, interviews and a questionnaire provided a broad data collection to ensure comparability to the Action Learning process in contexts not mediated by computers.

The entire process is described in detail in a narrative form in chapter five. Figure 3:5 describes the various strategies that were planned for data collection and analysis mapped against the Action Learning Cycle. It was challenging to plan data collection methods in a relatively unknown and little researched learning environment. The research plan was modified throughout the study to accommodate the capabilities and limitations of the environment as they became evident. At times the instability of the new technology itself led to failure to record data. By planning to collect data from multiple sources, the risk to the reliability of the study by technical issues such as this was minimised.

Table 3-6: Research methods aligned to Action Research Stages.

Action Learning Process	Transactional distance construct	Guiding Questions	Data source and analysis
Overall	Dialogue Structure Autonomy	How are the inherent technological affordances of the technologies that are made available being deployed by Action Learners and Learning Set Advisors to achieve the processes needed for Action Learning? Were participants able to learn? Were participants satisfied with their outcomes and the process? Would participants use this 3D environment again? If not, why not?	During design, the researcher documented the technological affordances identified and mapped actual use to intended purpose. With the data from semi-structured in-depth interviews about the relationship between the tools, the environment and the Action Learning processes, map the actual uses to the technological affordances. Questions developed to: Identify why and how each Action Learning process was conducted with which tools. Who determined which tools should be used when? Were different tools tried for the same purpose? How were decisions made in the selection of the tools used? Questionnaire – Modified GlobalEd questionnaire relating to computer mediated social presence and satisfaction in online environments developed to measure social presence in a CMC context from a group perspective (Gunawardena & Zittle, 1997)
Learning Set (group) meetings	Dialogue – social presence	What are the social affordances of a range of technological tools and 3D artefacts?	Questionnaire – Modified GlobalEd questionnaire relating to computer mediated social presence and satisfaction in online environments developed to measure social presence in a CMC context from a group perspective (Gunawardena & Zittle, 1997)
Learning Set meeting (group) meetings	Dialogue – Social Presence	Is the nature of the dialogue that is occurring in the online Learning Set Meeting indicative of high levels of social presence.	Transcripts of Learning Set Meetings coded to determine the Social Presence Density (Rourke, et al., 2001)

Action Learning Process	Transactional distance construct	Guiding Questions	Data source and analysis
Learning Set meeting (group) meetings	Dialogue - Technological affordance of tools chosen	Which tools were used for dialogue and when? Why were they chosen? What were they useful for? What issues were experienced? What were the shortcomings of the tools in use?	Facilitator Research Journal documenting the relationship between the tools, the environment and the Action Learning processes. Questions developed to: Identify why and how Learning Set Meetings were conducted with which tools. Who determined which tools should be used when? Were different tools tried for the same purpose? How were decisions made in the selection of the tools used? Identify patterns of use for various purposes related to Learning Set Meeting needs (as per needs analysis phase) and identify technological affordances of these tools for the task.
Personal reflection	Dialogue – personal reflection Structure – use of digital tools to support and provoke reflection	What was the nature and extent of personal reflection using blogs and journals? What bespoke tools supported reflection?	Transcripts of Action Learners' and Learning Set Advisers' personal reflections in Learning Journals or Blogs (if participants elect to use them) to find evidence of the satisfaction or dissatisfaction with the tools for the Action Learning Process; and development of the project and taking it towards a satisfactory level completion in the time allocated.

Chapter four describes the requirements and design decisions, Chapter five which has a narrative description of the tools and their roles and uses, and chapter six reports the analysis of the collected data about usage of the environment in each iteration.

3.7.5 The Participant Researcher

There are advantages and risks in having the same person take on all the roles of designer of the learning environment and facilitator of the programs as well as researcher evaluating their effectiveness and suitability. Nieveen (2007, p. 99) describes the risk of a participant researcher becoming "too attached to their prototype which could lead to a less objective view toward problems and comments from the respondents". In future research, it would be worthwhile to have additional external evaluators to provide an objective viewpoint. Although this was planned, circumstances at the commencement of the program prevented this from occurring. This is a risk of research in naturalistic settings.

To reduce researcher bias, it was planned to use an experienced Online Learning Facilitator who had completed the Action Learning Leaders Program conducted by the researcher in a non-mediated context. This would ensure the program's facilitator was familiar with the Action Learning process to be used. It would also mean the researcher would be an observer during the implementation of the prototype thus providing a view of the learning environment in use by another facilitator not the researcher. The study would then have another data source from that facilitator and a second opinion at the time of analysis making the findings of the study more reliable.

Whilst many elements of the design would be validated by their use, having another experienced facilitator would aid in determining if assertions were trustworthy and credible to others.

At the commencement of the Action Learning Programs when this facilitator was to be trained, two things happened that, when combined, made this facilitator unavailable to take on this significant role in the research. Firstly, the other facilitator underestimated the amount of time it would take to become familiar with the 3D environment at the commencement of the first program and was not adequately prepared for the leadership role. Relying on years of experience in online course facilitation using web based tools especially a commercial Learning Management System, the facilitator was challenged by the difference between the familiar web environment and the radically different 3D virtual world. This was the first barrier to the facilitator to take on this role. Secondly, an upgrade of broadband to the facilitator's home-based office, an essential technical requirement for the graphics intensive virtual world, was delayed by the vendor and due to this, the environment could not be used effectively from the location. Having a slow connection made facilitating impossible.

With the imminent commencement of the Action Learning Program and no other trained facilitator, the researcher was compelled to take on the role of facilitator thus risking bias in the findings. Although efforts were made to locate another experienced Action Learning Facilitator who could be trained in readiness for the second iteration, none could be found who had the time available that coincided with the research schedule. As a control for researcher bias, the researcher made a special effort to be constantly aware of the risk of researcher bias in selecting evidence or in reporting observations. Multiple data sources were used as a way to validate claims including observation, evidence in chat logs, feedback from participants and a questionnaire.

One advantage of the participation of the researcher as facilitator of the programs was that many the strengths and weaknesses of the environment were experienced firsthand and adjustments to the environment and processes could be made rapidly. Designed objects that failed could be fixed on the spot. This identified some of the technical issues in the use of the prototype.

3.8 Summative Evaluation

The Global Ed Questionnaire developed by Gunawardena and Zittle (1997) was administered at the end of the program using the same Moodle Learning Management System that contained all the program documents and calendar. See Appendix B for the items in the questionnaire which was slightly modified to use terminology to match this program. It was originally used in a study related to computer mediated social presence and satisfaction in a Computer Mediated Communication (CMC) context using web based discussion forums used in an online conference.

A follow up of the participants in the longer term was carried out to see whether they used virtual world beyond the end of the Action Learning Program because use of virtual worlds was the content of the program as well as the delivery mechanism. Various methods including informal interviews, reading blogs and social media sites,

Internet searches and email interviews were used to determine if they continued to use virtual worlds either for learning or teaching purposes after the completion of the program. This provided one indication that learning the content of the program, which was about teaching using 3D virtual worlds, had taken place if it was put into practice after the Action Learning Program was completed.

3.9 Evaluation: Broader impact

This phase of the ILDF is not wholly within the scope of this study and will continue beyond publication. This was an exploratory trial and the findings have been and will to be shared both through presentations and publication. There will also be a report to the research grant provider, the Queensland Government in the form of a set of recommendations to Queensland Government following this dissertation process. Already the processes used and the preliminary design principles and other outcomes have been documented in a number of publications which are listed in Appendix C.

3.10 Ethical considerations

Ethics approval was sought and obtained from the University of Southern Queensland. All participants gave informed consent after being issued with an information statement. These documents are attached in Appendix D. Safety of the participants in the virtual world was a priority so a private island was used to minimize any risk of exposure to inappropriate content or actions by other users of Second Life. To ensure the identity of the participants behind the avatars was kept confidential, all participants are referred to throughout this paper by pseudonyms unless otherwise stated. Permission to use some names has been granted. This also applies to their avatars as mediator for human communication since by association it also could be linked to their real identity. This includes the experienced Action Learning facilitators who were interviewed unless permission was given to use their names.

3.11 The research plan in action

Research conducted using the ILDF has four phases which will be described in the following chapters. Because Action Learning is a process that draws on content in support of the learning needs of its participants, the designed learning environment was generic in format and provided a set of tools for the support of Action Learners and their facilitators. The design also included generic tools that could be used for the delivery of content. The design was based on a list of requirements gathered from interviews with experienced Action Learning Facilitators. Chapter four details the data collected during the Informed Exploration Phase that is not included in the literature review in chapter two, and concludes with the plan for the prototype.

Chapter five takes a narrative approach to describe the building and use of the Action Learning environment in Second Life and contains many screen shots to illustrate the environment for the reader. Content added to the world by way of the upload facilities enabled participants and facilitators to customise content resources in various multimedia formats. Thus the Action Learning environment could be used by groups of participants in different programs who access unique sets of content resources associated with their program. Secure access was associated with usernames and passwords. Each group was able to access tools to communicate and

access content needed to support their workplace projects. The features and tools of the world were adjusted and refined to improve performance as a result of the feedback from participants about the affordances of various components of the world to support dialogue and the administrative processes required in an Action Learning Program.

Chapter six contains the detailed research data and chapter seven elaborates the design principles and research outcomes.

Chapter 4 - Preliminary design

4.1 Informing the design process

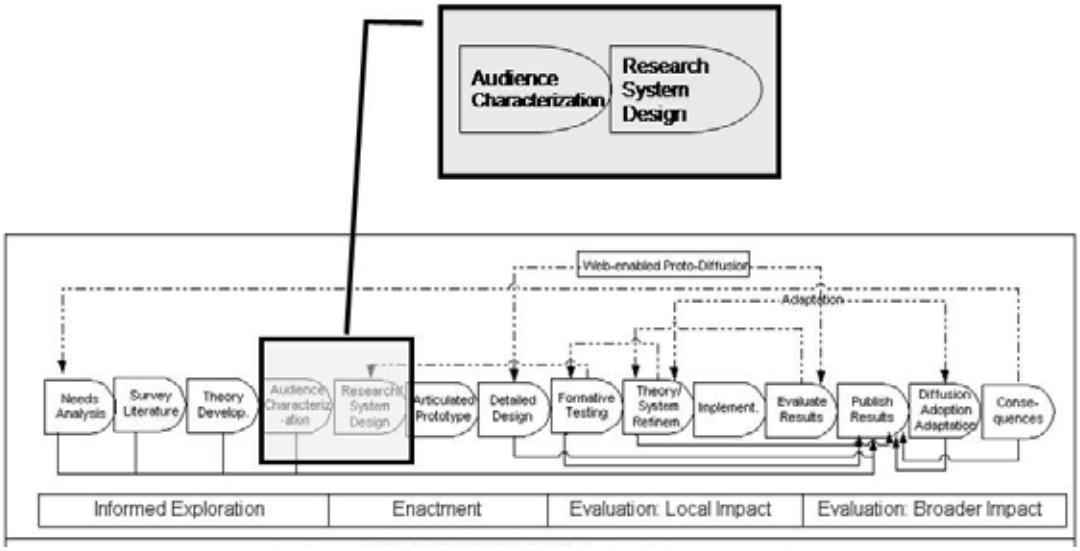


Figure 4:1: Integrative Learning Design Framework elements addressed in Chapter 4. Bannan-Ritland, B. (2003). "The role of design in research: The Integrative Learning Design Framework." Educational Researcher 32(1). p.22.

Preparation of the preliminary design included audience characterisation and the research design process as described in the Informed Exploration and Enactment phases of the Integrative Learning Design Framework (ILDF) (Bannan-Ritland, 2003) highlighted in Figure 4:1 above. The process of design of an environment in a 3D virtual world capable of supporting Action Learning began with exploration of how Action Learning occurred in circumstances not mediated by computers, where facilitators and Action Learners were meeting face-to-face. This was followed by an exploration of Action Learning in computer-mediated modes using web-based tools for communication. The researcher also investigated game based virtual worlds as an introduction to 3D learning spaces that are aimed at leisure not work but are filled with learning experiences that parallel the new user experience in the environment used for the study. A small trial of Action Learning in a blended environment that included face-to-face, web-based communication and a virtual world was then conducted. The processes and reactions were analysed to identify promising ideas. The aim was to build a rich picture of Action Learning processes through an analysis of the requirements for Action Learning as identified by experienced Action Learning Facilitators and participants in a range of contexts.

4.2 Drawing on personal experience

As outlined at the end of chapter one, exploration was grounded in the researcher's twenty years of professional development experience of which five years were personal experience as a facilitator using Action Learning in a range of teacher professional development programs. This experienced was comprised of facilitating Action Learning programs for several Australian organizations including the state education departments of Queensland and the Northern Territory, the Queensland Catholic Education System and a range of independent schools and teacher

professional associations. It also included facilitating Action Learning Leadership Programs for the professional development of staff and executive staff members of the Joint Council for Teacher Professional Associations (Lindy McKeown & Williams, 2004b). This leadership program was conducted using Action Learning as the underlying pedagogy of the program as well as the content of the program. Each participant was required to conduct an Action Learning Program as their project and report on their program at a state professional development conference. This personal experience by the researcher as well as the recounts from participants in the Action Learning Leaders programs provided a solid foundation for the understanding by the researcher of the requirements for Action Learning in face-to-face, non-mediated contexts.

This was complemented by the literature review (See chapter two) that analysed the intent, designs and processes within Action Learning conducted by the originator of Action Learning, Reg Revans and his implementation experiences. This literature review also explored the implementation of Action Learning by a range of people who have used this strategy in various settings such as business leadership, social development and environmental action. From this the researcher distilled the relationship between the essential elements of Action Learning and identified the underlying processes and program administration requirements. The literature review explored distance education with a focus on Transactional Distance Theory, the affordances of online learning technologies including virtual worlds and Action Learning as represented below in Figure 4:2 of the epistemological background.

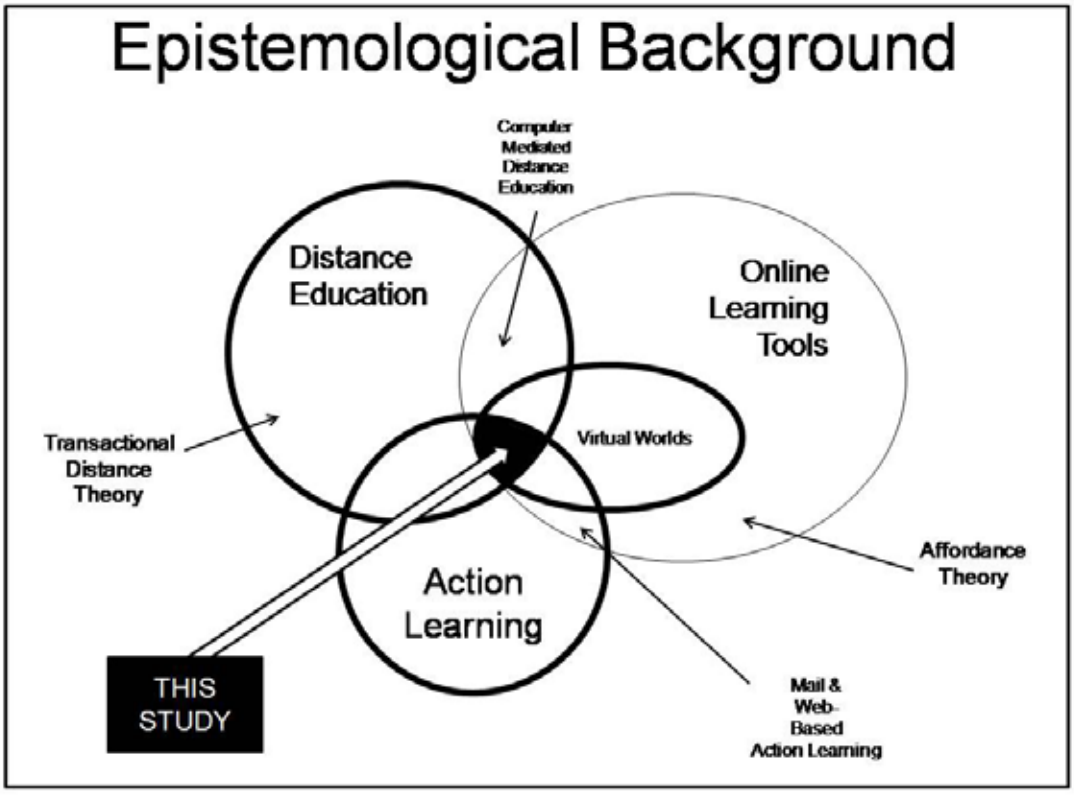


Figure 4:2: The epistemological background of the study.

Personal experience of the researcher in designing online Action Learning programs for the Department of Education in Queensland, Australia also informed the design process. These experiences highlighted firsthand the shortcomings of the text based

environments that researchers had documented in the literature including the lack of social presence and immediacy and the challenge for the remote facilitator to connect with the learners. Mapping the Action Learning process for the development of online Action Learning programs using a learning management system (Blackboard) identified the associated administration procedures that provided a basis for planning a 3D environment.

Web pages in the Learning Management System provided a location to host material used in the Exploration Stage of the Action Learning Cycle. Web based discussion forums provided asynchronous discussions and chat tools allowed for synchronous dialogue for the Learning Set Meeting component. The inbuilt messaging system and external email system were used for administration of the program. A series of content based activities and a digital workbook provided content (Programmed Knowledge in Action Learning terms).

Training of the facilitators was an essential element to equip them with the necessary technical skills to manage the system and interact with the learners. Participants also had to be trained in the use of the system as well as the process of Action Learning. Local mentors were available in some locations to assist participants with technical support but, where they was not available, this support could be accessed online or by phone. The LMS based program experience yielded a list of requirements for processes of administration. The need for training of both facilitators and participants in the technical components of the new 3D learning environment became evident as did the need for content to be available that was relevant to the workplace projects of the participants.

4.3 Structured group interview – Potential for Action Learning in virtual worlds

Going beyond personal experience and tapping into the experience of other veteran Action Learning Facilitators was the next step in identifying the needs of stakeholders and users of the future 3D virtual world environment. This was achieved by accessing the pool of facilitators who regularly attended the Brisbane-based chapter meetings of the Action Learning Action Research Association (ALARA) professional association, many of whom are internationally renowned in the field and conduct Action Learning Programs across the world and teach about the processes of action Learning and Action Research.

A structured group interview was conducted at the monthly meeting in February 2006. A presentation including images taken of avatars in virtual worlds and a demonstration of virtual worlds using ActiveWorlds was used as a stimulus for conversation and to encourage the group to imagine what Action Learning in 3D virtual worlds might look and feel like. Thirteen members with experience in using Action learning from a diverse range of industries participated in a discussion to identify a list of the key elements and qualities. The elements identified and the numbers of people who listed them are shown in Table 4-1. This group highlighted the central role of reflection and interaction especially questioning about the workplace project.

Table 4-1: List of essential elements of Action Learning from ALARA meeting.

Key element of Action Learning	Number of responses
Reflection	12
People, connections and interaction	9
Open discussion	5
Questioning	5
Problem, issue, critical incident or challenge as basis for the project	5
Connectedness of the action and the learning	3
Feelings of trust	3
Fun	1
Pain	1
Truly listening	1
Time to devote to the task	1
Various perspectives	1
Structure understood by all	1
Scaffolding for intended learning	1
Dynamic	1
Take risks	1

4.4 Facilitating Action Learning face-to-face – Interviews with Action Learning Facilitators Richard and Betty

To identify more of the specific details of the needs of Action Learning Facilitators in as diverse a range of contexts as possible, a series of structured interviews were conducted with experienced facilitators from the Action Learning professional association. Each used Action Learning in a range of learning contexts which between them included corporate and industry settings, academic courses, teacher professional development, community development and volunteer organizations. The first two interviews were conducted before the first Action Learning Program was conducted in the virtual world and the third interview occurred after the first program but before the second program.

Richard has worked extensively with corporations and government departments as well as some academic programs in Australia. Betty worked around the world exclusively in face-to-face settings with postgraduates, academics, senior managers and CEOs. Both Richard and Betty used a conventional Reg Revans style Action Learning sequence adapted to meet the needs of the situation. Both saw the workplace project and the Learning Set as the two essential components. Programs commenced with the identification of a workplace problem, issue or opportunity within the organisation that formed the basis of the Action Learning Project. Richard suggested that before the program started in corporate and institutional settings, it was important to identify a sponsor for the program and the boundaries of the Action Learning participants' authority to devise solutions to ensure projects could be enacted.

Although taking different formats, each of their programs began with an orientation to the processes of Action Learning, some relationship building between participants and skill development that would improve the quality of interaction among the

participants. In some cases if Betty travelled internationally to run a program, this went on for several days in a residential setting. For Richard, who worked locally, this was more likely to be a single event of less than a day. Both saw it as important to put the group at ease and have them build relationships within the limits allowed by the setting and culture of the group. Activities were used to encourage the sharing of personal information and to develop skills in reflection and listening. Betty emphasized building a clear vision at this point in the program. Richard sessions involved the use of a whiteboard, preferably an electronic whiteboard to allow easy distribution of copies, flipcharts or large sheets of paper. Richard organised the group members to bring relevant resources created at previous session to the following meetings.

4.4.1 Projects

Both facilitators saw the workplace project as the heart of the Action Learning program. This could be a single group project within an organisation that all participants were working on or individual projects with participants from a single or multiple organisations. Projects may also form a core activity of programs where Action Learning was the declared or undeclared methodology within an academic program. Betty described as ideal instances when a Learning Set worked on a single project.

Projects were identified as having both learning outcomes and project outcomes. Participants' projects provided opportunities for skill development in whatever field the host organisation was targeting such as leadership, facilitation or team work. They also aimed at solving a problem or capitalising on an opportunity for the organization. Both facilitators emphasised the need for a clear purpose for the project. They cultivated a heightened awareness of the absent stakeholders and stressed the need to work for them in their absence and involve them in the project if possible.

4.4.2 Exploring programmed knowledge (content)

Neither facilitator saw providing content needed for projects as their role. They were involved in skill development and facilitation only. Both said the host organisations or the Learning Sets bought in specialists if needed for the content area of projects. This could involve presentations of various kinds by the external or internal specialists who may make use of presentation software, flipcharts or large sheets of paper. The facilitator's role was entirely related to skill development in leadership and active participation processes, such as listening skills, conflict resolution and negotiation, and developing understanding of the process of Action Learning.

4.4.3 Learning Sets

Both saw Learning Sets as the core learning group within any program based on Action Learning whether they used the term Learning Set for them or not. Sometimes they were just called groups or teams. Both facilitators started with intense relationship building. Richard aimed to develop the participants' skills quickly with the aim of making the Learning Sets self-sufficient as rapidly as possible whereas Betty maintains a more hands on approach facilitating regular meetings from start to finish.

Both facilitators spent time in their programs developing participants' skills in how to work together. Richard found at times it was necessary to teach an unrelated skill such as how to run efficient meetings to free up time for participation in the Learning Sets. Developing group norms was seen as a valued element of the process but it was necessary to introduce these over time so as not to overwhelm the participants with so many rules at the beginning that it got in the way of the interaction.

4.4.4 Learning Journals

Both facilitators encouraged the use of journals and provided similar suggestions for the structure of their content. This included identifying features of the environment and significant events; theorising about their impact; supplying evidence for their beliefs; reflecting on mistakes made and modifications to plans; identifying the learning that had taken place; and planning for future action. Not all participants chose to use journals.

4.4.5 Online experience

Although experienced with the use of email and the web, Betty had no experience in managing an online Action Learning program. Participating in online events was identified as missing a lot of non-verbal cues especially when it was limited to text only mode such as email. She stated that having voice would be better than text only but not as rich as a face-to-face experience.

Richard had run courses about Action Research and Evaluation using email but not a full Action Learning program. There was a belief by Richard that individual differences, perhaps related to personality type (e.g. Myers Briggs Type Index), may influence how close people could feel using the "impoverished medium" of email alone or for that matter any other combination of online mediation on the continuum of richness of sensory experience. The suggestion was made that it would be possible to test if experience with technology influenced the ability to build relationships as Mary personally knew of people with a similarly extensive experience who did not find a mediated environment rich enough and this was in contrast to this interviewee who did indeed regard some online colleagues as good friends although they had never met in person.

To meet the needs of a facilitator, the online environment would need to provide a digital substitute for the electronic whiteboard or paper-based recording materials as these tools were used to record working material, plans and the various diagrams that were built up during face-to-face sessions to develop skills and explain models during a program. Training in the use of the technological equivalents to these tools would also be needed to make facilitators and participants comfortable with their use.

Richard also indicated that having some kind of gestures or animations that were professional but capable of expressing attention or agreement would be helpful cues. Both facilitators suggested that designing an environment capable of displaying the cues to physical and psychological presence was technologically possible, however, knowing whether the person behind the animated avatar was really still present and tuned in was far more challenging. Even when using videoconferencing, Betty felt there was a loss of the fine nuances in communication so that you could not see what was really going on in many online environments. This position was supported in

much of the literature about online learning (T. Anderson, 2011; T. Anderson, Rourke, Garrison, & Archer, 2001; D Randy Garrison & Terry Anderson, 2003; Russell, 2004; Siemens & Tittenberger, 2009) .

The need to be able to manage the flow of discussion to ensure all participants had an equitable share of air time in the Learning Set was another factor raised especially in relation to identifying when the quieter introverted types were ready to participate. Being able to see the non-verbal cues of readiness would be helpful. There was an expectation by both experienced facilitators that the lack of fidelity of the virtual environment for displaying non-verbal cues would be a significant downside as it would impede the facilitator's ability to know when to intervene at appropriate times.

4.5 Facilitating Action Learning face-to-face – Interview with Action Learning Facilitator Mary

After Program 1 was conducted, while the researcher was travelling interstate, an opportunity arose to interview another member of the Action Learning professional association. This facilitator's work in research, evaluation and learning in the areas of social and environmental sustainability led to implementation of a more flexible and less "orthodox" approach to Action Learning. The following comments were considered when the researcher was designing the virtual environment for Action Learning so that an environment was created that was flexible enough to cater for a diverse range of adaptations of the Action Learning model.

Mary felt there was often a loss of the learning if it was not occurring in the immediate context in which the work was happening. However, she acknowledged that, at times, there was a need to extract people from the workplace or community context to get a clear view of elements of that context. So Mary expressed support for a virtual Action Learning place that could complement embedded programs but not replace them.

With reference to the types of tools Mary would require, quality drawing tools were an additional requirement to the writing tools for the paper-based activities commonly used in face-to-face Action Learning programs. Mary also used photographs and music during events so access to these facilities would be very useful. Mary also used a lot of recorded, spoken and less often written narratives so being able to record voices and text would be imperative.

Several points of concern about virtual environments were raised in this interview. Firstly the technical understanding and access by both facilitators and participants was seen as a significant barrier that may exclude participation by some individuals and also some sectors of the community. Secondly there was a worry about the artificial nature of virtual environments compared to natural, non-mediated environments and the effect this might have on reducing the power of nature to provide an ambience that nurtures learning. This point had a profound impact on the design with every effort being made to make the 3D environment rich in natural elements and details to add realism.

Next was a concern about the dominance of orthodoxy in people's everyday lives and the potential for subliminal orthodoxy of built environments to impact acceptance, expectation and participation. This led the researcher to question whether

buildings in the virtual environment should look formal or informal, be set in natural surroundings or even if they should look realistic or fanciful, vintage, modern or futuristic. Since the virtual environment allows all of these possibilities, would a familiar setting make acceptance greater and the willing suspension of disbelief easier to achieve? Would the cartoon like avatars in most virtual worlds be so unrealistic they would not be taken seriously as a working and learning environment by some participants or facilitators? Would people who choose avatars that are not human not be taken seriously or worse be ridiculed?

But perhaps the most challenging of the risks identified by this interviewee came from the statement that *"*virtual environments are not reality*"* and that

> face-to-face interaction is essential because of it's the capacity to be honest, it's important, it's real time, it's our bodies knowing the knowledge and experiencing it in living reality with each other. That's what life is made of and virtual environments can only be and should only be supplementary to that. They're not reality.

Mary stated the belief that learning cannot occur totally online separate from the workplace. Only practice could occur online and the test of learning in virtual worlds would be how the learning "works in the living world – you know – where the work is". The interview ended with the desire for a critical review of what can be done in virtual environments but also of the limitations of the virtual environments using the example that although you can recreate sitting under a gum tree in a virtual environment, it is "not the same as sitting under a gum tree".

This left the researcher with the question, how would it be possible to create the virtual world in such a way that participants would willingly suspend disbelief and accept their co-learners as active participants in an authentic and trustworthy process and still learn despite the shortcomings of the limited non-verbal communication cues and attending in a simulated environment? Personal positive experiences by the researcher of friendships and productive working relationships developed in both online computer games and online work projects challenged Mary's proposition. Richard's earlier hypothesis that only certain personality types could achieve this level of comfort in virtual environments was relevant in considering this concern. This aspect of learning styles and personality types as they relate to online learning was not pursued in this research but would make a useful study.

4.6 Participant researcher - Drawing on lived experience

With experience in face-to-face Action Learning, the participant/ researcher also reflected on personal experience in non-mediated Action Learning Programs conducted over the five years prior to building the virtual world environment. The majority of this Action Learning was for teacher professional development. Like the previous two facilitators, this researcher had used a traditional Reg Revans style of Action Learning that involved a workplace project and Learning Sets. A well defined Exploration Stage preceded planning and often involved employer mandated content such as a new curriculum or assessment policy or training in a technique such as a literacy strategy or computer program.

In these contexts, the content was at times delivered by the staff involved in facilitating the Action Learning but it often involved outside specialists using a range of teaching strategies and resources including presentations with computer slides; videos; screen based software demonstrations and training; images and other graphics; small group discussions using break out groups and reporting back; evaluation of options using a Likert scale; polarisers where participants make a choice between two options; quizzes; and role-play.

A range of tools would need to be created in the 3D virtual world to provide these capabilities if they were not built into the environment if the content of the Exploration Stage was to be delivered in a virtual world. These requirements were added to the specifications for the learning space and tool list. The content specialists would also need training in how to deliver their content in this environment. It was decided to choose a topic for the content of the programs in this study that would minimise the need for other presenters to be involved. The topic of "Teaching in Virtual Worlds" was selected for this reason and also to appeal to the particular type of participant required for the study.

As an educational technology specialist with over 20 years of experience in teacher professional development, the researcher reflected on the potential challenges to adoption of virtual worlds by the users. However, the focus of the research was not the barriers to uptake of such an environment. This research was exploring whether the pedagogical integrity of the Action Learning process could be maintained within the virtual environment. Identifying the barriers to uptake was secondary to this primary goal. To limit fear of the technology being a barrier to participation, only technically capable participants were targeted for this exploratory study. Expecting that, once virtual worlds were more commonplace like other Internet technologies, fears of the new technology would subside and be less of a barrier, the exploration of the environment's potential for Action Learning would be best served by involving reasonably technologically competent participants, especially in the first cohort, to prevent this characteristic clouding the attempts to focus on the Action Learning processes themselves. This could have the effect of influencing the data collected about the orientation experience as the perspective of a computer novice (as opposed to just a 3D environment novice) would not become evident as no computer novices would be participating. The conclusions of this study should be viewed bearing this limitation in mind.

4.7 Facilitating Action Learning online using text-based tools: Email interview with Action Learning Facilitator Jill

The next step in the exploratory stage of the design process was trying to find other facilitators who had conducted Action Learning in any online format either using synchronous tools such as chat or video conferencing or asynchronous tools such as computer based forums or email. This proved to be a difficult exercise and the resources of the ALARA and web and literature searches unearthed only one example of a practitioner using Action Learning online, one web based course that was about Action Learning and Action Research methods called AREOL (Dick, 2005). This was an email based course but was not conducted using Action Learning methods as such.

The blended online and face-to-face program was a UK based Action Learning Facilitator who was also a member of ALARA. An email interview was conducted with Jill, the facilitator of this program. Jill's email response was confined to information about how she approached the Learning Set process rather than addressing all of the guiding questions used in the previous interviews (Appendix A). It yielded information on the use of an online discussion board (forum) based model that tried to replicate the process of the Learning Set. After trying a 'free for all' forum with everyone trying to help each other simultaneously that ended in a chaotic overload of messages and replies, this more manageable structure was devised.

> ...allocate each person a day within the week. Problems were posted up the week before by everyone and we all agreed that we would spend a little amount of time each morning reading the day's problem and asking at least two questions. We also agreed to do this before 10am (so if you were away from your desk on any day, you could post your questions up the afternoon / night before). Then, the person whose day it was would allocate a significant time to answering the questions and coming up with action points. If the others had any spare time they could dip in and out and ask more questions if they felt they were necessary, but this wasn't compulsory. This resulted in everyone getting good action points to follow up and actually resulted in more interaction between participants as it was easier to follow than the previous method.

Jill found both methods place heavy demands on the facilitator who needed to be available online with significant amounts of time scheduled to monitor what was going on and if necessary to ask more questions. Capturing the responses that were in the form of suggestions not questions and moving them off to a separate folder helped remind the participants that their role in the Learning Set was to ask questions not to make suggestions. These online Learning Set meetings alternated with face-to-face meetings at which listening and questioning skills were developed.

4.7.1 Facilitating Action Learning in a blended environment including a 3D virtual world

As no one could be found who had ever used Action Learning in a 3D virtual world, an opportunity to conduct a small trial implementation to inform the design was found when the researcher was invited to mentor an assistant professor at Appalachian State University, Dr Robert L. Sanders (real name used). He was keen to use their existing virtual world environment built on the ActiveWorlds platform called The AET Zone. This virtual world was already used in other classes in educational technology that were not using an Action Learning methodology. Dr Sanders also wanted to learn about Action Learning as a strategy for teaching and learning having heard about it during discussion of the plans by this researcher at the League of Worlds virtual worlds conference in Melbourne in 2005.

By aiding this professor to modify a course in the summer program for teacher librarians, some early exploratory trials could be conducted in a virtual world to inform the design of a dedicated Action Learning environment. This would also broaden this researcher's firsthand experience with the ActiveWorlds platform and provide a more informed comparison with another virtual worlds platform. The course had never before used a virtual world nor an Action Learning methodology.

Since this course also had a face-to-face component and access to several other web based tools including forums, blogs and voice chat, this was actually a blended learning environment not wholly conducted in a virtual world.

A structured interview with Dr Sanders was used to gain insight into the role of the virtual world in the program, the issues confronted with that implementation and the affordances of the virtual world for dialogue during the Exploration Phase of Action Learning and the Learning Set Meetings. The insights from this early exploratory implementation resulted in two conference presentations and the publication of two research papers that aided the characterization of the potential audience, clarified the requirements of the administration process and informing the design of the virtual environment (Sanders, 2007; Sanders & McKeown, 2007).

4.7.1.1 The ActiveWorlds 3D environment and the roles it played in Action Learning

In the AET Zone virtual world, Dr Sanders' students used The Commons shown in Figure 4:3, an area of buildings arranged like a shopping mall that was designed as a social meeting place for students from all courses, not a dedicated class area with content like the other Appalachian University courses had used in the past. The coffee shop styled area was ideal for meeting and discussing in text. Although there was a access to a voice based discussion system, few course participants invested the money to buy a headset with microphone to access it. This was understandable because in 2006, the use of Internet voice communication was dramatically less than it is at the time of writing.

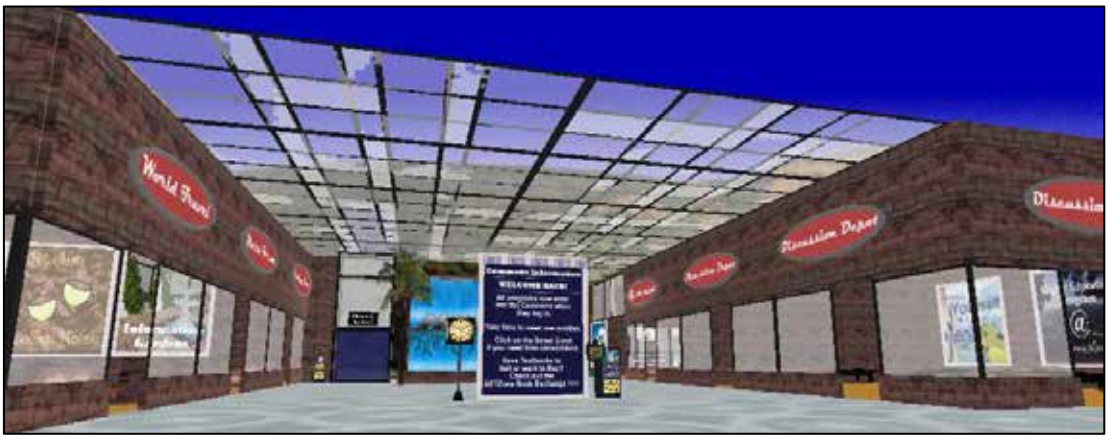


Figure 4:3: Exterior view of 'The Commons' area of The AET Zone in Active Worlds.

The three panes of the ActiveWorlds Viewer include the virtual world pane, the in-world chat log pane and a content pane. The content pane can house interactive components of web based tools and web links shown in Figure 4:4. The ActiveWorlds interface merged the social networking tools and web links with the interface to the 3D environment using this content pane. In the researcher's opinion, this interface is less immersive than having this information appear as screens or objects within the 3D environment.

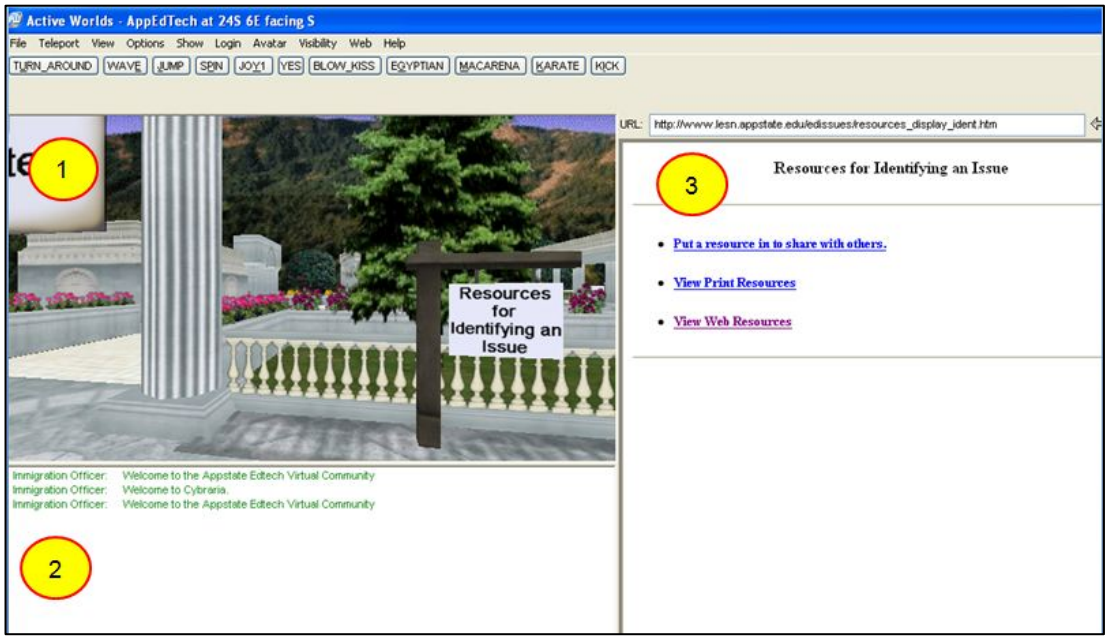


Figure 4:4: The three panes of the ActiveWorlds Viewer. 1. The Virtual World. 2. The chat log. 3. The content pane.

Students were represented by avatars but the program at the time did not allow for rapid and easy customisation of the range of pre-formatted avatars. This meant all students selected from this set of avatars which limited personalisation and expression of identity. Examples of avatars can be seen in Figure 4:5 below. Customisation of the avatar has the potential to increase the sense of personal identity projected onto the avatar by the user thus increasing engagement.

Figure 4:5: Avatars in The AET Zone in Active Worlds.

Access to other resources and tools external to the virtual world was from web links that were attached to objects in the world such as these wall posters in Figure 4:6 below. Threaded discussion boards were accessed via the posters on the walls of the 'Blog Bar and grill' but appeared in the content frame, not inside the virtual world. Blogs were the preferred tool for the reflective learning journals and these were written using the blogging tool not from within the virtual world directly. In this 3D environment, participants were required to divide their attention between the 3D

environment and the content pane of the viewer as opposed to the 3D environment containing all the communication channels within it. This could have implications for the level of immersion.

The ability for the Learning Set to easily have a private conversation in the world was identified as a criterion for platform selection to ensure for concurrent meetings of Learning Sets would be possible. This would avoid overlapping conversations that may lead to confusion by participants and would also allow confidentiality of the conversations to be maintained if required.

Figure 4:6: The Blog Bar and Grill in The AET Zone in Active Worlds.

Learning Set meetings in this program were held with avatars in the Chit Chat Lounge shown in Figure 4:7, a coffee house in The Commons area. Some accessed the Whisper feature to have private local text chat conversations. There were also face-to-face meetings during class time.

Figure 4:7: The Chit Chat Lounge coffee house in The AET Zone.

A library of content related web links were accessed in a building called the Information Gardens illustrated below in Figure 4:8.

Figure 4:8: The Information Gardens in The AET Zone.

Movement techniques used to travel around the ActiveWorlds environment included walking and teleporting – the ability to move instantaneously between locations on the map using a link attached to the teleport device, in this case a system of 'gates' illustrated in Figure 4:9 and Figure 4:10 below. Teleporting provided a rapid method of moving large distances in the virtual world and reduced the need for detailed knowledge of the map resulting in simplified navigation for participants. This feature could greatly reduce the number of students getting lost and confused in larger environments consisting of many locations which would be essential in scaling up the environment to cater for large numbers of concurrent participants. These teleports were intended for some of the other seven courses being conducted in this virtual world concurrently (Tashner et al., 2005). Larger worlds would also be required if privacy of the Learning Set Meeting was to be maintained when Action Learning programs were sharing the virtual world with other programs in an institution or if large numbers of Learning Sets were meeting simultaneously. The teleport hub was not used by the Action Learners in Dr. Sanders' program but they used a type of personal bookmark (landmark) list of teleport destinations.

Figure 4:9: The AppEdTech Course teleport gates in The AET Zone.

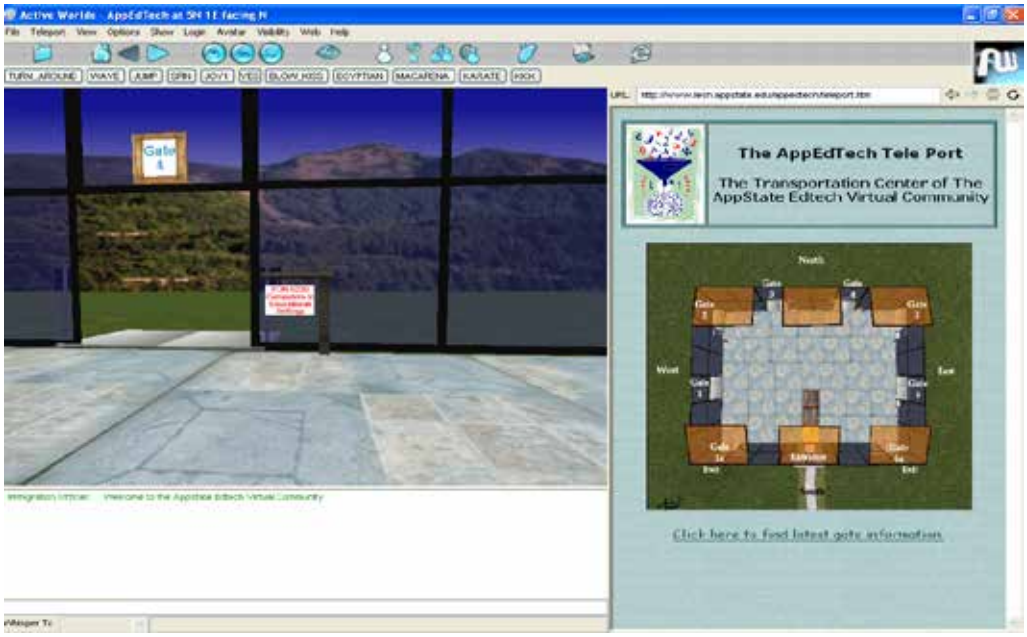


Figure 4:10: The interface to the teleport gates in The AET Zone.

This preliminary exploration provided valuable insights into the differences and possibilities of virtual worlds as opposed to using a Learning Management System for Action Learning Programs. However, these experiences had involved blended learning not totally online programs. Another valuable source of design ideas and experience were some large online computer games.

4.8 Gaming informs design

The researcher spent time investigating, through experiential learning, the features and learning strategies embedded in the massively multiplayer online role play game (MMORPG) called World of Warcraft (WOW) (Blizzard Entertainment, 2005). This game was the most popular online 3D PC-based game environment in the English speaking world at the time and has remained an unparalleled phenomenon in online gaming with more than 12 million monthly subscribers as of October 2010 (Blizzard Entertainment, 2010). WOW had been breaking sales and concurrent user records since its release in 2005. This huge success made it ideal for use as a training ground for the researcher to experience firsthand the new user experience in a highly successful 3D environment. The researcher coupled this learning experience with the literature review conducted in parallel with the gaming experiences. This resulted in the identification of attributes of games worth emulating in the 3D learning environment.

Although virtual worlds differ from computer games in some significant ways, there are many common elements. In the virtual worlds discourse, there has been debate and attempts to clarify the definition of virtual worlds were in process. Some drew a distinction between games and virtual worlds based on the gaming aspects, including the makers of Second Life as stated below:

> Linden Lab, the company that created the platform that is Second Life, is emphatic that their creation is not a game. “There is no manufactured

> conflict, no set objective," says spokesperson Catherine Smith. "It's an entirely open-ended experience."(Kalning, 2007)

Bell (2008, p. 2) assimilated various elements of the definitions from Bartle (Bartle, 2004), Koster (Koster, 2004) and Castranova (Castronova, 2001) to arrive at the definition of a virtual world as a "synchronous, persistent network of people, represented as avatars, facilitated by networked computers". Not stated as a feature in the definition, but perhaps implied by the representation by avatars, the researcher believed that the Bell definition omitted explicitly listing the essential characteristic of location - that place where the avatars exist and interact - that had been included in the earlier definitions by Koster and Castranova. This could be a text based description sometimes accompanied by images as would be found in a MOO or a MUD[2] ; 2D based images such as a web based world like Club Penguin; or a fully immersive 3D rendering of a digital environment such as WOW or Second Life. Bell included games like World of Warcraft as virtual worlds because the game play occurs in an environment with these attributes. This led to the version of the Bell definition modified by the researcher that incorporates the elements of place that earlier definitions contained being created by this researcher:

A virtual world is a persistent, self-contained, spatially-based, digital environment mediated by computers to provide a location for people represented as avatars to interact synchronously with their surroundings or each other.

Using this definition, virtual worlds could have gaming or social networking as their primary use. WOW being an example of the former and Second Life being an example of the latter.

MMORPG players usually have pre-determined goals or specific task to achieve such as quests for rewards. In a similar way in the Action Learning Programs, participants using the virtual world environment built for this study were on a self-defined quest for learning to solve their workplace problem or take advantage of some workplace opportunity. The processes and environment of the game had many requirements in common with the learning environment the researcher was designing in the virtual world. These included the need for an engaging environment; embodiment of users as customisable avatars; the need for tools to accomplish goals; a group of colleagues with whom to interact; a sharp learning curve at the time of orientation; and ongoing learning required to master the environment and the tools within it.

Since the potential participants' and facilitators' prior experience with 3D environments was expected to be extremely limited, learning to move and navigate the learning environment using avatars was expected to be a barrier, or at least a challenge, to participation unless Action Learners had some prior experience with computer games. In designing processes and artefacts to orient new users unfamiliar with the interface and the environment, the researcher investigated the techniques used in WOW to embed the learning of the user interface into the process of playing the game. This knowledge was applied in the design of the prototype built in Second Life.

[2] MOO and MUD are Multiuser Object Oriented text based or 2D Dungeons

One of the insights gained from WOW was the significance that a rich holistic view of the virtual environment can have on creating an appealing place that is memorable and navigable by users. Reporting on the popularity of the WOW, a New York Times reporter (Scheisel, 2005) Chris Metzen, Blizzard's vice president for creative development, who stressed the importance of visual detail that supports the vital element of story in the game:

> It's the difference between an immersive experience and a mechanical diversion," Mr. Metzen said. "You might spend hundreds of hours playing a game like this, and why would you keep coming back? Is it just for the next magic helmet? Is it just to kill the next dragon? It has to be the story. We want you to care about these places and things so that, in addition to the adrenaline and the rewards of addictive gameplay, you have an emotional investment in the world. And that's what makes a great game.

This game influenced the visual design of the prototype by making "*the fanatical attention to detail that over the last decade has made Blizzard a premier developer of PC games*" a similar priority for the design of the models of the scenes and artefacts on island in Second Life. Virtual places on the island of Terra incognita were given names that were signposted and used in all communication to create a sense of identity for the place. Details such as flower gardens, sculptures by digital artists, landscaping and decorative minutiae gave the island a visual richness that drew comment from participants and visitors. Each place was named after one of the volunteers who had formed a community associated with the island during the building process. A growing group of builders and scripters not only made the resources on the island or collected items for the stores, but also joined the group called Decka's Geeks Club which became known across the wider Second Life education community and went on to make many educational tools and buildings for others. Their stories were embedded in the island's cultural artefacts in the form of photo boards, place names and signs, giving that strong sense of story and community to the lifelike but otherwise lifeless 3D computer graphics. Many of this group who frequented the island became de facto technical support to Action Learners when they were visiting the island to customise their avatar, work on their building projects or collect tools or materials for their Learning Set Meetings. Comments such as the following examples were common in personal communication in the virtual world and in emails:

> ... love the ethos of your Island...
>
> ...wondered if you'd like to present something about your island (which looks fabulous)...
>
> ...Also, wanted to tell you how gorgeous Terra Incognita is! It's clearly a labor (sic) of love as well as imagination...
>
> ...by the way, your place is great!...
>
> ... I've just had a look round your sim. It's coming on really well - I'm most impressed :-)...

…you have a great island!!...

In WOW, quests are given to players and it through these quests that skills are developed during game play. There are a lot of fun, playful qualities built into the game events and the environment itself. In an attempt to capture these attributes, game-like qualities were added to the prototype with playful, interactive elements for learning the operational elements of the interface in Second Life such as the use of pose balls and menus to animate an avatar; the use of right clicking on objects to activate them through touch; the use of text chat interfaces; equipping objects form the inventory; camera controls; and the use of floating text and notecards to access instructions. An area called the Play Deck included an arm wrestling table, a mud wrestling pit, a hangman game, trampolines and a game that involved throwing daggers at balloons mounted on a spinning target on which another avatar was mounted. Canoes and tubes were available for exploration of the island from the water and to travel to the remote outer atolls where meetings could be held with avatars laying on beach towels on the sand. The following comment from a visitor is typical of many similar comments made about the final design.

> Very interactive place. Exiting games. I wish I brought a friend. I will next time.(Visitor)

In the organisation of the learning environment and the processes of the Action Learning Program, many of the qualities of good games as defined by James Paul Gee (2004) and experienced in WOW were incorporated into the learning environment and the processes. These elements are :

I. EMPOWERED LEARNERS

1. Co-design

2. Customize

3. Identity

4. Manipulation

II. PROBLEM SOLVING

5. Well-Order Problems

6. Pleasantly Frustrating

7. Cycles of Expertise

8. Information “On Demand” and “Just in Time”

9. Fish tanks (simplified small scale segments of the larger process)

10. Sandboxes

11. Skills as Strategies

III. UNDERSTANDING

12. System Thinking

13. Meaning as action image

For example, the (1) co-design of elements was enabled through the participants' projects that were built on the island and used as part of the learning environment. The option to (2) customise was offered by making asynchronous alternatives to all synchronous activities except the Learning Set Meeting but Sets chose their own times and meeting places. Extensive options for avatar customisation were available. The village stores contained tutorials and content to personalise avatars allowing the (3) identity development. (8) Just in time and on demand help was available in the form of notecards located throughout the island and available by touching the nearby notecard giver object. These were stored in avatar's inventory for re-use at any time of need. (10) Sandbox qualities were available on the island as each participant had building rights and could also bring colleagues to the island so they could try technical building skills and social skills in the safety of the island's boundaries. As an example of (11) skills being developed as strategies, when avatars needed to navigate their way around the islands pathway system to get to various locations such as a venue for a meeting or a free clothing store to customise an avatar, they were practising their movement skills in a purposeful manner. Gee's list provided guidance to the design of all elements of the prototype. These are further explained throughout the narrative in Chapter 5.

4.9 Selection of the virtual world software - Which world and why?

The features of a range of virtual worlds were compared for selection of the development environment. Consideration was given to the available budget, the cost of contractors with 3D graphic skills and the timeline of the project. A technological issue was access to the chosen 3D environment, so a platform that would be accessible from Microsoft Windows, Apple Macintosh and Linux operating systems would be required to ensure anyone with broadband access to the Internet and a capable computer could access the virtual environment.

In 2006, a limited range of 3D virtual worlds was available. The two most popular environments used in education were ActiveWorlds and Second Life. Table 4-2 contains a summary of the salient features of these two virtual worlds that were considered.

Table 4-2: Comparison of Virtual World Platforms (2006).

Virtual World Attributes	ActiveWorlds V4.1	Second Life
Operating System	Windows only	Windows, Mac and Linux
Cost per month to use In US$	$0 to once off fee of $39.95 for portable avatar across worlds	$0 to $6 (Premium allows land ownership)
Hosting	Commercial or self	Commercial
Initial set up of private land – Educational pricing	$900	$1500
Ongoing monthly costs to host land- Educational pricing	$70	$150
Custom avatars or fixed	Fixed	Fully editable
Build content	Yes	Yes
Script content	Limited	Extensive using Linden Scripting Language
Economy	No	Yes

Virtual World Attributes	ActiveWorlds V4.1	Second Life
Voice communication	External $50 fee	External* Later free & in-built
Text communication	Yes	Yes
Platforms	PC	PC, Mac, Linux (with some limitations)

* At the time of evaluation in 2006. Second Life introduced built in voice beta trial in 2007 during the second cycle of the Action Learning programs in this study.

At the time of selection of the virtual worlds, few had voice built in and most used text chat as the main communication channel. The commonly expressed limitations of text chat were challenged by Polin (Polin, 2000)and yet text chat has been successfully used in many contexts since the invention of the internet.

> Chat environments are generally neglected as learning tools. This seems to be the result of two independent misperceptions. First, chat is a resource-poor environment for conversation, especially for "intellectual" conversation. After all, it cannot support critical prosodic elements: intonation, volume, stress, variations in vowel length, phrasing, and other acoustic features that support meaning. It deprives participants of access to each other's facial expressions, gestures, and body language, all of which are considered critical devices for assisting in meaning-making in conversation. Thus it only offers written talk, constrained further by the general etiquette of turn-taking which requires short bursts of text no longer than one or two lines at a time. Truly it is a thin version of conversation that it offers.

Since these limitations would be experienced by all the worlds as all were text based, they were noted for consideration during use.

4.9.1 Second Life® selected.

Linden Lab's virtual world called Second Life was selected as the most suitable and cost effective cross-platform environment for the research project. Second Life provided a low cost solution to both creating and hosting a 3D environment that would be accessible to the research participants from anywhere in the world at no cost.

Although many games engines allow for the creation of customised environments, Second Life allowed rapid and affordable development and customisation of the environment to an almost infinite degree. Creation of buildings, landscaping, props, teaching tools and lifelike and suitably attired avatars were all possible with the built-in building tools of Second Life. These tools made building and customising accessible to the researcher for the initial build and for rapid modifications throughout the project instead of employing high cost 3D developers.

Three distinct segments of an economy exist in Second Life, which uses the Linden dollar as currency. This currency exchanges for money outside of Second Life on a floating exchange with US dollars. Over the 2006 to 2010 period its value has remained fairly stable at between 230 to 270 Linden dollars to the US dollar. The first level of the community is "players", people who are playing in Second Life like any other game. Often they make items and give them away or sell them at very low,

almost negligible cost in the range of less than one dollar. The second group are more entrepreneurial amateur scripters and builders. They charge more for items but also may run their Second Life business as a hobby but for profit not entertainment alone. The charges might be between a few cents and a few dollars. The third group are professional project managers, scripters and graphic artists who earn a living making computer mediated content and charge market rates normally seen outside of the virtual world. This may range from around forty dollars to two hundred dollars or more per hour.

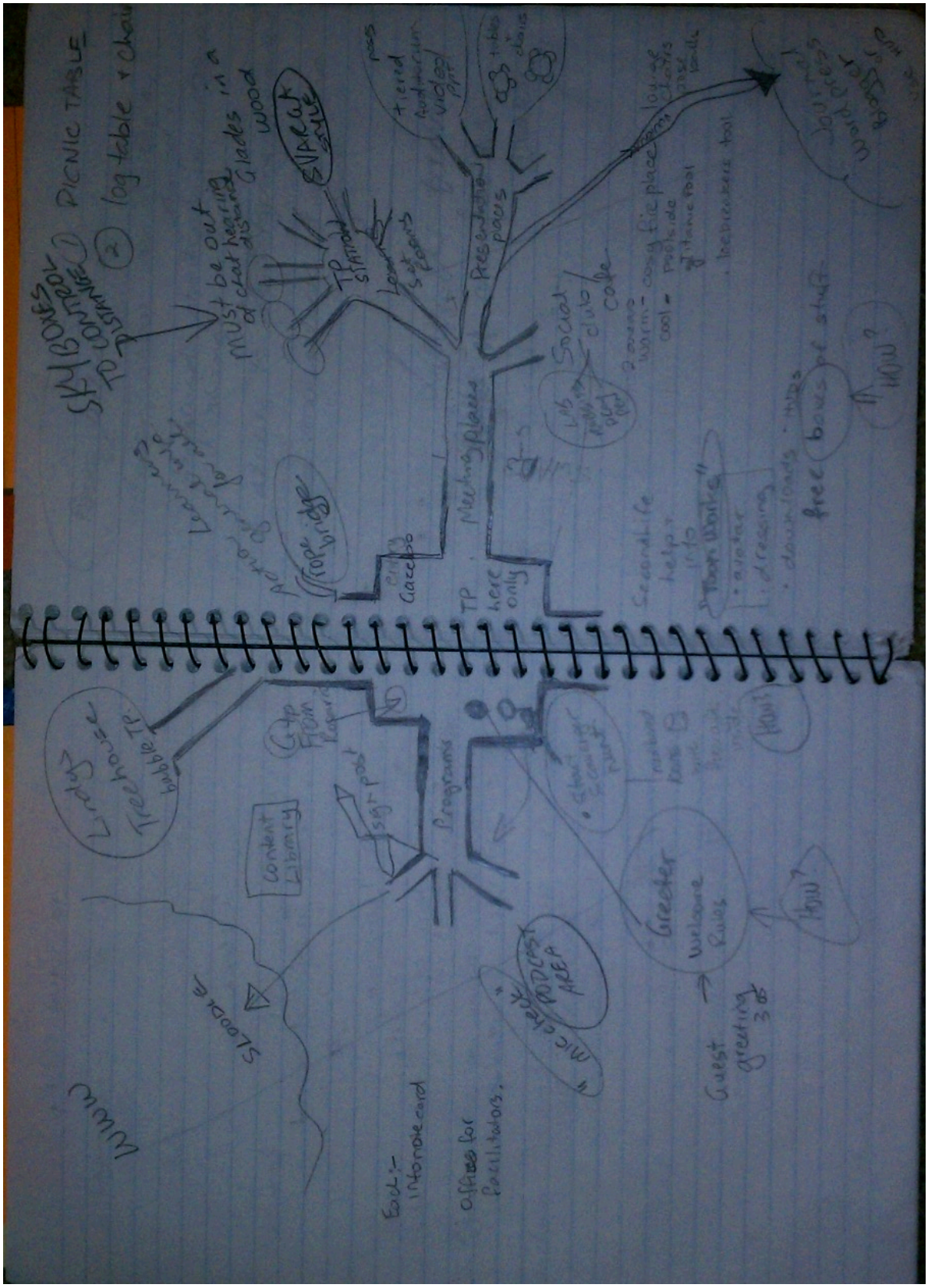
In addition to building, a vast array of user-generated, readymade content was available for sale and for free in the virtual world. By using a publicly accessible, commercial virtual world, the extensive user base of Second Life and the 3D artefacts they have created provided a vast pool of readymade objects and tools suitable for use in creating the environment for the Action Learners as well as providing teaching and management tools as outlined in the requirements identified in Chapter 4. This was seen as an advantage of using Second Life, saving time and money. Since Second Life had a built in scripting language called the Linden Scripting Language, customised and scripted objects could be programmed on demand by accessing a pool of contractors at affordable rates to meet the special purpose needs of the project especially in making recording devices for the research data collection. This combination of features kept development and hosting costs for the project within the budget provided by the Queensland Government Smart State PhD Grant and the University of Southern Queensland PhD Support Grant.

Once the platform Second Life was chosen, appropriate virtual land was acquired and then buildings and artefacts were purchased or created to form the virtual locations and tools to be used in the Action Learning Program.

4.10 The Action Learning Programs in Second Life

As a result of the Informed Exploration Phase, the plan of the environment was ready for creation in Second Life. When completed, these design decisions were implemented after the initial plan for the overall location was mapped out on paper, shown in Figure 4:11. These plans were based on the requirements distilled during the Informed Exploration Phase. This was followed by detailed plans for each element to meet the specific requirements of Action Learning in the virtual world, details of which can be found in Chapter 5.

Figure 4:11: Research journal (Designer Log in ILDF terms) entry August 2006. Putting the plans on paper prior to building in the virtual world of Second Life.



At this point the plans for the first prototype were ready for building in 3D. The island in Second Life was ordered and construction commenced in earnest. At all times the researcher continued reading, attending training and seminars about virtual worlds and 3D building, Action Learning professional association meetings and conferences. This constant input aided refinement of the designs and processes.

In 2007 two iterations of an Action Learning program were run in the virtual world of Second Life. Each Action Learning program had as its theme and content the use of virtual worlds in educational settings. So it was an Action Learning Program *about* using virtual worlds for educational purposes conducted *in* a virtual world. Participants were required to devise a workplace project that involved the use of a virtual world in their organisation in some way. Each program ran for approximately three months. Detailed data about the two programs can be found in chapter six on participants. Chapter five describes the building process, the hosting of two iterations of an Action Learning Program and ideas for future tools that could be of use to other Action Learning Facilitators.

Chapter 5 - Enactment: Building the environment for Action Learning and implementing Action Learning Programs in 3D

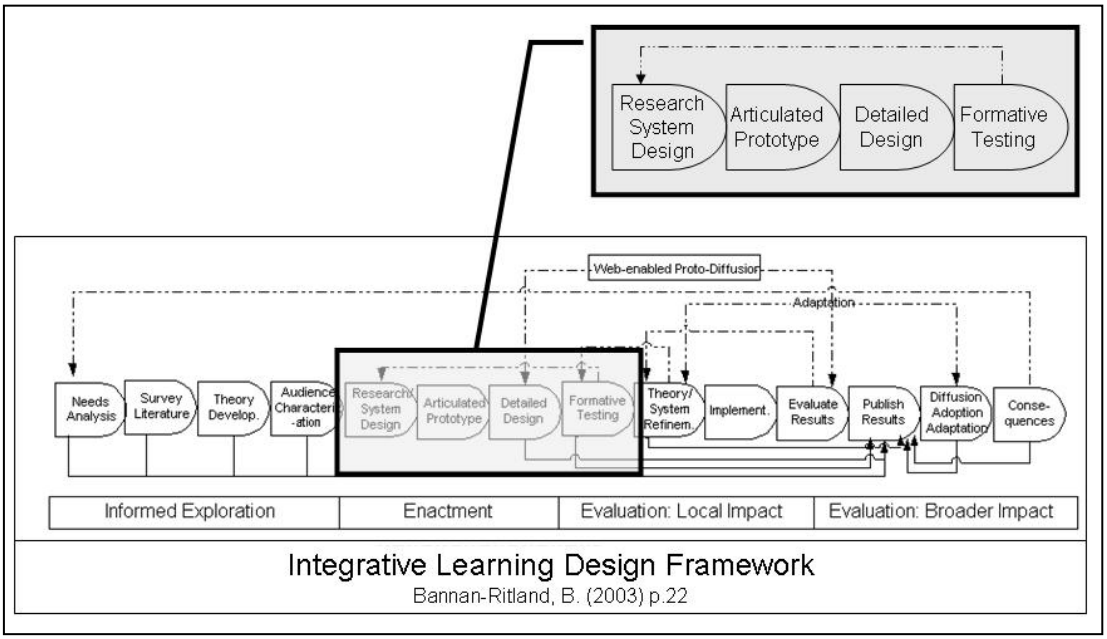


Figure 5:1 Integrated Learning Design Framework (Bannan-Ritland, 2003).

> Design studies involve a pronounced emphasis on the narrative report of the complex interactions and feedback cycles (Bannan-Ritland, 2003)

Using a narrative format as suggested by Bannan-Ritland in the above quote, this chapter describes and illustrates the iterative cycles of the development and refinement of the 3D Action Learning Environment as it was initially constructed, used and modified during two iterations. The Enactment Phase and formative testing steps are illustrated in the ILDF process diagram in Figure 5:1. The collection of resources and tools that became the "Tool Box" for facilitators including tools for administration and content delivery within the Action Learning programs is detailed and illustrated. The built environment and the roles these virtual structures played in the Action Learning process are also described. This demonstrates how the design principles derived from collaboration with practitioners and informed by the literature review were applied to develop and test a prototype in this context. Although not all of these tools that were discovered or created were put to use in these two iterations of the Action Learning Programs as they were implemented, the investigation, collection and evaluation of these tools identified possibilities for future programs and demonstrated the affordances and constraints of this environment for online Action Learning in various context using the virtual world of Second Life for teacher professional development.

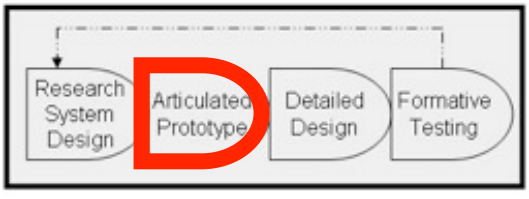


Figure 5:2 ILDF Enactment Phase - Articulated Prototype (Bannan-Ritland, 2003)

5.1 Articulating the prototype

When trying to determine what would be most useful in the design of the specific elements of the locations, buildings, objects and furniture in a virtual world environment where almost anything is possible, the choice of what to make was challenging. The interviews with experienced Action Learning facilitators in the Informed Exploration phase provided data that steered the design process to create the "Articulated Prototype" (Bannan-Ritland, 2003, p. 22) explained in Chapter 3.9. Figure 5:2 illustrates the cyclic nature of this step in the ILDF in which testing leads to changes in the design as a process of constant refinement based on feedback about the design in action.

In designing the prototype, the affordances of both the selected 3D virtual world platform of Second Life and the artefacts that can be created within it needed to be identified and exploited. As a starting point, the researcher identified the capacity for affordances such as access, presence, expression, creation, interaction or aggregation (Siemens & Tittenberger, 2009) found in other emerging technologies. These affordances were constantly being employed to reduce transactional distance (M. G. Moore, 1992) during Action Learning in the 3D virtual world by providing appropriate opportunities for quality dialogue (M. G. Moore, 1991).

After interviews with the group of experienced Action Learning Facilitators, there were clear indications that a range of locations would be required to meet the facilitators' needs. Locations and artefacts would have to be built to meet the needs of all four stages of the Action Learning Cycle (Explore – Plan – Act – Reflect) as well as to support program administration; research data collection; orientation to the virtual world interface ; and skill development in operating the avatar in the virtual world.

For any technologically mediated system, facilitators and potential participants indicated the need for an orientation process and access to help and support for the user to learn to use the new tool initially as well as intermittently during the use the technology if difficulties were encountered. Use of the environment and personal experience of the researcher as a new user informed the process of identification of orientation, help and support needs for the cohorts of Action Learners. The look and feel of the interface had the potential to be a barrier to feelings of social and physical presence.

This requirement to consider orientation to the 3D virtual world itself would differ from virtual world to virtual world but would remain an essential part of programs for new users until use of virtual worlds became ubiquitous. When the skills to use virtual worlds such as navigating an avatar in 3D become common in the way email and the web have become commonplace over time, this will be less necessary. As a technology becomes more commonplace and more familiar to a larger percentage of the target population, there becomes less need for extensive orientation as basic skills can be assumed.

Although Second Life has an orientation process built into the new user experience, many new users chose to skip it. It was important to ensure participants in the Action Learning Programs were familiar with all the elements of the interface required to operate and use the items and locations specific to the designed Action Learning

location. Reinforcing those concepts was considered useful to ensure that lack of familiarity with the technology was not a barrier to participation. A bespoke orientation experience can target training at both the generic skills to use the virtual world as well as the specific customised tools created for the Action Learning process.

The four stages of the Action Learning Cycle were considered individually to determine their needs. Program administration was also considered as a separate component of the Action Learning Process in the design. These stages will act as organisers for the content of this chapter.

5.1.1 Exploration Stage resources

In the Exploration Stage of the Action Learning Cycle, if an activity was mandated for all participants, then a large group meeting space may be required where a facilitator or guest speaker might conduct a lesson, activity, presentation or discussion with the whole group. Smaller teaching spaces might be needed for elective sessions in the Exploration Stage. These areas may need to have the capacity for voice, video, slide presentation, note making and text chat. Multiple teaching spaces might be needed to cope with simultaneous events for elective activities or learning activities initiated by a Learning Set..

All facilitators indicated the need for places for small groups of people who formed Learning Sets to meet. These groups varied in size from 3 to 8 people. Facilitators would need to meet with individuals or small groups for skill development or interviews. Consideration was given to having a business office type location to hold these meetings.

Some facilitators indicated a large group meeting area would be needed for initial orientation and for some learning events especially if content was mandated within the program. Facilitators commonly provided materials such as documents for skill development activities and readings in the content area. A storage and distribution system for documents was another basic requirement for the 3D environment to manage these.

5.1.2 Planning Stage resources

During the Planning Stage of the Action Learning Cycle, participants would mostly work outside the virtual world on formulating plans. However, during this stage, participants may want to meet with the facilitator so some places for a one-to-one conversation might also be required. Voice or text chat capability would be needed for these meetings. There may also be the need to access document templates, view documents and take notes. Recording these meetings may be a useful record for review by the Action Learners.

5.1.3 Action Stage resources

The Action Stage of an Action Learning Program would normally take place in the participant's workplace. However, since the topic for the content of this particular Action Learning Program was going to be Learning and Teaching in Virtual Worlds,

the participants might actually require some building space or event space in the virtual world for their workplace project if it involved constructions and events. The exact requirements were not clear until after the program had commenced. At the beginning of construction, it was just worth noting that space needed to be allowed for this. Since it was possible to build sky boxes - platforms that appear to defy gravity and remain hovering in space at any altitude - there was an opportunity to use the vertical space to provide participants with sandboxes for temporary building as well as housing their final constructions. Participants might also take advantage of the buildings created by the researcher and repurpose them for their own needs.

5.1.4 Reflection Stage resources

In the Reflection Stage of the Action Learning Cycle, the world needed meeting places for small groups for the Learning Set Meetings. As several of these were conducted simultaneously, several locations were required. These needed seating for up to eight participants and a facilitator. Participants at times needed presentation, note taking or recording tools. As privacy needed to be maintained during these meetings, the constraints of the platform in terms of hearing range were an influence on layout on the map.

5.1.5 Administration process resources

The processes associated with advertising a program, collecting registrations, arranging dates and times of events, providing program resources, exchanging documents and collecting data for the program and the research were also considered in the design process. Those activities that preceded the use of the virtual world such as advertising and registration were conducted via the web and email as well as within the virtual world to tap into a broader pool of participants. Other processes were planned into the 3D environment as detailed later in this chapter.

5.1.6 Research data collection tools

The research process added the need for some data collection tools in the virtual world. These included chat recording for later analysis. Some data was also collected from email and a web based questionnaire.

5.1.7 Construction style and design questions

Although it was clear from the interviews with several Action Learning Facilitators that locations for large and small groups would be required and that a range of specific tools for note taking and journal writing were required, there were still a lot of questions about designing the locations to create a space suitable for an Action Learning Program.

From reading, discussion and reflection about the concepts of cultural signifiers and conventions (Norman, 1999) the researcher formulated the following questions that guided the design of the 3D models within the virtual world to include a range of locations that included replicas of both manmade structures such as offices and natural settings such as forests and beaches.

- Should the built environment be so realistic that it is easily recognizable because it is similar to what the users would experience in their physical lives or would fantasy locations like space craft and surreal environments be novel and interesting?
- Are buildings necessary at all in a place where there is no weather to contend with and where walls provide no sound proofing and little privacy?
- If buildings are created, should they have walls and roofs that may interfere with avatar movement and hinder the viewpoint of the avatar's camera position?
- How much reality is needed to achieve immersion or what, in literary terms, is called the willing suspension of disbelief?
- Will familiarity of the built environment through the use of lifelike appearance aid the new users in their process of accepting the environment as a working space and make them feel more comfortable?
- Does the style need to be business like replicas of manmade buildings such as offices or can natural settings such as forest glades and beaches with informal furniture such as logs or rocks for seats be used that would not perhaps be the typical location used for meetings in the physical world?

The design priority in virtual worlds where everything is a pixel-based illusion, a blending of meshes, models and textures, is to create idealised spaces as credible imitations or photo-realistically rendered mirrors of physical world locations with the intent to lure the user into believing they are there in that virtual place (spatial presence) not merely sitting in front of their computer and viewing it from the outside and that the other people they are interacting with are there with them (social presence). The goal of the design of the physical location is to achieve a level of spatial presence that gets the user to disregard their actual location and interact as though their body is actually located in the virtual location (Albion, 2008). If this can be achieved, then the environment is ready to support the level of social presence required during encounters between avatars so that users feel others are there with them and interact accordingly.

"The perceivable part of an affordance is a signifier, and if deliberately placed by a designer, it is a social signifier." Norman (2007, p. Unpaged) explains that "in design, we care more about what the user perceives than what is actually true." The researcher was constantly trying to build objects and add features to them that would readily signify their purpose.

By considering the affordances designed into the virtual objects and how the collection of these interrelate to create a holistic environment, items were selected to include in the 3D virtual environment for Action Learners to use. However, the challenge was to adequately convey the full capability of an unfamiliar virtual environment to novice users. By building familiar objects and contexts in the 3D space, participants were given some clues about how objects might behave. In the same way as the desktop interface on a personal computer uses metaphor to give users a way to start working with it, the 3D objects could indicate their affordances by replicating familiar physical objects signifying their purpose. A group of logs around a burning fire might then be perceived to be casual seating since it replicated the physical world. This was a reason to avoid ideas that were too futuristic or fantasy oriented as they would be less recognizable to the participants.

On his website Norman (2007) explained why signifiers are also as important, if not more important than the inherent affordances of products or services in aiding user understanding and coping. “People need some way of understanding the product or service, some sign of what it is and what it is for, what’s happening and what the alternative actions are.”

A collection of requirements was gained from the analysis of the descriptions of how Action Learning works for a range of experienced facilitators of Action Learning programs in a range of contexts from corporate board rooms to formal academic programs to teacher professional development in schools. A range of different buildings, navigation support systems, scripted objects and tools would have to be built, collected, commissioned or purchased to create locations to meet the anticipated needs of Action Learners in the 3D virtual world. These included areas for small and large groups.

As virtual world technologies were rapidly changing due to their increasing popularity at the time of the study in 2006, the affordance of a feature in one virtual world platform was sometimes replicated by other platforms making the affordance of features in the chosen environment potentially available in any virtual world with similar characteristics. After the study, changes, developments and updates would influence this for any platform meaning that other platforms could then have the same attributes that at the time of this research, made Second Life the preferred choice.

By the end of this process of distilling requirements and comparing platforms, a conceptual drawing of the requirements formed the plan for the detailed building process as shown in Figure 5:3.

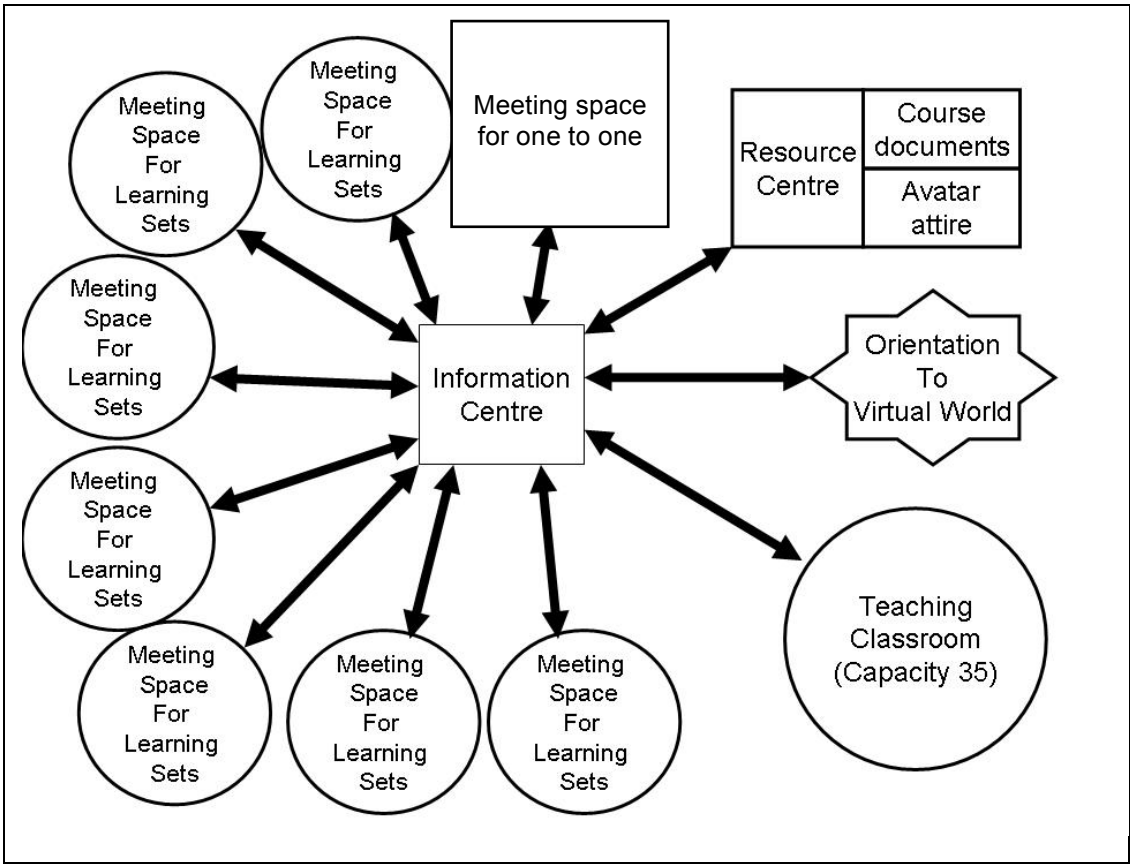


Figure 5:3: Articulated Prototype of required locations in the virtual world to meet the needs of the program.

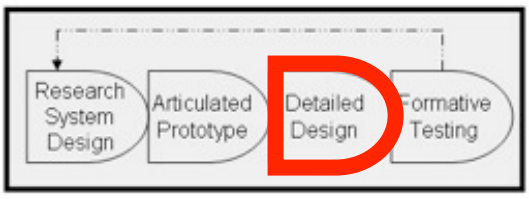


Figure 5:4: ILDF Enactment Phase - Detailed Design.

5.2 Detailed Design

Once this prototype was adequately described to the point where construction could begin and selection of Second Life as the appropriate virtual world platform was made, the next step in the ILDF process, as illustrated in Figure 5:4 above, was creating the detailed design. Several platforms had been compared for their features including cost so as to stay within the project budget and still fulfil the specification. Selection of the virtual world software was detailed in chapter four.

5.2.1 Bespoke and native features

It is worth revisiting here the difference between bespoke objects and native objects and features of virtual worlds before describing in detail the prototype environment that was created and then used and the affordances of that environment. There are objects and tools that are elements found in most virtual worlds. There are those features that are specific to Second Life and there are some bespoke items that are

constructed using the capabilities of Second Life as illustrated in Figure 5:5. For example, all virtual worlds feature text chat as a communication channel. Second Life has the Linden Scripting Language as a feature only available in that particular virtual world at the time of the research. The Decka's Decks building that is scripted to fly apart into breakout rooms is a custom built feature created using the Linden Scripting Language. Features from all three levels of this pyramid were used individually and in combinations to create an environment for Action Learning and to conduct the Action Learning Program. Wherever possible, affordances are attributed to the capability or feature most significant in creating that affordance.

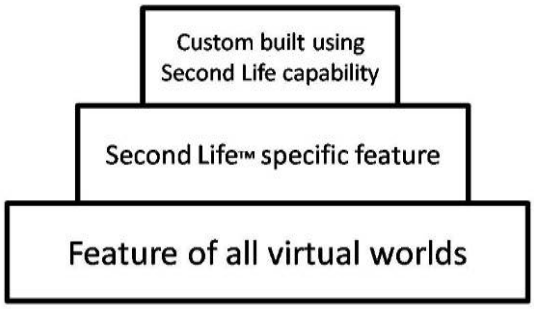


Figure 5:5: Three types of object or feature in Second Life virtual world.

When looking to adapt the processes, products and findings of this study to another virtual world in which to conduct Action Learning, some affordances may not be replicated if the features were not available in that platform. However, other features may allow the same facility to be created but in a different way.

5.2.2 Virtual land, terrain and the overall layout: tapping the affordances of access and space.

The spatial aspect of the virtual world, the 'land' that is graphically represented in 3D in Second Life-, is subdivided in a hierarchy of features and permissions described using the terms parcel, region, estate, private region and mainland. This is explained in an excerpt from the Second Life Wiki and illustrated in Figure 5:6 below.

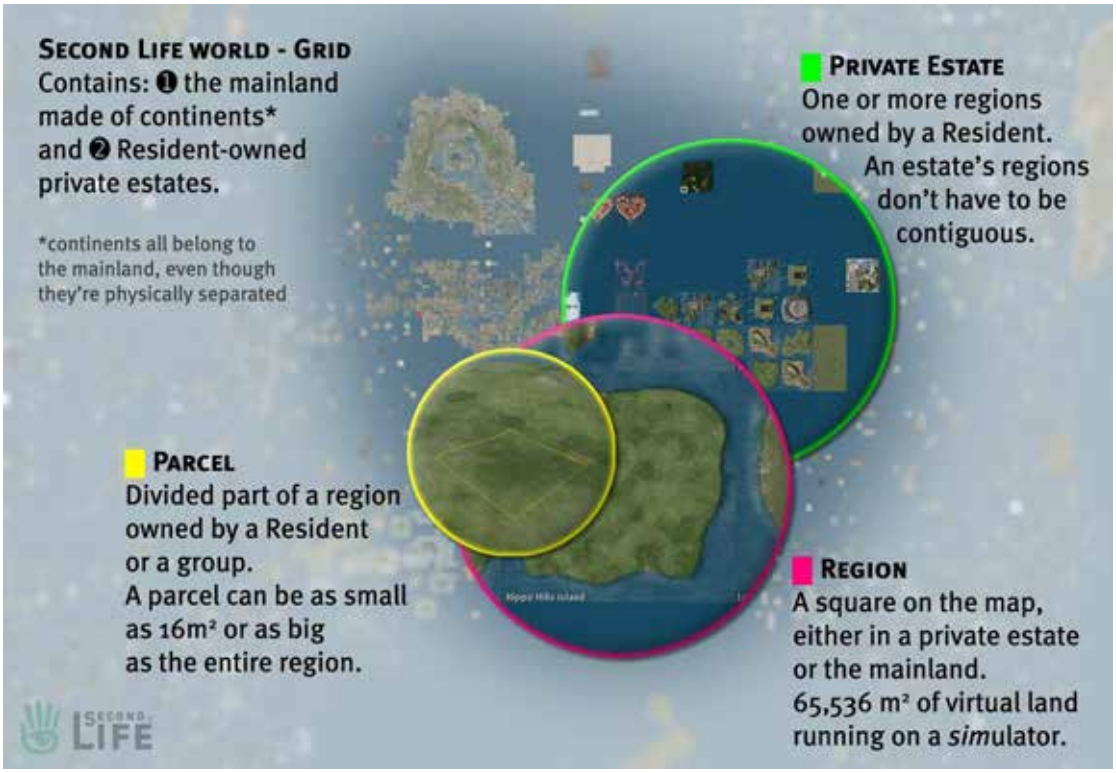


Figure 5:6: Second Life® land hierarchy(Linden Lab, 2011b). Copyright © 2007-2009 Linden Research, Inc. CC Creative Commons Attribution-Share Alike 3.0 License.

> Parcel: An area of land owned by a single user or group, which is at least 16m² and at maximum 65,536m², all within one region. Parcels are composed of square blocks measuring 4×4 meters, but the blocks do not have to be contiguous.
>
> Region: A named 256m x 256m (65,536 m²) area hosted by a single simulator process (sim). In common usage, the term "simulator" or "sim" may also refer to a region...
>
> Estate: A collection of regions with a particular shared set of rules, such as banned users, sun position, etc. Estates have integer identifiers...
>
> Mainland: The largest masses of non-island linked simulators in the Second Life grid that refer to Linden-designed continents...
>
> Private Estate:Private estates are collections of Resident owned Regions (Linden Lab, 2011b).

Both the terminology and functionality of land differs from platform to platform. For example, in ActiveWorlds, what would be called an "estate" in Second Life would be called a "world". Attributes of the land also differ and the tools to edit and customise vary from platform to platform. Also since virtual worlds were a rapidly developing technology at the time of the study, even the attributes of a single platform such as Second Life have been changing over time. The following description refers to the attributes of Second Life as they existed in late 2006 and mid 2007. It includes,

where relevant, some of the changes to those attributes between 2007 and the time of writing.

For the purpose of the study, a single region private estate within Second Life in the form of a 3D simulated island as shown in Figure 5:7 was rented. A single island could support 50 concurrent avatars at the time so this would be adequate for the entire Action Learning group to use concurrently. The island was named Terra incognita, meaning the unmapped place, to reflect its role as a research space for investigating the uncharted waters of Action Learning in 3D environments.

Figure 5:7: Blank island in Second Life®.

Because of its relative isolation from other land as an island region, this estate allowed a level of privacy that mainland areas did not. Mainland areas are contiguous areas of virtual land where parcels owned by different "residents" are abutted to form one large continent. It is extremely difficult to make mainland places secure or totally private as avatars can detach their camera from their avatar and use this to spy on most privately owned parcels of land even if their avatars are denied access at the boundaries. Islands are large regions that may be grouped together to form larger, multi-region estates or used in stand-alone configuration. As they are surrounded by water that cannot be crossed by an avatar or their camera and are only accessible by teleporting, islands can be made totally private or public using the access controls.

The island location in relation to the remainder of the world of Second Life is illustrated in the World Map pictured in Figure 5:8.

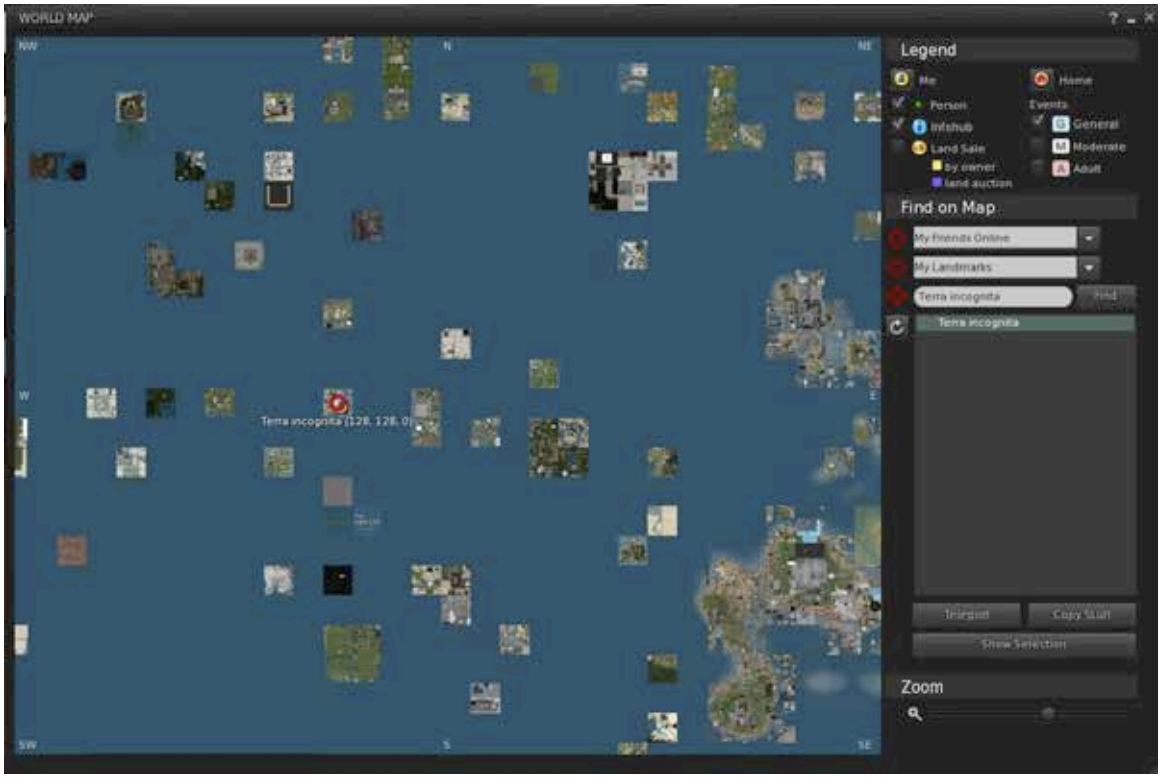


Figure 5:8: Location of Terra incognita island on the World Map of Second Life Virtual land is represented as islands or mainland on the Second Life® World Map (Grid). Island simulators are based on a virtual server and appear surrounded by water. The island named Terra Incognita was used in this research and is indicated by the red circle.

The island's topography was customised to create unique geographic features in an environment designed to meet the needs of the Action Learning Program structure, content and participants. Once a more detailed plan of the layout of the buildings that were needed was drawn up, as shown in Figure 5:9, this plan was used to design the landforms and structures.

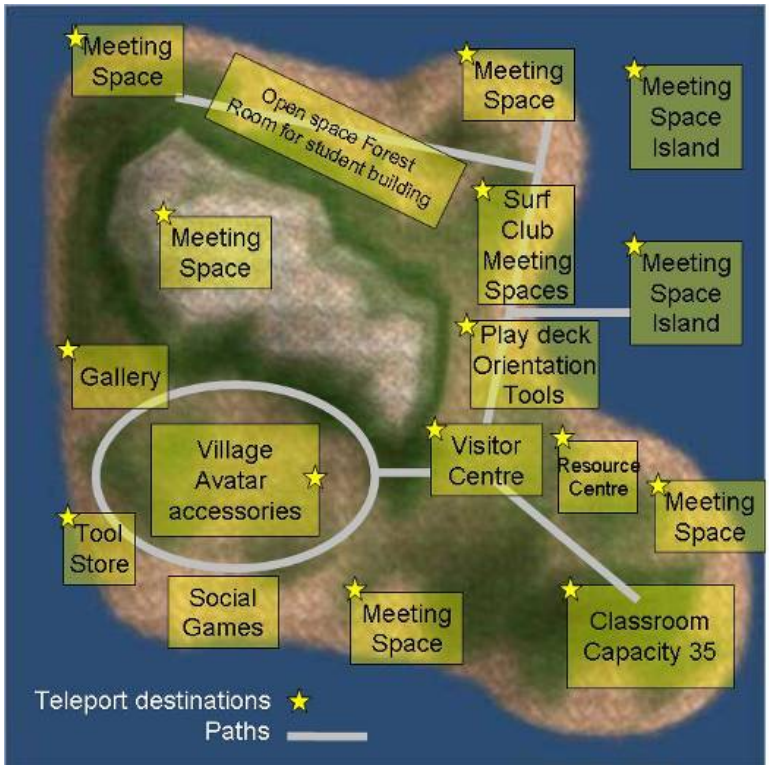


Figure 5:9: Plan for the buildings on the virtual island of Terra incognita in Second Life®.

5.2.3 Landforms

The virtual land could be easily shaped and reshaped by the land owner, a process called 'terraforming' in Second Life. Once a plan for the entire site was prepared, the land was terraformed to allow building to commence. This included low, flat areas and elevated areas. Apart from the aesthetic quality of the diversity, this separation of conversation spaces ensured locations were out of the twenty meter range of text chat to prevent conversations from overlapping. This was vital to make it easier to follow the thread of a dialogue or discussion for the inexperienced users. This had the added benefit of making it easier to record the Learning Set Meetings for both the Action Learners' later referral and for research purposes. Water features and hills were used as boundaries for separate locations and to guide navigation and movement. Over time, adjustments were made as needed to complete the locations and to modify them based on feedback.

Voice chat was added as a feature to Second Life after this study was completed. Since voice chat has a range of sixty meters, the distance between small group locations would need to be adjusted to prevent overlap of conversations in the future iterations of Action Learning Programs at this location.

Built-in tools for raising, lowering, flattening, roughening and smoothing land, as shown in Figure 5:10, can be supplemented with scripted tools to speed up these processes.

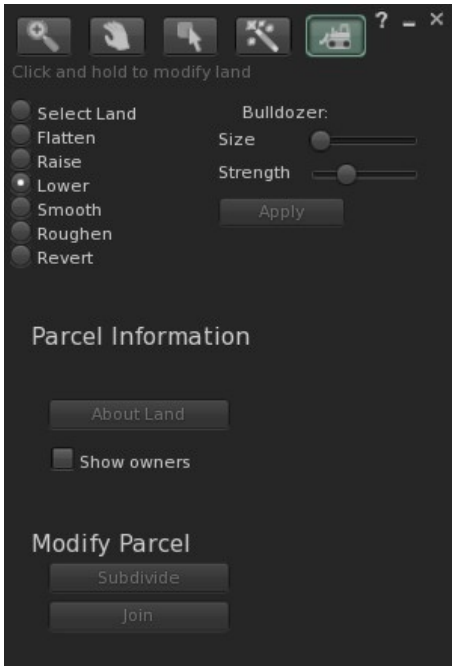


Figure 5:10: Second Life® terraforming tools dialogue box.

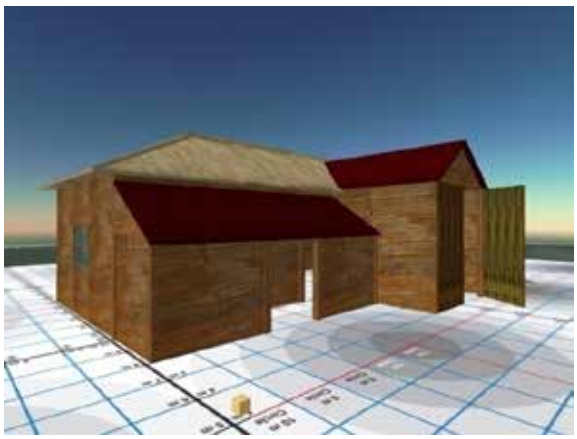


Figure 5:11: Example of a sky box, an elevated platform in the sky, used as extra building space for participants' projects. Pictured here is a barn under construction on a platform at 200m.

The addition of platforms at altitude called sky boxes, pictured in Figure 5:11, added additional locations for more buildings especially those related to the participants' workplace projects.

The completed environment included place names to assist participants in remembering the layout and locations as well as to help in describing places to meet in emails, group notices or Instant Messages (IM). The place names are labelled in Figure 5:12 on the next page.

Location	Role
1. Visitor's Centre	Information hub and navigation home
2. Resource Centre	Resource cabinets and boxes with notecards & tools
3. The Village	Free clothing for customising avatars & event space
4. The Play Deck	Orientation to the interface
5. Terra Surf Club	Learning Set Meeting location
6. Poinky Peak Meeting Gazebo	Learning Set Meeting location
7. Daydream Island	Learning Set Meeting location
8. Hide-away Island	Learning Set Meeting location
9. Gypsy Point Pier	Learning Set Meeting location
10. Tree House Board Room	Learning Set Meeting location
11. The Fireplace	Learning Set Meeting location
12. Captain Zed's Submarine	Learning Set Meeting location
13. Marbles Cove	Learning Set Meeting location
14. Tree House Offices	Learning Set Meeting location & one-to-one meetings
15. Decka's Decks	Classroom with breakout rooms
16. Edu-Gallery	Display photos of Action Learners' activities
17. Edu-Mall	Tools for educators

Figure 5:12: Aerial view and list of ground level buildings in the completed layout in Second Life®.

5.2.4 Parcels

Once the various zones and locations were created based on the plan, the land was subdivided to take advantage of the permission system for site access control and to manage access to media such as streamed audio. Subdivision allows smaller parcels of land to have different settings such as different media streams for audio and video. Ownership can be set to the individual or a group to allow others to manage land settings, status, access and privacy. This was especially important to control who had the ability to run scripts and add objects (build) in areas where participants were building items as part of their Action Learning Project.

The island was subdivided into smaller parcels with different permissions, access and services available on each parcel. Land parcels were created initially to allow different media streams especially for the facilitator's voice and guest presenters to be used during whole group events in Decka's Decks classroom (Number 15 on the map in Figure 5:12). Since voice chat was enabled in mid 2007 and the ability to play media on a texture on an object in 2010, the use of the parcels has been used extensively to control the video or web sources on a particular parcel.

Another parcel was created in the shopping area that was developed to provide clothing for avatars. This allowed a public radio station to be broadcast in the same way music is broadcast in shopping malls. This provided another element of realism to the environment. A radio placed near a park bench allowed users to change the station acting as an encouragement to interact with the environment. A fun element to practice the use of pose balls for animation was located on the bench seat near the radio. The animation on this seating emulated a person listening to music and tapping their feet to accompany the music. In the orientation area another parcel was created to allow the streaming of music at social events that were used as icebreakers at the commencement of the programs. Various interactive elements and animations were embedded in the environment to encourage practice and experimentation as well as to add nuances of realism. Another example was a fully functional chess set with table and chairs depicted in an aerial view in Figure 5:13.

Figure 5:13: Social area with chess set (Overhead view).

As an aid to program and cohort management, parcels could also be used to limit access to certain locations, to limit building permissions to certain individuals or groups as well as limit access to streamed media. So parcels are a component of the communication and access affordances of virtual world since they support audio channels and allow or prevent access to various locations by certain individuals or groups. This can be very useful for security and privacy as well as limiting or allowing building by certain individuals or groups – a necessary control for those Action Learners who had building projects as part of their workplace project.

5.3 Construction of the virtual location

Once the land was prepared, construction of buildings and the installation of artefacts both decorative and functional commenced. More questions arose about the design of these elements and how the affordances of the 3D objects would be accessible to the users especially those unfamiliar with 3D virtual worlds or computer games.

5.3.1 Look and feel – High fidelity photorealism, cartoons, reality or fantasy?

Similar to designing a website, choices that had to be made at the beginning of the 3D building process related to the style to be used for the look and feel of the design. The range was vast in that it could be anywhere on a continuum from realistic to imaginative and fantastic. There is also a continuum from high fidelity photo realism to cartoon-like caricature. Making these choices was an intentional process with the goal of supporting the use of the 3D space by the users unfamiliar with the interface of the Second Life Viewer and the virtual world or for that matter any virtual world or computer game in general. However, access to prior knowledge, experience and conventions of the non-mediated world could be brought to bear in this context by the use of replicas of physical objects familiar to the participants. In that way familiarity with the objects in the physical world may signify the perceived affordance of the virtual objects through similarity of the virtual objects to the physical world objects. For example, if it looks like a chair, then it might be for sitting or if it looked like a filing cabinet, it might hold documents.

Designing computer mediated environments is complex and needs to take into account perceived affordances, signifiers and conventions (Norman, 2004). Previous experience of other computer interfaces could be assumed to some degree in the design process but, since Second Life uses a proprietary viewer to access the 3D world not a web browser, there were many new and unfamiliar screen based commands to consider. To improve the ability of the participants, who may have had little or no gaming experience, to perceive the affordances of the various 3D artefacts, a lot of effort was made to make obvious the affordances of the artefacts in the mediated world.

Since completing this study, the Second Life Viewer 2 has been released which resembles the typical web browser making many of the computer controls of the interface much more familiar to web users and as such to a vastly larger number of potential users. By accessing these cultural conventions in the viewer, there is the potential to reduce at least some of the issues of access to the less familiar 3D virtual world. For example, search was relocated to the same location it appears in a web browser and the gear icon was used to denote editable settings.

When approaching the design of a 3D space for use in a previously untried purpose, in this case Action Learning, the design process had to address the aspects of perceived affordances, signifiers and logical and cultural conventions. If achieved, the system would be accessible, functional and meaningful to the users including facilitators, guest presenters and participants. This system needed to cater for novices, experienced or expert users of the same environment. Another challenge was to achieve this with minimal impact on the immersive experience. The temptation was to plaster the environment with intrusive labels and signs that detract from the visual illusion of a natural and realistic place.

“Signifiers are some sort of indicator, some signal in the physical or social world that can be interpreted meaningfully that indicate how to behave” (Norman, 2004). Conventions, or as Norman calls them, “logical and cultural constraints”, can either be determined through reasoning in the case of logical constraints, or are learned because they are shared by a cultural group. The challenge in the design of the 3D environment was to include those conventions that even novices to the environment would be familiar with or to use images, words, metaphor and consistency to make novel experiences accessible to novice users. The designer in 3D has some advantages over the web designer because it is possible to build objects that look like the physical world objects. For example, when indicating a direction to be followed, an actual path or road with signposts can be used to signify the right direction to go. A logical constraint such as the end of the virtual island can be represented by the end of the land disappearing into a vast sea with no other land in sight. Fences and walls can be used to draw on the cultural understanding of these items as barriers to signify boundaries.

Norman (2004) states that “in the world of design what matters is:

1. If the desired controls can be perceived

   1.a. In an easy to use design, if they can both readily be perceived and interpreted

      2. If the desired actions can be discovered

   2. a. Whether standard conventions are obeyed.”

Knowing the role the sites would play made the affordances required in the virtual locations clearer. As almost all of the potential participants were expected to have little or no experience of virtual worlds or computer games, the "perceived affordance" of the virtual environment would provide important clues to the new users.

> \for in design, we care much more about what the user perceives than what is actually true. What the designer cares about is whether the user perceives that some action is possible (or in the case of perceived non-affordances, not possible). (Norman, 2004)

Therefore a realistic style was chosen for the design as opposed to a futuristic or fantasy appearance. The intent was to tap into the participants’ prior experiences in the physical world to aid their use of the virtual world. By creating a lifelike environment with recognizable buildings, furniture and objects, the intent was to prompt participants to infer the use of various virtual items. This inference was supported with other cues as well especially if the purpose was less obvious. This included floating text that supported user understanding. For example, the tour pod vehicles displayed the word “Tour” above the vehicle and boxes had floating text saying “Touch”. Signage on the islands also supported understanding especially when the actions were amongst those not possible in the non-mediated world such as teleporting.

5.3.2 Navigation

Like travelling in a foreign land, one of the challenges for learners, especially those experiencing the 3D environment for the first time, is finding their way around in a

three dimensional world. A range of devices were used to aid navigation in the 3D environment. Supporting navigating in three dimensions is as important as good web site navigation as without navigation support, new users can become disoriented, have difficulty finding what they need efficiently and mentally mapping their surroundings so they can return to locations easily when they revisit the site.

Built into the interface of the Second Life Viewer is the ability to make and store landmarks. Similar to Favorites (sic) or Bookmarks in a web browser, landmarks are used to mark locations in the 3D world to make revisiting them easier. Names can be customised to make sense to the user just as they can in the web browser bookmark. Landmarks can also be shared between avatars and inserted into notecards to embed links to destinations in the text of a document. This was expected to be one useful method for providing instructions, directions and help provide asynchronous assistance for orientation and navigation.

Because customisation of the built environment could aid orientation and navigation, the following items were constructed in 3D to provide a structure for navigation and around the island and orientation to the virtual world.

5.3.2.1 The Visitor Centre

The overall layout of buildings radiated from a central information hub referred to and labelled the Visitor Centre, pictured in Figure 5:14 (a). It formed the 3D equivalent of a website's main menu and home page for the island. It was the location where avatars automatically arrived on the island if teleporting there. This is called a Telehub in Second Life. By using a Telehub, visitors were forced to land on the island in this location making it possible to control the entry point and increase the chances of participants noticing the help material. There were four exit doorways to the north, south, east and west signifying the optional pathways for navigation shown in Figure 5:14 (b). All exits had signs indicating the name of the destinations.

Figure 5:14: (a) The Visitor on Centre Terra incognita island was the landing point and information centre. (b) Aerial view showing exits to the north, south, east and west.

An online indicator was programmed into an object that looked like a counter bell as pictured in Figure 5:15 (a) and (b). Floating text above the bell indicated the online / offline status of the facilitator. Using a mouse click to touch the bell would "ring" the

bell and activate the script that would send an Instant Message to the facilitator if online or an email if offline.

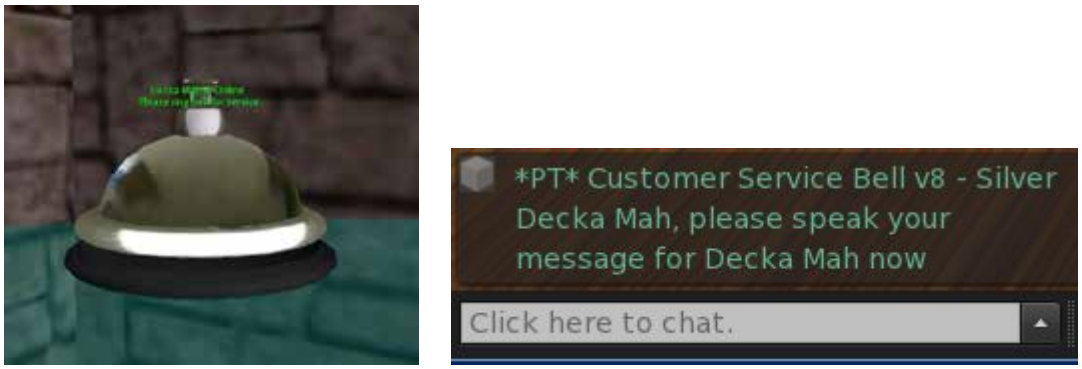


Figure 5:15: (a) Online indicator in the form of an bell was used to contact the program facilitator. (b) Chat message when bell is rung.

In the Visitor Centre, participants in the Action Learning Programs could touch an object (termed a 'Giver' in Second Life) that would give them a notecard with the general information about the island and about Action Learning. This parallels the "About" page on a website. They could also collect a landmark for the island, the 3D equivalent of adding the location to your Favourites or Bookmarks. It is possible to automate this process so that a sensor always hands new arrivals this greeting material. This type of scripted greeter can provide information directly to new avatars who had not visited the island before by using a sensor that checked a database of previous visits. This capacity was not used in this research but could improve access by providing guaranteed delivery of help and information materials although there is no guarantee the material would be read by participants.

Signs in the Visitor Centre, shown below in Figure 5:16, identified the island as a research site with disclaimers about the recording of chat conversations. There was also a sign with a web link to the Queensland Government Smart State site and information about the University of Southern Queensland acknowledging the funding sources for the research and clearly showing the association between the location and these institutions.

Figure 5:16: Acknowledgement signs were located inside the Visitor Centre.

In Figure 5.10 earlier, the aerial view of the completed island depicts the diversity of the island layout. To support the development of mental maps and a sense of place, an object textured with this map was created and used as one of the teleport devices in the Visitor Centre. Red buttons were placed on each location that, when touched, teleported the avatar directly to that location. The map device, a familiar object from the physical world, signified navigation assistance.

5.3.2.2 Paths

Another aid to navigation and movement was the use of pathways between locations. These led to the various locations on the island and back to the central hub. Paths have a perceived affordance for locomotion in a general direction. The pathways supported ground navigation for new users who had not encountered flying or teleporting, two aspects of travel and navigation available in virtual worlds that are not possible in the physical world.

5.3.2.3 Teleporters

The ability of avatars to teleport is a novel feature of being in a virtual world. Borrowed from science fiction, teleporting is the ability to move an avatar more or less instantaneously between two destinations with the aid of a scripted device called a teleporter. Teleporting parallels the hyperlink in web site navigation with avatars starting at an anchor point and travelling to a target point with the aid of a scripted device (computer program) that includes the coordinates of the destination and a command to move the avatar to that destination upon activation by some command such as a touch by the mouse. This capacity of virtual worlds, not available in the non-mediated world, afforded rapid and efficient movement of avatars from one location to another to improve access. This avoided the tedium of manipulating the avatar to walk around using the arrow keys and avoided the associated risks of getting lost or accidentally veering off course into potentially time wasting distractions or frustrating hazards. Below in Figure 5:17 (a) and (b) are pictures of some of the teleporting devices used on the island. Floating text and signage aided perception of purpose.

Since at the time of writing teleporting does not exist in the physical world except in science fiction, guidance was needed to support the use of teleport devices. By creating a teleporter that led back to the Visitor Centre in the shape of a miniature copy of the building, it was intended to support the participants' perception of the affordance of the device for travel to that place. Floating text above the teleporter and sign posting with words were designed to aid understanding of the affordance of teleporting.

Figure 5:17 (a) One type of teleporter used. (b) Sign marking the "Return to Visitor Centre" teleporter in the shape of the building. Note floating text above the teleporter.

5.3.2.4 Signage and location naming

As an aid to memory, mental mapping and clear communication for arranging meetings and class events, locations on the island were given place names that were referred to in notices, on maps and in meeting invitations. Signs, like the examples shown in Figure 5:18 (a) and (b), acted as signifiers that locations suitable for use in the program existed at these areas. The locations were included in the teleporter devices and maps providing an "address" to specific areas of the island for people to use in correspondence via email, instant message or group notices.

Figure 5:18: Signs on the island helped navigation and the sense of cultural back story. (a) Harlan Bay orientation Play Deck and Surf Club meeting rooms (b) Spotter Square shopping village for avatar customization.

The use of named locations mirroring the physical world conventions was intended as a social signifier (Norman, 2007) in an attempt to provide cues to the participants so they might more readily infer the type of location and its use. An alternative way would be to actually label the places with specific purposes such as "Small Group Meeting Area 1". However this may be less conducive to creating immersion and the feeling of being somewhere (spatial presence).

5.3.2.5 Tours

As another aid to orientation and navigation in the virtual world, automated tours were created and well signposted. By using a scripted Tour Pod device, programmed to fly occupants around the island on a custom made trail with an accompanying script describing locations, participants could gain an overview of all the areas of the island and their roles. Using floating text above the tour pods and signs with directions was intended to create the perceived affordance (Norman, 2004) of being touch activated (Second Life terms) or clickable (general computer operation terms). Figure 5:19 (a) shows the Island Tour centre with green Tour Pod and the nearby sign Figure 5:19 (b). The Tour Pod in flight near the mountain top classroom called Decka's Decks is indicated by the red circle in Figure 5:20.

Figure 5:19: (a) Island tour pod base and (b) sign.

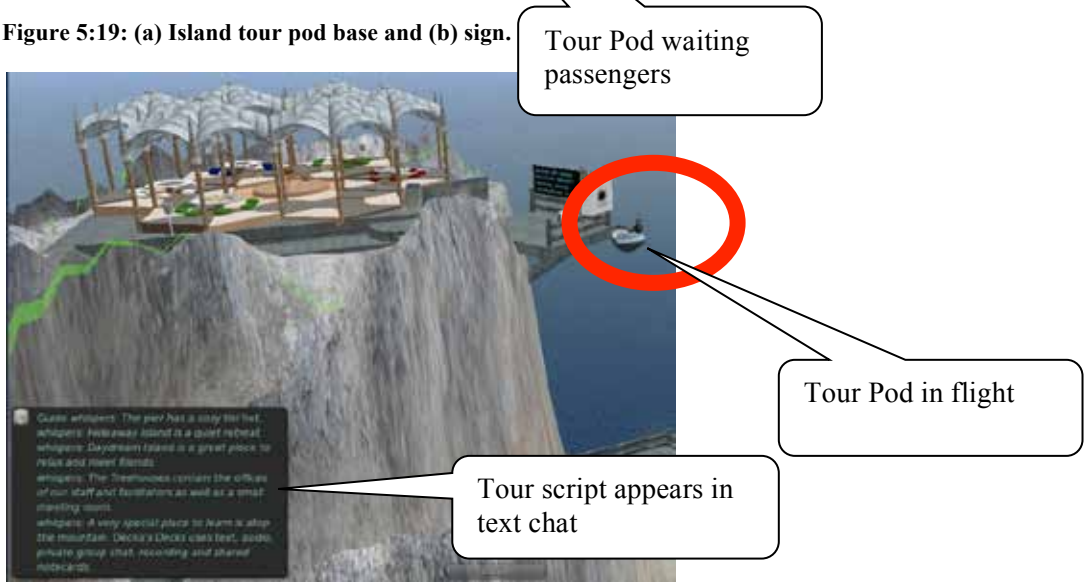


Figure 5:20: Tour pod in flight. Note tour script in chat history.

5.3.3 Notice boards, picture boards, event boards

Noticeboards were made to look as much like their physical world counterparts as possible to signify their purpose. Messages could be left on the board and appeared

like yellow sticky notes. Photos could also be taken with the built in camera in Second Life and added to the noticeboards. Samples on the board provided models for this. An example of one of the photograph and note boards is picture in Figure 5:21.

Figure 5:21: Photo board in the Visitor Centre

Billboards, such as those pictured in Figure 5:22 (web form controlled) and Figure 5:23 (notecard controlled) were used to show events that were being held at various locations to indicate to participants as they arrived that they were in the right location for an event.

Figure 5:22: Bulletin board that are editable through a web interface were used to reserve areas on the island for Learning Set Meetings and events.

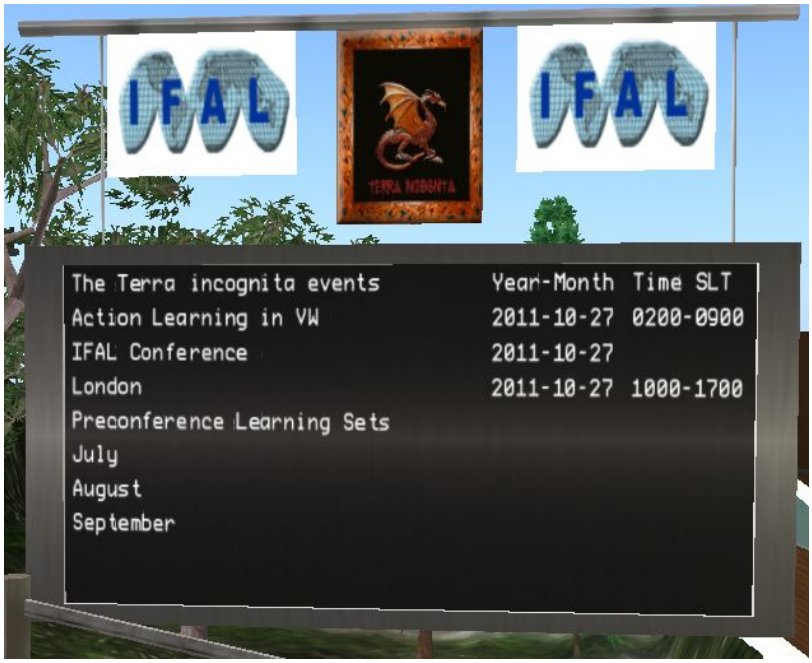


Figure 5:23 Master notice board of current events on the island.

5.3.4 Buildings with special characteristics and purposes

5.3.4.1 The Flying Classroom - Decka's Decks

During the Explore Stage of the Action Learning process, there can be times when the facilitator, looking for efficiency of time and effort, may opt to explore new content with the entire group in an Action Learning Program. This was a feature that all the interviewed facilitators identified as a requirement. This may involve a guest presenter, an activity for skill development or a discussion about the content or the impact of that content on Action Plans. Also during orientation to the Action Learning process, the facilitator may want to interact with the entire cohort to conduct administrative tasks, to practice Learning Set Meeting protocols or to support early project planning. The environment needed to have locations for this to occur.

A purpose built scripted building, called Decka's Decks pictured in Figure 5:24, was created by scripter Biran Gould based on a design by the researcher. This building made it possible for a larger group of up to 35 avatars to interact as a group. By taking into account the limitations of the technical environment and the opportunity to use the in-built scripting language, a building was made to provide a whole group space as well as automated break-out rooms for discussions and activities including Learning Set Meetings. To accommodate the chat distance specifications of Second Life, the building measured slightly less than 20 meters across to ensure all the avatars seated within its boundaries could read the text chat of other members present.

Figure 5:24: Decka's Decks group facility with break out pods in large group configuration.

The modular building was scripted so that on command the hexagonal pods would fly upwards to a range of altitudes to create separate discussion break-out rooms that were out of text chat and voice hearing range of each other. As shown in Figure 5:25, fences appeared when the pods separated to prevent avatars falling should they inadvertently stand up while at altitude.

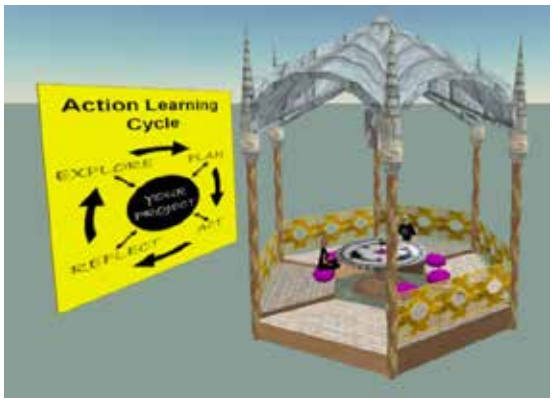


Figure 5:25: Break our pod at altitude. Note fences for avatar safety and slide presentation screen.

Figure 5:26: Facilitator pod docked with break our pod at a height of 400m. Note resource box to the left of the facilitator's chair.

One panel remained open to allow the Facilitator Pod to dock when it flew to the same altitude if any avatar used the button that paged the facilitator. The Facilitator Pod docked with Pod 4 is pictured in Figure 5:26 above. Screens were available to show slides or video at the elevated positions.

A recording device would email the chat log of conversations in text chat to the facilitator. No facility for recording voice was available but participants could hear the streamed voice of the facilitator at any time because all the pods remained within the same land parcel. The facilitator's podium also had a resource box seen in Figure 5:27 to the left of the seated avatar. At a touch from the facilitator, the control panel popped up to allow a range of notecards to be distributed to either one pod group or to all avatars seated in any pod.

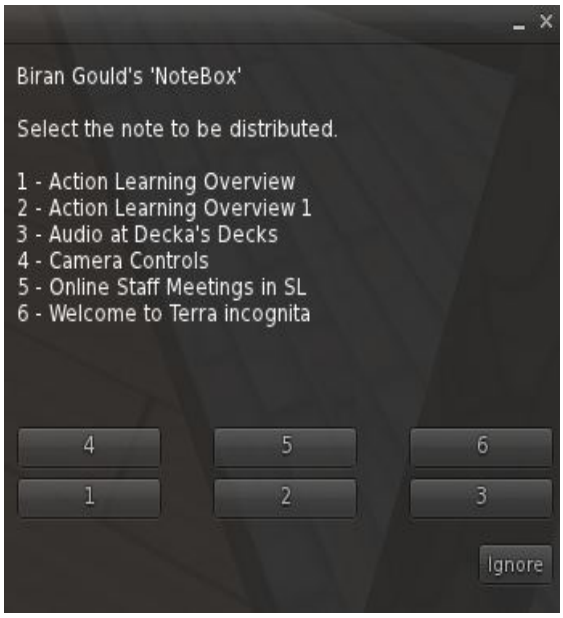


Figure 5:27: Notecard resource delivery system dialogue box.

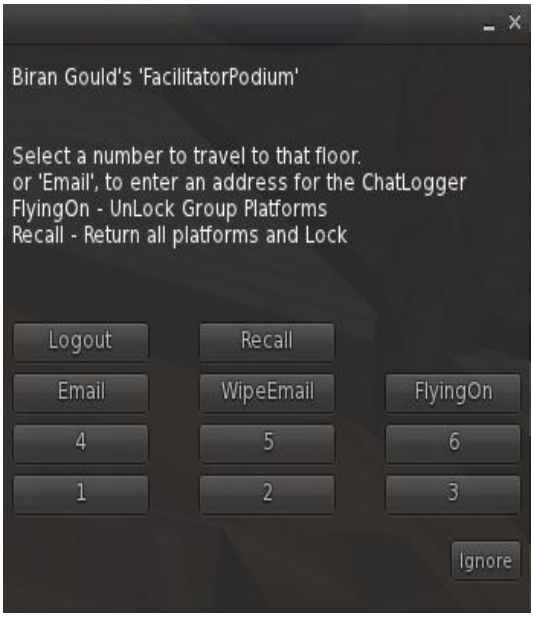


Figure 5:28: Facilitator control panel for the management of the flying break out pods and the email address destination for text chat recordings.

Participants were able to make the pods ascend or descend by touching a button on the table. The facilitator could also control flying with an administrator's control panel, illustrated in Figure 5:28, that included recall all pods and turn flying on and off functions.

All the features of the Decka's Decks and their purpose are listed in Table 5-1.

Table 5-1: Decka's Decks feature list.

Feature	Attributes	Purpose
Pods	Each numbered pod has 7 seats and flies to a different altitude on command by the facilitator or participant. Only fly when facilitator has activated flying to prevent inadvertent flight. Fences appear at altitude so avatars don't fall off the platform if they inadvertently stand up.	Seating for a large group when on the ground and form private break out rooms when flying. Figure 5:24 ground level and Figure 5:25 pods at altitude.
Facilitator chair	Seat for facilitator and command centre for the whole building. Ability to fly to any of the pods when they are altitude.	Sitting activates the user as commander of the system. Controls include: Change email for chat log email. Turn flying on & off. Hand out resources to one pod or all pods. Recall all pods. Change cushion colour on chairs in each pod. Fly to the break out rooms to interact with groups during discussions or activities. Figure 5:26.
Chair cushions	Change colour. Automatically calibrate for the height of the avatar.	Colour can be changed and used for grouping avatars. Note colours in Figure 5:25 and Figure 5:26.
Resource box	Can contain up to 12 notecards to be distributed to either one pod or all pods.	Hand out materials to participants. Figure 5:26.

Feature	Attributes	Purpose
	Box can contain text, images, landmarks and objects.	
Notecard drop box	Allows participants to drop notecards into the box but only the facilitator to take them out.	Submission of forms, summaries, activities.
Recorder	Records all text chat within 20m and emails files to the facilitator.	Recording chat logs for research, reflection or assessment.
Pager	Button on the tables allows participants to send a page to the facilitator.	Allows groups to ping the facilitator and get assistance or ask questions. Facilitator can then IM participants or fly the facilitator podium to the pod altitude. Figure 5:26

An audio tour of Decka's Decks was recorded for participants and potential facilitators so that information was always available for those visiting the site. The tour was activated by clicking a sign board pictured in Figure 5:29.

Figure 5:29: Decka's Decks audio tour sign when touched plays a description of the features of the facility.

5.3.5 Course administration and Communication

Although every effort was made to use the 3D virtual world as much as possible for every aspect of the Action Learning Program, the administration of the program was conducted using a combination of communication tools both within and outside the virtual world. Email was used extensively in the enrolment of participants as the majority of applicants had not entered the virtual world at this point in the program. For participants who enrolled inside the virtual world, communication was done using Instant Message (IM) and notecards (text notes that can be shared with other avatars in Second Life). Email was also used to collect information about suitable times for Learning Set Meetings. Apart from these two tasks, all other communication related to the program happened inside Second Life. Since the addition of web access inside Second Life in 2010, even these tasks could now be completed from within the virtual world if preferred.

The following section outlines the various administration tools and processes used to manage the Action Learning Program in-world.

5.3.5.1 Resource Centre

With the title of 'Resource Centre', a building, shown in Figure 5:30, was created that housed course materials, such as presentations and notes (Examples shown earlier in Figure 2:1 and later in Figure 5:41), and devices needed during the program, such as the SpeakEasy HUD. Drawing heavily on the conventions of the physical world for document storage and distribution, this afforded communication via asynchronous communication using notecards and images. Course content materials were written on notecards or created as images (textures) that were stored in objects that looked virtual filing cabinets. Two levels of access permissions allowed public access to one cabinet but only course participants to access the second cabinet. Public access resources included general information notecards on how to use Second Life such as camera controls, changing appearance, landmark lists, and scripting and building tutorials. Course specific notecards were about Action Learning, Learning Set protocols and a proposed Learning Set agenda. Content area notecards and copies of presentation slides were also distributed in this manner.

Figure 5:30: Resource Centre building.

Figure 5:31: Filing cabinets with floating text labels for document storage and distribution.

The rectangular object that was textured to look like a filing cabinet acted as a signifier that this was a document storage device shown in Figure 5:31. Floating text above the cabinets indicated the contents. Letter labels on the drawers indicated the alphabetical range of the titles of the notecards. A wall-mounted sign also indicated the role of the cabinets and their contents.

The content of the cabinets were distributed when the avatar touched the cabinet using a mouse click and selected an item from the menu that appeared. Notecards and images were then saved for later retrieval in the avatar's inventory. In this way, asynchronous communication was afforded between the facilitator or content area specialist and the participants. Access to documents was through mouse clicks on the drawer of the virtual filing cabinets.

On the wall of the Resource Centre building, a replica of a cork notice board with sticky notes attached acted as a signifier that notes could be used as a way of leaving

messages to course participants or the facilitator. A sample note gave instructions if touched. Although not regularly used, some participants left several messages and photographs for the facilitator. This provided an asynchronous communication channel for administrative purposes.

Other items available in the Resource Centre included devices such as SLStats Watch that if worn tracks time online and reported it on a graph on a website. These items were packaged to appear like they were products for purchase. Using a mouse click touch command, participants were able to activate the giving script in the object to deliver the device without the facilitator being present. By using the scripting language to make objects that distributed items to course participants, many more resources were available asynchronously.

5.3.5.2 Text chat

Text chat was the basic form of communication between avatars. After an initial period of adjustment to the lack of access to voice communication, which at times frustrated both the facilitator and the participants, text based communication, like that accessible on the World Wide Web, became the norm. It was a common expectation that they would be able to communicate in voice when they arrived in world and saw their colleague there with them embodied as avatars. For inexperienced users of chat, it took some time to learn the conventions and common abbreviations but most participants were familiar with emoticons also used in email.

5.3.5.3 Voice

Voice chat became available in beta test mode midway through the second program but the full release was after the completion of this research study. At the time of writing, a blend of voice and text chat is used at events. Voice morphing even allows avatars to change the sound of their voice to include other genders and characters.

Before voice chat became available in Second Life, group members (See Groups below) could be advised that a voice conversation or broadcast was available in other voice channels run in parallel software such as Skype[3], Ventrillo[4] or TeamSpeak[5]. These are group voice chat programs that allow group calls. When spatial voice chat was implemented in Second Life, group calls became possible and provide another communication channel for interaction, removing the need for other external products. This process is similar to making a telephone call when used in one to one mode, or a conference call when used in a many to many mode. The telephone terminology of making a call signifies the affordance for telephone like communications. Calls are possible to groups or to individual members on the Friends List. This feature affords another channel for communication when avatars are logged on but not located in close proximity in-world. It would be useful when participants are scattered across Second Life during exploration events and activities. It would also be a useful tool to keep conversations in class private from the general

[3] Skype voice over Internet protocol software http://www.skype.com/

[4] Ventrillo http://www.ventrilo.com/

[5] Teamspeak http://www.teamspeak.com/

public. This feature was not available as a standard feature of Second Life at the time of the actual Action Learning Programs were conducted.

5.3.5.4 Groups

Built into Second Life is the capacity to collect lists of avatar names into groups and this feature was used for each cohort in the Action Learning Programs. The group notices feature made asynchronous communication possible between all the members and between the facilitator and the members with a single post using the group notices feature. These notices were distributed to the members in a similar way that email can be distributed to an email list. Since messages can have attachments that include landmarks, images and notecards, many of the administrative tasks were conducted using these notices once the Action Learners had created an avatar. Group notices were automatically forwarded to email if the recipient was not logged into Second Life.

Groups also have a profile that includes access to archived messages, group member names and online status, group charter and member roles. Roles can include group owners and administrators and various categories of members. This allows members to have a range of permissions to post notices, manage membership, invite members and access group owned facilities. This feature was not used extensively in the programs for this research but could be useful for managing larger numbers of participants; multiple facilitators or guest presenters; or concurrent programs and learning sets.

Group members are identified by a group tag that appears above the avatar's name tag that floats above their avatar in-world that signified group membership and role within the group. This was used to differentiate members of the program from random avatars when they were encountered on the island or in other public places in Second Life. The current group was called AL3D for Action Learning in 3D and on completion of a program, the group members were invited to join the AL3D Alumni. The latter formed an ongoing learning community and social network. When online they were also available as mentors to the new group of Action Learners.

5.3.5.5 Instant Messaging (IM)

When avatars were either not physically co-located in the virtual world or they wanted to have a private conversation, a system of Instant Messaging afforded private communication in text. This was available for one-to-one and one-to-many conversations between formal Second Life groups or ad hoc collections of avatars. Since IM can be forwarded to email, it was useful for both synchronous and asynchronous communication. Participants or facilitators who were offline could still receive messages from those who were online, at times prompting the offline person to log on to deal with the communication immediately. At other times, the message would be answered when convenient either by email or when the participant next logged into the virtual world. At the time of writing, IM had become available outside Second Life via a web browser or smart phone mobile interface allowing communication via IM without being logged into Second Life. These upgrades have linked the physical and virtual worlds more closely affording more seamless communication between the worlds.

These built-in tools provided the channels for communication. These communications tools were implemented in various combinations to meet the requirements of the processes of Action Learning, program administration and learning the interface.

5.3.5.6 Facilitator Tools

The Facilitator used a number of personal tools to assist with group management, meetings, presentation and general interaction. The most useful of these was an attachment called the MystiTool made by an avatar called Mystical Cookie. This device has many features but the most commonly used were the avatar radar, avatar locator, sim scan, DynaTable (pictured in use in Figure 2:4) and landmark shortcuts. This personal tool was equipped as a HUD and activated using a menu system. The role of the tools are listed in Table 5-2.

Table 5-2: MystiTool Accessory Components and their application in the Action Learning Program.

Tool	Purpose	Use in Action Learning Program
DynaTable	Instantly rez a table and chairs anywhere. Table always created a spare chair when last chair is occupied signifying to people walking up that they can join the group by sitting.	Any time a group wanted to sit and talk, a table could be rezzed for a discussion. Several of the tables were permanently located around the island making it easy for people to accommodate any number of participants without having large fixed arrangements of tables with lots of chair that lack intimacy for smaller groups.
Landmark barrel	Landmarks were collected and a menu of favourites was available on a HUD button shortcut.	Easy movement between regularly visited locations on the island and across Second Life.
Avatar radar	All avatars within 96m were listed on the screen with the distance.	Used to determine who was in the vicinity and if they were in chat range (<20m) or IM was required to speak with them (>20m).
Sim search	Identified all avatars on the island (simulator).	Used to find program members' avatars who seemed lost.
Find avatar beam	Shoots a beam of particles towards a nominated avatar allowing them to be pinpointed.	Used for locating avatars and for providing a marker during tours.

Similar to the DynaTable, the MultiChair by Timeless Prototype also generated seating based on creating a spare chair each time the last chair was occupied. Several MultiChair styles were stationed around the island including logs around a fireplace and an arrangement of small crates around a larger crate.

5.3.6 Avatar selection and outfitting

Once the environment was prepared and the Action Learning Program was ready to begin, each participant needed to create and avatar, the virtual character who would be the embodiment of the participant in the virtual world. The avatar "declares a state of presence" (Siemens & Tittenberger, 2009) in the virtual world. As the embodiment of the human, it is also a tool of expression through the appearance of the avatar and the profile image and description.

The researcher also had made an avatar to use to create the learning environment and for use within the programs. By attending many educational and social functions in

Second Life and observing a broad range of avatars, the researcher formed questions about how avatar choice might affect the Action Learning Program. Many of the same questions that had come up when building the environment surfaced when creating an avatar. Is realism necessary? Is mirroring the physical world necessary? Would futuristic or fantasy avatars influence the willing suspension of disbelief? Would gender switching or fantasy avatars reduce trust between the group members or affect the professionalism of the dialogue? Could these fun elements be a positive influence on building relationships?

As this was an exploratory study in design in a very new medium, the researcher decided to choose realism but not a mirror image avatar. So the end result, pictured in Figure 5:32, was an avatar that was similar but not identical to the human. Named Decka Mah, the researcher's avatar was the same gender, had a similar hair style as the researcher and was customised with many accessories including some to track online status, modify walk and flying animations, and avatar radar to identify avatars within chat range.

Figure 5:32: The researcher, Lindy McKeown Orwin, and her Second Life avatar, Decka Mah.

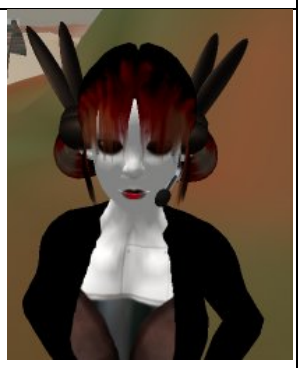
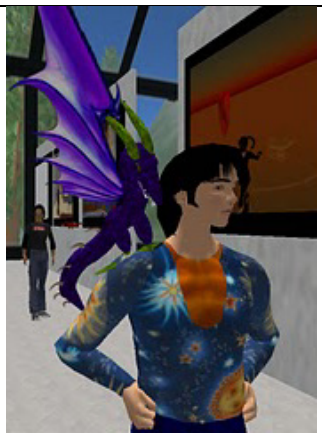
Since Second Life did not force the participants into a predetermined mould of predetermined avatars in the way earlier versions of ActiveWorlds did, the researcher decided to let each participant choose the level of realism or fantasy allowing people would choose to do with their avatars and how much effort they would put into their avatar development.

5.3.6.1 Avatar customisation

Avatars in Second Life, and many other virtual worlds, could be customised by changing the appearance of the avatar in terms of body shape, skin, hair, clothing, animations and accessories. Outfits could be created that include all these elements and were stored in the avatar's inventory and swapped rapidly. This even included sophisticated photo-realism where services were used to create the avatar's face from photographs of the human. Hair created, styled and coloured using the building tools and primitives to create was termed 'prim hair' illustrated in Table 5-3 (d) and (i). It

was possible to change skin to mimic various races as shown in the Indian example in (i) in the table.

Table 5-3: A range of avatars from Second Life (2005).

		
(a) Default natural with modified clothing	**(b) Customised caricature of reality**	**(c) Default natural**
		
(d) Customised appearance using shape, skin, clothing and accessories	**(e) Customised to closely approximate reality**	**(f) Default stylized**
		
(g) Slightly modified default	**(h) Accessorised default wearing a pet dragon**	**(i) Example of customisation for race using skin, hair and clothing (Indian)**

It was also possible to have non-human and partly human avatars, as demonstrated in Figure 5:33, that could vary from such things as a puff of smoke to a dragon. None of the participants chose non-human avatars for use in the program although this feature

was demonstrated and some non-human avatars called ‘Furries’ were included in their inventories as a default. Furries are anthropomorphic animal avatars.

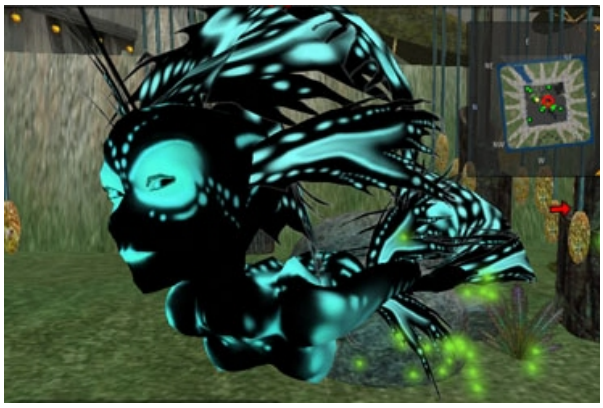


Figure 5:33: This Sea Siren fishlike fantasy creature is an example of a non-human, fantasy avatar.

5.3.6.2 Shops

A series of shops were created in an area on the island named Spotter Square which became a shopping village supplying free materials used to customize avatars such as clothing, skins, shapes and accessories. This facility afforded personalization expression of avatar identity. Items in the village were mostly free but avatars in the program were also given a small stipend to buy items outside the island used in the program. An extensive market economy exists in Second Life for virtual goods, so each participant was able to customize and personalize their avatar if they chose to spend the time to do this at times outside the scheduled events of the program. The orientation experience in the program included an optional session about changing appearance that included a visit to the village stores and a tutorial in how to edit appearance and change clothing and equip accessories.

Figure 5:34: (a) The shopping village and (b) inside a store an avatar makes selections from cabinet drawers full of clothing and accessories for avatar customisation.

The participants varied in the amount of time and effort they spent taking advantage of these options. Some avatars spent a lot of time making elaborate avatars whilst others were satisfied with the default avatars chosen at registration with only minor adjustments. Some of the participants made comments about feeling embarrassed by the low quality of their avatars compared those who had taken the time to customize their appearance including the facilitator’s avatar. A number of people arranged times between events to meet the facilitator or other participants to get assistance to

customize their avatars in an effort to create an identity that was acceptable to the user. As a result, participants stated they felt more comfortable being represented by the customised avatar. Others sought out assistance from other Second Life residents to equip their avatars.

At the time of writing, the quality of the start-up default avatars had been dramatically improved making the distinction between a new avatar and a customized avatar less noticeable. Some organizations have created their own registration systems for Second Life which included sets of readymade avatars suited to their clientele, such as business men and women, teenage avatars for school age students or industry specific uniformed avatars such as nurses, paramedics or fire fighters.

5.3.6.3 Naming conventions

Second Life avatars, at the time of the study, were required to use the last name from a fixed list but could choose the first name as long as that pair of names made a unique username. To use your own name required you to create the avatar's first name from your human name using underscore or hyphen to join them. It was a social convention within Second Life to create fictional names. This process at times impeded communication or at a minimum confused some members of the group when some avatars used the human names and avatar names interchangeably for people they knew in person. Some people preferred to maintain anonymity and do not divulge their human name. This would cause issues in course administration in an academic context where assessment was involved.

A range of tools were tested by the facilitator to overcome this confusion. The most effective being a heads up display (HUD) that showed both the avatar name and the human name below a picture of the avatar. Although the picture was useful for those identifying those avatars who did not alter their appearance regularly, they were useless for those who changed regularly. A more compact, simpler tool with just human name and associated avatar name in a pop down list would be preferable as avatar appearance could be changed making the images useless for identification.

In 2011, new naming conventions were introduced to Second Life which allowed for the use of any names rather than the fixed surnames previously demanded. This could allow easier identification of participants and matching of physical world and virtual world identities. This could aid administration, communication and trust.

5.3.6.4 Animation

One of the other common customizations of avatars apart from appearance was their walking, sitting and standing animations. This was modified using a scripted device called an animation override. It modified the built in animations and substituted alternative animations usually to achieve a more lifelike and natural movement. The facilitator used an animation override to alter walking, standing and sitting poses. This more natural movement and randomized gestures affords more realistic movement to the avatar. Some participants also equipped animation overriders.

5.4 The Action Learning Program

5.4.1 Orientation

After recruitment and registration had occurred via email, the first event in the program in the virtual world was the orientation event. The question arose of how to introduce the Action Learners to the new environment of 3D virtual worlds quickly and efficiently so they could get on with the Action Learning Program. Ideally this would happen in a manner that would immerse them in the world, give them early success, make them feel more comfortable with this unfamiliar environment as well as teach them the interface. They needed enough knowledge of the interface for active participation.

The interface itself, though, was only one quarter of the process as illustrated in Figure 5:35. Participants also needed to get to know the location they would be using for the program, so an introduction to the key locations on the island, their roles and how to find them was an essential part of the orientation process. At the same time as meeting the interface and the environment, participants also needed an introduction to the iterative cycle of the Action Learning process. The participants needed to meet each other and get to know the facilitator and establish a rapport that would lay the foundation for a working relationship for the remainder of the three month long program.

Figure 5:35: The four elements that make up orientation: Location, Interface, Participants and Action Learning Process.

Because Action Learning requires participants to form small, social, reflective groups (Learning Sets), it is vital for participants to establish a level of trust to participate fully in those groups where both successes and failures, strengths and weaknesses can come under scrutiny as opportunities for learning. Building this rapport without ever meeting face-to-face was identified as a major challenge in the interviews with experienced facilitators, so every effort was made to design

processes that would facilitate the creation of good relationships between the participants.

Although Second Life had a built-in orientation process for new avatars at registration, the researcher decided that a group event designed to expand these initial skills in a fun, relaxed atmosphere could provide additional social opportunities for the cohort that might establish that rapport and practise skills as they would do in a face-to-face event. If new participants were left to simply complete the in-built orientation, the facilitator would have no idea who had completed that process or their level of understanding of the interface. Although the focus of this research was not the process of orientation to virtual worlds environments, this element was important in preventing drop out at the entry threshold. Tracking retention rates, dropout rates and reasons for dropout using the questionnaires and exit interviews would help identify if orientation was successful.

This decision to create a play based orientation was based on an analysis of the game World of Warcraft. As detailed in chapter 4.8, the researcher played this massively multi-user online role play game (MMORPG) to analyse how learning the interface and meeting other players was embedded into the game play. An "Orientation Party" was designed drawing on the attributes of World of Warcraft such as peer teaching, signs and written help text in explanations of procedures, forced social interaction to achieve outcomes and having fun while learning. This event would play the role that in face-to-face events is called an "ice-breaker" or "rapport building".

5.4.1.1 The Action Learning orientation event

An introduction to the Action Learning was needed to familiarise the participants with the underlying iterative process of Explore – Plan – Act – Reflect. An overview of the purpose and process of the social reflection stage called the Action Learning Set was included. This was done in presentation mode using a set of slides in a group session, pictured in Figure 5:36, using the classroom facility called Decka's Decks. The researcher, in the role of facilitator, used voice streamed into Second Life since voice was not available at the time. Slides created in a presentation program were saved as image files and uploaded for use in a slide viewing screen, a process that costs a few cents per image to upload. At the time of writing this process could still be used but it was also possible to access a web based document directly while in the virtual world, making this a much simpler and totally free process.

Figure 5:36: Orientation event at the beginning of Program 2 giving an explanation of the Action Learning Process. Note the two avatars standing are the Facilitator (left) and the technical support volunteer (right).

This range of communication channels typically expands as technologies mature making the communication affordance of the virtual world better and more versatile over time. The slide viewer, shown in Figure 5:37, and voice streaming were also used to give an overview of the various island locations suitable for Learning Set Meetings, individual meetings, avatar customization and project building. Since the addition of the media texture feature, video based tutorials could also be used to access web based video tutorials both synchronously and asynchronously.

Figure 5:37: Orientation event described Island locations explained. In this example, The Village for avatar customization. Note the controls on the base of the scripted slide viewer for advancing slides.

5.4.1.2 The Party

An area named The Play Deck was designed as a location to support a playful learning experience. It contained a number of games and playful objects that encouraged interaction in pairs or small groups. There was a lot of laughter and joking during this event and many participants stayed much longer than the allotted time.

Table 5-4 lists and describes the items included in the prototype of the Play Deck and their purpose in training in the use of the Second Life interface and encouraging social interaction between the members of the new cohort of Action Learners.

Table 5-4: Items in the orientation area of Terra incognita island in Second Life.

Item	Interface lessons	Social interaction with colleagues
Arm wrestling table.	The use of pose balls for animating avatars.	Peer teaching others how to use the controls for the game. Shared experience competing.
Mud wrestling pit.	The use of pose balls for animating avatars.	Peer teaching others how to use the controls for the game. Shared experience competing.
Dagger board and Dunking Machine.	The use of pose balls for sitting, standing and animating avatars; Objects givers; Equipping items from the inventory; Alternative first person camera position called Mouselook.	Peer teaching others how to use the controls for the game. Shared experience competing. Peer teaching others how to use the controls for the game.
Hangman game.	Text chat commands to a scripted object; Floating text; Camera controls.	Peer teaching others how to use the controls for the game. Conversation to help others to win the game.
Trampolines.	Right click and touch command; Animating avatars – start and stop animation; Touch activate; Animation menu.	Shared experience in the fun of watching avatars bounce and do tricks. Peer teaching others how to use the controls for the game.
DJ streaming music and taking requests.	Listening to an audio stream; Use of Instant Messaging (IM); Adjusting sound settings in the SL preferences; Adjusting personal sound settings on the user's computer.	Discussion starter of music choices, likes and dislikes.
Dance floor.	Use of touch panel animation; Stopping animations; Camera controls; Using control menus; Avatar movement in close quarters with other avatars.	Shared fun of watching and joining in the randomized dance animations and synchronized dances.
Text chat.	Use of both text chat and IM to communicate to share instructions for use because the facilitator only taught 1 person to do something and then expected them to teach peers; Text chat abbreviations such as SL for Second Life, IM for Instant Messaging, ty for thank you, YW for you're welcome.	Give the participants a reason to talk to each other about things other than work. Social and personal items shared.

Item	Interface lessons	Social interaction with colleagues
Changing clothes to wear to a party and equipping glow sticks.	Use of Inventory; Equipping clothing and accessories; Camera controls; Editing appearance; Crisis management when clothing malfunctions occur (eg. Equipping the box that contains clothing as opposed to the clothing itself).	Non-verbal statements of identity. Peer teaching others how to use the controls for the game.
Taking snapshots and adding them to the avatar's profile.	Use of the snapshot tool to save to inventory and to the hard drive; Camera controls to frame subjects in photographs; Editing the user profile; Adding personal notes; Giving inventory to others.	Sharing photos taken of other people. Completing profile to communicate about in world and physical life. Revealing identity or maintaining privacy. Accessing other avatars' profiles to find out more about people.
Layout of the Play Deck	Walking with control; Flying and stop flying; Chat distance judgment.	Aiding others to fly who fell off the play deck into the surrounding moat.
Friendship and Group Membership during the event	Add friends; Join groups.	Community building and networking.

The Orientation Party followed the participant's solitary experience on the official Second Life Orientation Island. Some participants described the formal new avatar orientation experience that is built into Second Life as so tedious they refused to complete the prescribed process, instead opting to teleport directly to Terra incognita and attempt to work the interface out for themselves through trial and error or exploring the island or looking for help at other venues in Second Life.

Once the participants had completed their introduction to Action Learning, the island and the interface and had gotten to know one another, it was time to form Learning Sets, define Action Learning Projects and participate on Exploration Stage activities.

5.4.2 Explore Stage: Core Learning events

A series of core learning events were a part of the explore phase of the Action Learning Program. In the interviews with experienced Action Learning Facilitators, some indicated that, in their Action Learning Programs, all the content was the responsibility of the of the Learning Set Members. In these programs, a series of events and activities were planned for the whole group based on the shared needs for projects. This was to determine the affordances of the environment for content delivery and activities. There were activities related to these events.

Since the content area of the Action Learning Program was the use of 3D virtual worlds for teaching and learning, one of these activities was to create a gallery of

examples by having the participants seek out examples of educational activity in Second Life, photograph some evidence of it and create a notecard describing their findings. These were displayed in the edu-Gallery pictured in Figure 5:38: Core Learning Edu-Gallery exhibition gallery for Action Learners' photographs.Figure 5:38, a building designed like an art gallery with scripted frames that distributed the notecards holding the descriptions when touched. The participants had to use web searching of sites such as blogs, wikis, news articles, institutional websites for universities and the built in search of Second Life using the Education category to locate potential sites for their exploration.

Figure 5:38: Core Learning Edu-Gallery exhibition gallery for Action Learners' photographs.

The completed gallery, shown in Figure 5:39, provided asynchronous access to the content created by other program participants and built over time from one course to another to become a directory of educational sites in Second Life used in these Action Learning Programs as well as by many visitors to the island when it was publicly accessible.

Figure 5:39: Core Learning event – Creating content in the edu-Gallery July 4, 2007.

5.4.3 Plan and Act Stages: Workplace projects

At the heart of the Action Learning Process is the workplace project that is the learning contexts for the program. It has both content learning opportunities and skill development learning. The content of these programs was "Learning and Teaching in

3D Virtual Worlds" and the potential for skill development was in the areas of managing technological change in organizations; dealing with resistance; working in virtual teams and communities of practice.

Some participants chose their own individual workplace project but, where there were members of the same organization, they tended to work on a single workplace project although individuals were responsible for different elements of the project. (Table 6-8 in Chapter six has a list of projects shows the diversity of the implementation and contexts that were possible within a program.) All the projects involved other members of the target organization in the implementation of the project. Much of this collaboration happened face-to-face on the work sites where the participants were co-located and in one case the need for the virtual world for the Learning Set Meetings seemed so superfluous that the participants stopped attending online and just continued with the project outside of this research program. There were no distributed teams within either of the cohorts although there were several participants who ran projects that had distributed members who took part via the virtual world, email and voice chat tools such as Skype.

5.4.4 Reflection Stage: Learning Sets

The other key component of Action Learning is the Learning Set Meeting. Due to the many timezones represented in the participant groups, it was difficult to allow the participants to choose their own Learning Sets. Each group was emailed a timetable of potential meeting times and Learning Sets were formed on the basis of compatible timing for meetings. Any participants who nominated other people who they wanted in their Set were accommodated. This administrative task was a tedious manual process but free web-based meeting organisers such as Google Documents using a Google Web Form[6] feeding into a Google Spreadsheet or When is Good[7] or Doodle[8] would greatly streamline this process.

In the second program, the facilitator/researcher invited one member of each of the Learning Sets to take on a leadership role for the Set. These people were selected as they showed early skill and interest in using virtual worlds. They were given the task of setting up each of the Learning Set Meetings for their group, nominating which location they would use to meet, emailing reminders and notifying the facilitator. This reduced the administrative load on the Facilitator and made the Learning Sets more autonomous. An example of a Learning Set Meeting in progress is pictured in Figure 5:40.

[6] Google Documents and Forms at http://docs.google.com/

[7] When is Good http://whenisgood.net

[8] Doodle http://doodle.com

Figure 5:40: Learning Set Meeting May 3, 2007.

The same protocol for Learning Set Meetings, shown in Figure 5:41, was suggested for use in the virtual world and was identical to the protocol used in the physical world. This was provided as a notecard to participants. It involved giving each participant "airspace" (Weinstein, 1999, p. 110) to share what they were doing followed by questions to encourage learning and reflection from the other members of the Learning Set.

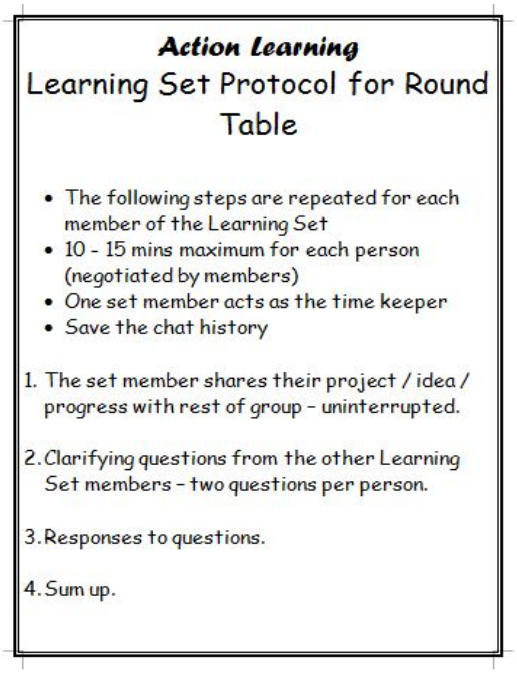


Figure 5:41: Learning Set protocol.

Since the Learning Set Meetings were to be conducted in text chat, a tool called a SpeakEasy was provided to participants for the airspace element of the protocol (Item 1 in the list above.) This device was worn as a HUD by the speaker and the entire presentation could be typed into a notecard that was read by the device, one line at a time, when clicked by the speaker. If the speaker wanted to add something

between lines, they could type in the text chat before clicking the SpeakEasy HUD attachment again to continue the prepared material. The ability to script objects in Second Life afforded this simplified presentation process which was much faster than typing the text during the meeting. Since the addition of voice chat, this device is used only when there are people present who for technical or disability reasons cannot access voice chat or if a text based transcript is being created.

The Airspace time was followed by questions that were also defined using text chat. The Second Life inbuilt typing animation indicated when someone was typing something in the chat box. This acted as a cue that questions were coming from various people in the Learning Set. The advantage of text based chat was that an automatic transcript was created for each participant. Since voice became available, a person would have to be nominated as the recorder for the Learning Set to create a text summary into a notecard as happens in the physical world during a Learning Set Meeting.

Without the prosodic elements of voice, text chat was a lean medium and participants could easily overwhelm the speaker with questions that seemed like criticism. The use of emoticons in the form of punctuation and letters used to pictorially convey the mood of the writer. Emoticons are illustrated in Table 5-5. There was also a common practice of using words enclosed by asterisks such as "*nods*" to convey non-verbal communication elements lost in this environment. Even though some of these animated gestures are available in Second Life using the gesture commands or a gestures HUD, few participants used them during dialogue. Since dialogue was followed in the text chat history, many animated gestures may have gone unnoticed as they were separated on screen from the stream of text chat whereas emoticons and words inside asterisks are embedded in the chat stream.

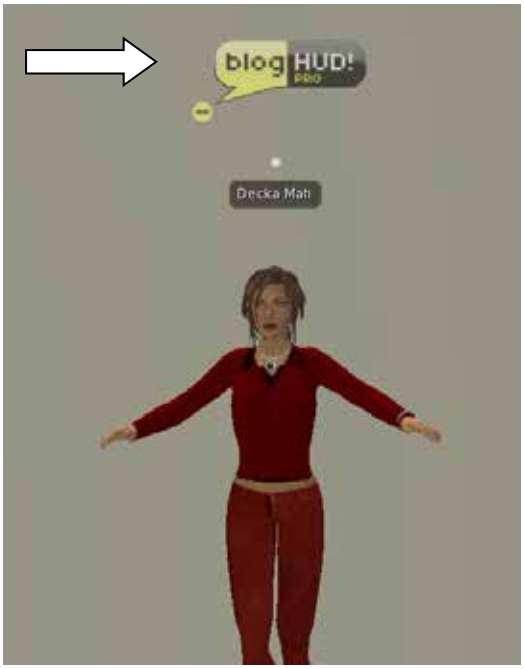
Table 5-5: Common text emoticons and their meaning.

Emoticon	:) or =) or :-)	:(or :-(	:p	:O
Meaning	Smile, joking, happy	Sad, sorry	Cheeky smile, tongue in cheek, humorous	Shock
Emoticon	:D	<3	;)	O_o
Meaning	Delight, very happy, excited	Love	wink	Surprise, raised eyebrow

5.4.5 Personal Reflection: Learning Journals

As the participants would be encouraged to use Learning Journals in the form of blogs outside the virtual world, a range of tools were offered for blogging directly from inside Second Life . This included a BlogHUD. Few people tried this or blogged in either of the two programs but this facility may be important to future groups especially those using the environment for academic programs where blogging may be part of the assessment. Figures Figure 5:42 (a) and (b) illustrate the blogging HUD attachments and (c) shows the blog-shaped public blogging tool, the 3D version of the suggestion box and guest register.

(a) Personal Blog HUD (indicated by arrow) given to participants for Learning Journals.



(b) Commercial Blog HUD Pro (indicated by arrow) worn by the Facilitator.

(c) Suggestion box and comment blog device in Second Life with the dialogue box (indicated by arrow) opens when it is touched.

Figure 5:42: Various blogging tools.

Figure 5:43 shows an example of a participant's blog post. Some participants created word processed documents and emailed them to the facilitator/researcher but most did not sustain this. One person used notecards inside Second Life and gave copies of some entries to the researcher/facilitator. This is a similar level of limited use of Learning Journals experienced by the facilitator in previous face-to-face programs unless they have been for assessment purposes. As participants became more familiar

with virtual worlds in longer programs, blogging as a form of reflective journaling may be an option that more people would take up.

Hi. My name is [avatar name removed] and I am an avatar from Second Life (SL). This particular blog is dedicated to my experiences in SL as they relate to Decka Mah's Action Learning project. I will be posting updates here as events happen and as I learn new ways to use SL as an educational tool.	

Figure 5:43: Sample of blog post by Program 1 participant with accompanying picture.

5.4.6 Program Conclusion: Celebration event

Each Action Learning Program concluded with a celebration event where each participant shared a summary of their project within their Learning Set as illustrated in Figure 5:45 of a group form Program 1 and Figure 5:45 of a group from Program 2. The SpeakEasy tool ,that types one sentence at a time of a prepared presentation, was used again for this event. Slide viewers were used to share images from the project events captured using the snapshot tool built into the Second Life Viewer. Some participants conducted tours of their built locations in Second Life.

Figure 5:44: Celebration event – sharing their journeys. This slideshow by one of the Action Learners demonstrates his use of the exact tool (the MystiTable) for his project that was in use for the celebration meeting.

Figure 5:45: Celebration Event at the end of the second program.

5.4.7 Research Data Collection

It was important to the research process to collect research data during the program with a minimum impact on the Action Learning Program and the participants. A number of tools were used to collect data. Many of these tools were experimental in nature themselves. Some were successful and some did not work as planned.

5.4.7.1 Chat loggers

A device was constructed to record the text chat especially of the Learning Set Meetings. This device took the 3D form of a large box, illustrated below in Figure 5:46, with the island logo on it and floating text identifying it as a recorder and indicating its status as off or recording.

Figure 5:46: Chat logger device for recording Learning Set Meeting dialogue.

5.4.7.2 Avatar location sensors

An attempt was made to use an avatar location tracking device on the island to determine the most popular areas. These hidden sensors recorded the location of avatars and their name as well as the duration of their stay in any particular area to a database. It was thought that these indicators would show preference for particular locations. This was not successfully used as a data source. This is one of the risks in using experimental tools in naturalistic settings.

5.4.7.3 Snapshots

Taking snapshots in the virtual world, like those used in this chapter, helped capture the action and the environment. Snapshots provided the researcher with a record for later analysis and reflection. They also provided avatars with images of their projects for use in Learning Set Meetings and were used as profile pictures to personalise the identity of the avatar. Snapshots were automatically created by the Viewer

5.4.7.4 Machinima

Although at the time of the study the researcher did not create any machinima (video created in a virtual world) to collect data, it could be a useful tool especially after voice chat was introduced. Filming a Learning Set Meeting may impact people's willingness to disclose certain information had it been used to record Learning Set Meetings. However, since the camera is not visible like a person with a video camera is visible in the physical world, this impact may be lessened.

Machinima could have been useful at other stages as well. Short videos could also be provided to improve skills in the use of the interface and navigation. The orientation including the introduction to Action Learning, the island tour and the celebration events at which projects were shared would have all been great opportunities to record video or use a recording. By making these videos available as asynchronous

resources, it would add opportunities for people to revisit these elements or catch up missed elements especially due to timezone issues or calendar clashes.

5.5 Web and 3D Enabled Proto-Diffusion

In Bannan-Ritland's Integrative Learning Design Framework (2003), the next phase is the Web Enabled Proto-Diffusion in which feedback about the ideas and findings are sought. For this project, this process was modified to include web-enabled and virtual world enabled diffusion of the prototype. It included discussion in mixed-reality, shown in Figure 5:47, and face-to-face forums. Virtual World dissemination is detailed further in chapter seven. Feedback was incorporated into design decisions.

Figure 5:47: Mixed reality research symposium on Virtual Worlds and 3D learning environments sharing the first prototype and trials in ActiveWorlds. Virtual worlds venue is the Decka's Decks conference facility in Second Life.

5.6 Explore Phase of the Action Learning Process – Additional tools for teaching content and their affordances

A broad range of readymade tools available within the virtual world were investigated for their potential use in Action Learning Programs. Some of these tools were not used for specific events within the two program iterations conducted during this research study. They, however, may be useful in other programs depending on the content of those programs and the teaching styles of the facilitators or content area experts and guest presenters.

5.6.1 ID Board

The ID Board is a people and avatar identification system that shows both photographs, human names and avatar names and online status to allow participants to quickly locate other group members or the facilitator if they are online. Staff and participant boards could be combined or separate. By including avatar and human photographs, it would be possible to provide links between human identities and

avatar names. In Figure 5:48 one of these types of boards shows the partially filled slots for avatar and/or human pictures. Floating text with avatar names and human names is not visible in this picture but appears over each person's images.

Figure 5:48: Sample of a people and avatar identification board. (Some images blurred to protect identities.)

5.6.2 Polarizer Tool

The Polarizer tool was created for use during a discussion when the participants would be asked to take a position from the three choices of agree, disagree or remain neutral. The participants would walk their avatars to the relevant, coloured area on the platform to register graphically their position in the matter.

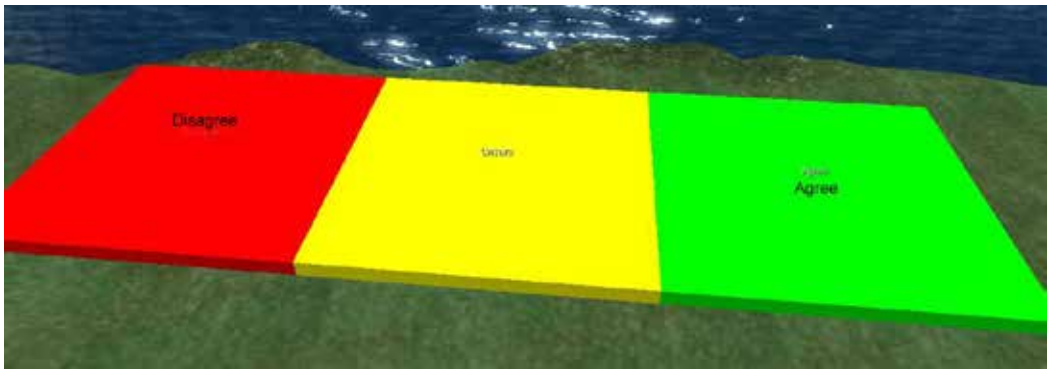


Figure 5:49: Polarizer tool used for avatars to vote (agree, disagree, neutral).

5.6.3 Hand Show Chair

Developed by the avatar Angrybeth Shortbread, the Hand Show Chair, pictured in Figure 5:50, was a seat with a built in animation that was activated by the page up and page down keys on the keyboard. These keys would raise and lower the avatar's arm to indicate either a question needed to be asked as it would in a classroom or to register a vote.

Figure 5:50: Hand Show Chair demonstrating built-in hands up animation for raising hands in a class situation.

5.6.4 The Opinionator

This scripted tool, called the Opinionator (V1.0) and pictured in Figure 5:51, counted the number of avatars who responded to a question by walking to a position on a Likert Scale and represented the tally as a pie chart. Created by Entropy Hax in Second Life, it was suitable for voting activities and data collection in focus groups. The Opinionator was not used to collect research data because of the risk of peer influence on selection.

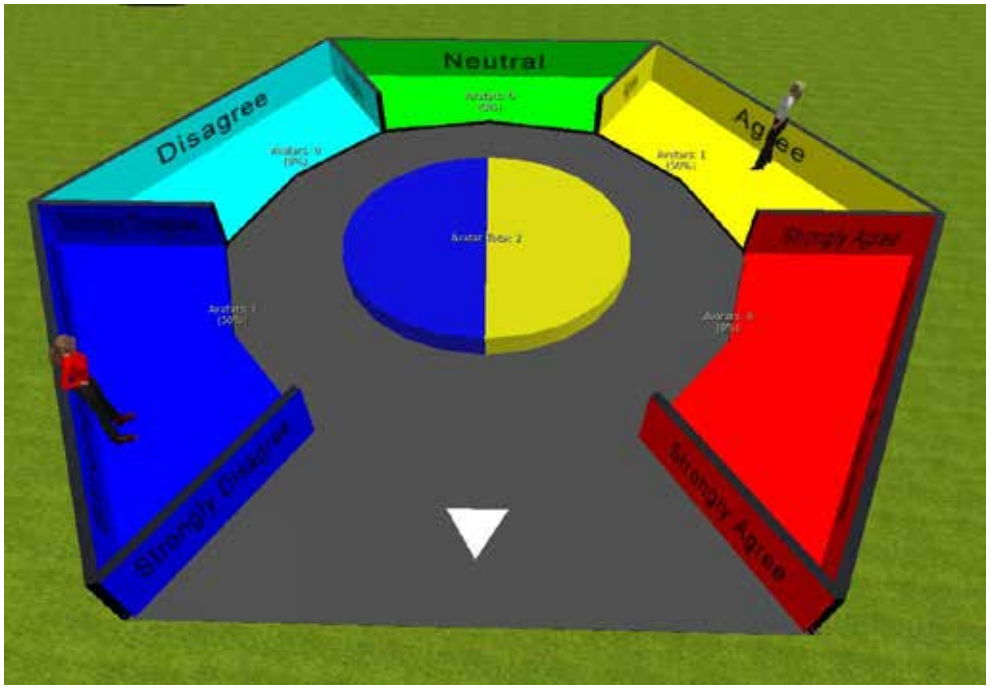


Figure 5:51: The Opinionator – Likert scale options that collate votes by counting avatars to create a scoring pie chart in the centre.

5.6.5 Poinky's Pods speed networking management tool

Based on the concept of speed networking, this scripted tool created chairs and pods then managed the process of avatars talking in pairs until the allocated time elapsed. A pair in a pod is pictured in Figure 5:51. The system would automatically switch the participants to a new pair after each time period until all pairs had spoken together or until the facilitator stopped the process.

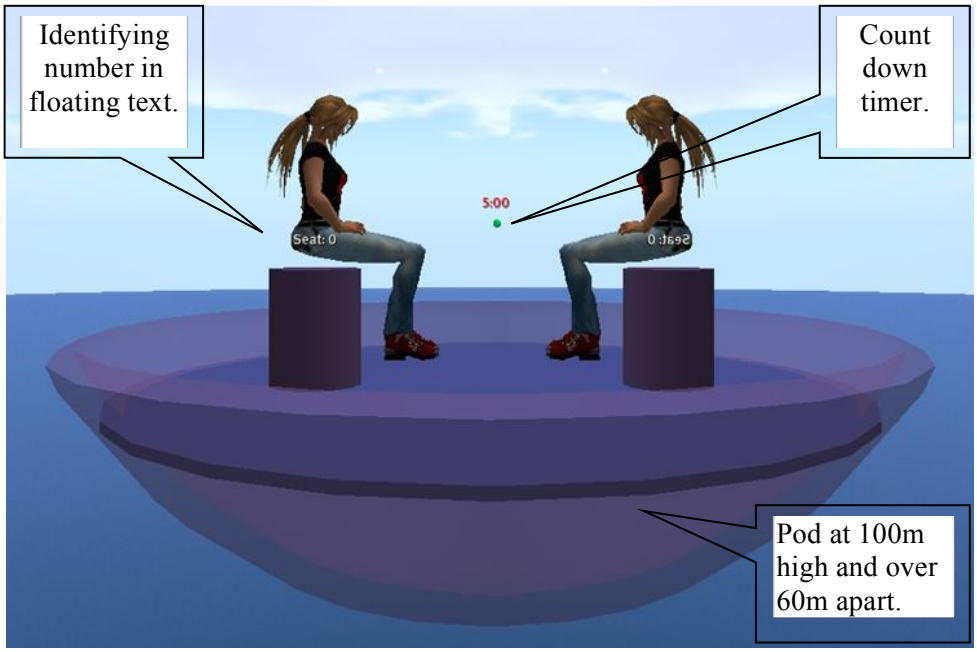


Figure 5:52:: Pod at altitude from Poinky's Pods speed networking tool.

Figure 5:53 shows the Pod Commander console used by the facilitator to control the number of pods, rez (make an object appear in 3D) the pods and chairs, and set the time limit. For groups with odd numbers of participants, the facilitator would participate to even the numbers to ensure everyone had a partner.

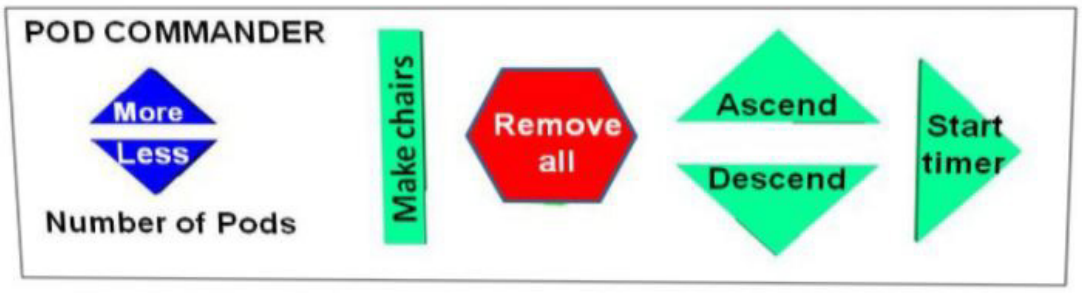


Figure 5:53:: Pod commander for Poinky's Pods speed networking tool.

5.6.6 Image display systems

As mentioned earlier, notice boards were used to share photographs and notes. The image display system, pictured in Figure 5:54, had the feature of displaying large photographs submitted by participants. This type of tool could be a useful tool for showing program content or help information as pictures or text in asynchronous kiosks. It would also be a useful tool for participants to share photos of their projects or work context during Learning Set Meetings.

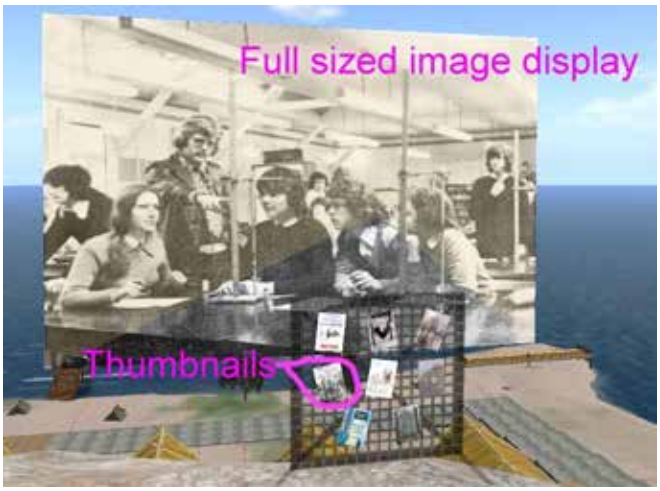


Figure 5:54: Brochure Display Board shows thumbnails and enlarges selections on the screen.

5.6.7 Communicating emotions

All experienced Action Learning Facilitators who were interviewed were concerned about the loss of non-verbal, para-language and prosodic cues such as tone of voice, body posture and facial expressions. The researcher attempted to find tools to allow overt communication of these elements although it was recognised that many of these elements are subconscious rather than overt reactions. Also there are subtle nuances of expression that were just impossible for avatars to convey. The Mirada HUD, pictured in Figure 5:55, was one tool that was found that could be used to animate the avatar with various emotions.

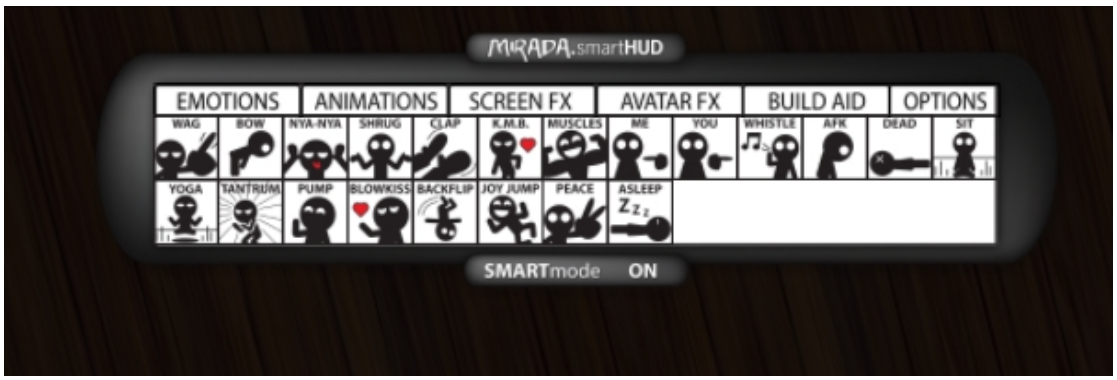


Figure 5:55: Mirada Animation HUD.

With access to scripting and building tool as well as a thriving community of amateur and professional contractors for those less skilled at these activities, Second Life provided a rich, customisable environment in which to build the Action

Learning prototype. The bespoke tools added additional levels of functionality to the environment but at the simplest level, the native Second Life environment could provide a basic location in which to meet and run Action Learning Programs. With the addition of a range of tools, the level of sophistication can be increased in parallel with the skills of the facilitator. The data from the implementation of the prototype environment in two Action Learning Programs is collated in chapter six.

Chapter 6 - Results

In this chapter the prototype and two iterations of Action Learning Programs using the prototype will be examined through their data. Each Action Learning Program is examined and the changes made between the two programs to improve the prototype described. Chat log analysis and questionnaire data about social presence and satisfaction are considered in relation to the perceived transactional distance between participants and facilitator in the program.

6.1 Community feedback on the prototype

Prior to the commencement of the Action Learning Programs, various tools on the virtual island in Second Life were tested during other events. Feedback was sought from experienced users of Second Life including staff of corporations, educators from universities and the public as well as new users who were attending events for the first time. This included members of Australian and US professional associations. Although this was an informal process, this community feedback led to the refinement of some of the components in the environment. For example, improvements were made in the signage and navigation aids in response to suggestions from people trying to attend events hosted on the island who were getting lost. This included the purchase of additional tools for making editable signs that showed the date and time of forthcoming events on the island and their intended location. Teleporters were simplified when people found the devices that were installed in the first instance too difficult to operate. A map based navigation system using a simple teleport activated by touching a clearly labelled red dot on the map replaced a complicated device. As mentioned in chapter four, there were many positive comments on the beauty and detail of the completed location but functionality for the designed purpose was of paramount importance.

6.2 The Action Learning Programs

Two iterations of an Action Learning Program of three months duration were conducted entirely online. Except for administrative emails and some Learning Journals that were either emailed documents or blogs, the activities within the virtual world of Second Life. The content theme of each program was “Teaching using 3D Virtual Worlds” as this was seen as a way to encourage people to try a variety of the affordances of the environment and provide opportunities for contributions by the participants in the process of Design Based Research. As the participants conducted a workplace project using a virtual world themselves, they were, at times, employing various strategies and materials in different ways to those used in the Action Learning Programs providing additional ideas for future courses which informed the design process.

See Appendix E for a sample schedule from Action Learning Program 2.

6.3 Participants

In Design Based Research where the context is the naturalistic setting of the workplace not the laboratory, the researcher works within a complex setting and all the unpredictable influences of daily life for those participants in the research.

Participants were invited by the researcher based on expressed interest or potential need for the content of the program or volunteered to participate and were mostly located across Australia with some participants in the USA and Singapore. The program was advertised on three technology related email lists: Second Life Educators, the Queensland Society for Information Technology in Education Community, and the Games in Learning list and sent to various individuals in computer education professional associations across Australia. There were two programs that ran one after the other. This allowed for modification in each iteration. The researcher had no control over the participants' ability to complete the program and some people who expressed interest at the beginning did not even start. Others did not complete the program for various reasons outlined later in this chapter in the section on drop out. Table 6.1 indicates the number of people in each of the two programs.

Table 6-1 Number of participants, completion rate and program dates. n=40

	Program 1	**Program 2**	**Total**
Number of participants enrolled	13	27	40
Number of participants completed the program	11 (84%)	21 (78%)	32 (80%)
Number dropped out	2	5	7
Number of Learning Sets	3 groups of 4	7 groups of 3 to 5	10
Number of Learning Set Meetings per set	3	3	30
Date program commenced	4 February 2007	10 June 2007	
Date of orientation	12 February 2007	27 June 2007	
Date program ended– Celebration Events	14 June 2007	31 August 2007	

6.3.1 Learning Set Meetings

Table 6-2 summarises the number of Learning Set Meetings in each program. Each Program cohort was divided into these smaller fixed groups who met regularly to discuss the progress on their workplace projects and to help each other learn.

Table 6-2: Number of Learning Sets and Learning Set Meetings.

Program	Number of Learning Sets	Number of Meetings conducted for each Learning Set	Number of Learning Set Meetings total
1	3	3	9
2	7	3	21

6.3.2 Education sector

Participants came from a broad range of educational sectors including teachers in primary and secondary schools; corporate trainers; system level professional development staff of government school systems; professional association executive and members; and university academics. This provided a broad cross section of the educational communities who might use Action Learning as a professional development strategy. Table 6-3 below indicates the number of people from each sector.

Table 6-3: Education Sector of Participants

Education Sector Position or Role for this program *	Program 1	Program 2	Total
Primary teacher	1		1
Middle school teacher		3	3
Secondary school teacher	1	4	5
School specialist teaching position eg. Music, Teacher Librarian or Learning Support	1	3	4
School non-teaching specialist position eg. Curriculum or IT		5	5
District level administrator	1		1
State level education department staff	3	2	5
National education system personnel	2	1	3
Vocational education trainer		1	1
University academic	2	4	6
Online course facilitator	1		1
School volunteer		2	2
Professional association executive	1	1	2
International education project		1	1

*Note: Some people had multiple roles but for this program, they elected to choose a project for one of their roles identified here.

6.3.3 Geographic diversity

The participants came from all across Australia and each program had one internationally based participant. This meant that at least three timezones needed to be factored into arrangements for events such as Core Learning events, Electives and Learning Set Meetings. As this factor is a key difference between face-to-face and online Action Learning programs, it was important to consider this factor in the investigation of the affordances of the virtual world environment . By making this a natural part of the program by allowing participants in different timezones, this element impacted in natural ways rather than in the more formal laboratory trial context. There is an opportunity in the future for more research into the impact of having single timezone cohorts as opposed to a diverse range of timezones in a single program.

Table 6-4: Locations by state and country in each program with completion rates.

Location	Number in Program 1	Number completed Program 1	Number in Program 2	Number completed Program 2	Total in both programs
Queensland, Australia*	7	4	6	3	13
Western Australia	1	1	2	2	3
South Australia	2	2	1	1	3
New South Wales, Australia	0	N/A	12	9	12
Victoria, Australia	1	1	1	1	2
Tasmania, Australia	1	1	4	4	5
Washington, USA	1	1	0	N/A	1
Singapore	0	N/A	1	1	1

*Location of the researcher/facilitator at the time of the programs. N/A = Not applicable.

6.3.4 Prior experience with computers

The exit questionnaire included a question about prior experience with virtual worlds or computer games as this may influence the ease of participation due to prior experience with the platform or similar 3D environments. Email also provided an insight into prior experience with virtual worlds and computer games. There was a mixture of prior experience which is collated from questionnaire responses and email data in Table 6-5.

Table 6-5: Prior experience with computer games or virtual worlds questionnaire item response summary. (n=18)

EXPERIENCE	Program 1	Program 2	Total
Number of responses / Number completed program	6 of 10	10 of 22	16 of 32
Gamer	1	2	3
Used Second Life or another virtual world	2	4	6
No experience	5	4	9

6.3.5 Reasons for withdrawal from the program

To determine if participants withdrew from the program because it was not meeting their learning needs as an environment for Action Learning or for other reasons not directly related to the program content or process, data was collated from email, chat logs and questionnaires. All the stated reasons for withdrawal or lack of completion of the program were collated in Table 6-6 which lists the number of participants who withdrew according to which program they were in and provides a total across the two programs. It does not include people who registered or were registered by a colleague but never started the program. Data was collected to establish the reasons for withdrawal to determine if the environment itself was too difficult or if the entry threshold was an insurmountable barrier to participation. Four participants cited multiple reasons.

Table 6-6: Reasons for dropout as stated by participants. Note: Some people cited multiple reasons. (n=8)

REASON FOR WITHDRAWAL	Program 1	Program 2	Total
Technical difficulties of personal computer or modem	1	2	2
Platform instability of Second Life		1	1
Inability to access Second Life from work		2	2
Family commitments	1		1
Work circumstances changed	1	1	2
Medical (Illness or accident)	1		1
Real life overwhelmed virtual life		1	1
Unspecified unforeseen circumstances		1	1
No information given		1	1

6.3.5.1 Technical difficulties and platform instability

One of the reasons cited for not completing the program was technical difficulties. Hardware requirements at the time of the programs meant that not all standard computers could run the Second Life Viewer software required to access the online

environment. At the time of writing, this has become less of an issue as the base level computer specifications are higher for both laptops and desktops making more computers capable of running the Viewer software. The new issue about hardware is that more people are relying on netbooks, smart phones and small screen tablet computers and these either run the Viewer software too slowly to be functional or not at all. Three participants who withdrew from the program included technical difficulties with broken down computers or slow modems. Participants who did not drop out although they experienced lag issues with download speeds included the only potential facilitators amongst the group. As a result, the researcher ended up facilitating both programs.

6.3.5.2 Work circumstances changed and inability to access Second Life from work

An issue for all professional development programs is finding time in busy schedules for in-service professional development. Since this research was conducted in what Barab (2004, p. 2) describes as the contextualized "naturalistic setting" of the daily working lives of the participants as opposed to under the controlled conditions of a laboratory experiment, sometimes those busy lives overwhelmed the participants and they were unable to complete the program. The following excerpt from an email by a participant as they withdrew from the program identifies the access issue and also the workload problem.

> I am sorry but I will have to pull out of the Second Life learning group. One reason is that I have still been unable to get access from my work computer, and that is the only place I really intended to use it. The second is that my teaching load is excessive at the moment and with the addition of the [identifying detail removed] Conference that I am organising, I am starting to buckle under the load (Wendy, Program 2).

Since the participants were entirely made up of experienced teachers working full time, experiencing drop out due to changed circumstances and busy lives is not uncommon in any form of online learning as the following excerpt from the 2009 Sloan Report on online learning suggests. "This [drop out] may represent the different nature of the public institution's student mix, drawing a larger proportion of older, working students that might be more likely to suffer the 'life happens' events that would force them to withdraw" (I Elaine Allen & Jeff Seaman, 2010, p. 14).

6.3.5.3 Medical issues

As with any professional development program, the possibility of illness can cause drop out. One participant suffered a severe back injury in a "...car accident resulting in a back injury necessitated time off work and inability to sit for prolonged periods of time" (Email, Kate, Program 1). Fortunately, in an Action Learning Program, the participant could return and pick up where she left off. The virtual world may at times support participation by someone who has some form of illness or disability as it can be accessed from anywhere with an appropriately fast broadband Internet connection if the person is in a fit state to use a computer. Unfortunately, Kate also suffered a severe technical failure of her hardware and was without a computer capable of running Second Life for an extended period. Again, an Action Learning Program can cope with this as the participant would join back in when the problem was solved as long as the program was still continuing. The participant could even

join the next program if need be. In the end, however, Kate dropped out but not for either of these reasons. In the end, her workplace would not allow the Second Life program to be used through the government firewall so, without her home computer available, Kate could no longer participate at all.

6.3.5.4 Real life overwhelms virtual life

One Action Learner, who was participating in the sessions from her home computer as they were scheduled in the evenings, was overwhelmed by a number of issues that combined to lead to her dropping out of the program. Slow Internet access issues initially and a bad experience getting lost and turning up late for another event were followed by an incident that became the final straw. Here below is her email about leaving the program:

> On Wednesday I was going to attend the SL building meeting and unexpected visitors turned up! This is another issue for SLers. If it was a RL [Real Life] meeting I could say "sorry I was just leaving for a meeting" or more likely I wouldn't have been in, I would have been on my way to the meeting! I didn't feel as though I could say" sorry guys but I can't see you right now as I have to attend a meeting in SL. Sophie, Program 2

6.3.5.5 Nominated for the program without consent: Lack of buy in

In the second program, there were thirteen registrations for participation from a single school. These people were nominated by the IT Director at their school during a school vacation when they could not be consulted about their participation. This was done with the best of intentions to make the most of a timely opportunity for free professional development on a topic that would be needed imminently by these teachers. This Action Learning Program seemed to be an ideal professional development opportunity at a point in time just as this institution was embarking on a new virtual world project.

In the end, three of these people did not even commence the program and three more dropped out for various reasons but a key aspect was the lack of buy in from the participants. Data about the reasons for drop out came from email. None of the seven remaining participants completed the exit questionnaire.

This was also the only group who conducted some face-to-face meetings even though they agreed to use the virtual world for the whole program. Having access to a face-to-face alternative may have impacted their need and willingness to use the virtual world as they saw face-to-face as easier and more practical. This tension between the needs of the researcher and the practicalities of everyday life for the participants is a common characteristic of Design Research when conducting research in the naturalistic setting of a workplace as opposed to the laboratory (Barab & Squire, 2004).

6.4 Barriers to participation

A number of the reasons for drop out highlighted some of the barriers to participation in virtual worlds based online learning. Some of these are consistent with barriers to

the uptake of any kind of online learning such as technical difficulties or unfamiliarity with the software. However these were at times exacerbated or amplified in the virtual world environment. The following section looks at the barriers that were overcome and what barriers remained. As time passes in the ever changing environment of technology, some of these issues encountered in 2007 are no longer applicable to the Second Life platform at the time of writing. However they point to potential barriers in new and emerging environments.

6.4.1 Technical barriers

6.4.1.1 Quality and quantity of internet connection

The virtual world Second Life requires broadband access as the user-created environment is streamed, unlike a preloaded world such as you would find in a computer game. It has a high download that at times meant participants exceeded their download allocations and had to pay additional charges.[9] Some participants increased their access plans to pre-empt this issue whereas others, who would have willingly participated, were unable to get access to broadband. The following quote describes the experience of a participant with slow access:

> My broadband is not fast enough so that is a source of frustration (Email, Sophie, Program 2).

It was a challenge at times for participants to determine the reason that the technical issues occurred as it could be broadband, graphics card or Second Life instability. This made some participants consider withdrawing simply due to technical issues as this quote demonstrates:

> If it is because of my connection then I figure I won't be able to continue with your project (Email, Liz, Program 2).

6.4.1.2 Access through firewalls

Firewalls in institutions blocked access by default for security reasons as special ports needed to be opened. At the time of the trials and again now at the time of writing, an extensive investigation via web search, email list enquiry and email with the company technical staff, the researcher was unable to find any publicly recorded security breach created by this process. Despite no evidence of breaches, thousands of other institutions allowing access through their firewalls and improved firewall security tools such as stateful inspection[10], many network security staff still blocked

[9] In Australia at the time of the research (2007) broadband Internet suppliers impose download limits that differ from vendor to vendor and plan to plan. Download limits were relatively low for the price paid compared to the US participant. Often DSL broadband plans were 'shaped' (slowed to dial up modem speeds) when maximum download limits were reached for the month. Since Second Life™ downloads a large amount of data, some participants were affected when they reached their download limits for the month because their access to the virtual world was slowed to a point where it became unusable. Participants with Internet access plans that had no shaping but were limited by volume were unable to connect to the Internet from home if they reached their maximum downloads for the month. Accessing virtual worlds has become easier over time because volume limits have adjusted upwards, cost of access is dropping and access speeds are increasing.

[10] Stateful inspection http://en.wikipedia.org/wiki/Stateful_firewall

access to Second Life through their institutional firewalls stating an unacceptable level of risk to the network security.

> Having trouble working through the server issues at school. Have already used a couple of hours and 4 helpdesk staff, and have not yet downloaded the software (Email, School teacher, Harry, Program 2).

This highlights the broader issue in the educational use of technology of IT technical staff making uninformed decisions that have a negative impact on teaching and learning by both staff and students. When access to learning is blocked by technical staff as opposed to them managing risk, the potential of a technology to provide access to professional development or student learning is denied. This scenario was common for several participants in the program as these two posts confirm.

> I was unable to get access to Second Life from my work computer and as I had planned to use Second Life for work purposes, I decided there was no point continuing unless I had that. I was also somewhat overwhelmed by the concept. This might have been reduced had I the chance to practise at work (University academic, Wendy, Program 2).

Similar issues were faced by this government employee.

> I am unable to access SL [Second Life] from work computers due to [workplace name removed] access restrictions. (Government education department staff member, Kate, Program 1).

Even in the projects that participants were planning, this same issue was a major stumbling block to acceptance of the platform as the following quote from a participant organising online staff meetings demonstrates:

> Several are in the position of having to wait to get access to SL from their workplace. This has created a major barrier to date...Unfortunately, because of the delay I can see the initial excitement and acceptance being eroded, and the likelihood of success reducing, unless the purpose is seen as being compelling enough to overcome the issue/s (Distance education teacher, Teresa, Program 2).

6.4.1.3 Graphics cards

As Second Life required a relatively high level of graphics capability, the unacceptably low graphics card was enough to make the computer useless for accessing the program.

> A broken computer and the need to use an old laptop at home compounded this as the laptop specs meant that I was unable to download SL [*Second Life*] at home (Questionnaire, Kate, Program 1).

6.4.1.4 Stability of the viewer software and the virtual world platform

At the time of the study, the Second Life virtual world environment was somewhat unstable and resulted in regular crashes of the Viewer and unscheduled system downtime. Participants never knew if the virtual world or their hardware or Internet

connection was the issue. Over time the stability of the Second Life platform improved dramatically but during the study, crashes, downtime and constant updates plagued the program and impacted the participants confidence and participation as these two quotes exemplify.

> Whilst I'm successfully accessing SL, the system repeatedly crashed and the previous night of course SL was shut down. I'm really not sure if it's the SL programme or my own...When I next logged in I got a message to say that new upgrades were required. Ever since doing these upgrades I have crashed every time I log in... approx 2-3 min after arriving (Email, Liz, Program 2).

Similarly, this participant encountered issues logging back into the virtual world.

> Sorry about last night - I bowed out to eat dinner and when I tried to come back SL froze my computer and then I had a blue screen fatal error and could not re-enter with my avatar. This fatal error is something that I have only experienced with SL and I had no other applications open. Do you have any ideas on why this might be happening? (Email, Louise, Program 2).

6.4.1.5 Platform

All participants but one were using Apple Mac or Windows based computers. Both of these platforms were fully functional and supported by Linden Lab, the provider of Second Life. However, one participant chose to use a Linux based computer to test the level of access and support for that platform. This was another element of using any technology, not just virtual worlds, that must be considered. Users may be using any of these technologies and platform choice can limit participation. With the growing number of more powerful mobile devices including netbooks, tablet computers (such as the Apple iPad and Android based tablets) and smart phones, it can no longer be assumed that learners will have access to a computer capable of running the virtual world environment chosen. As new web based virtual worlds become available and existing Viewer based virtual worlds mature, it will be interesting to see how platform, operating system and device affect the access to and the affordances of new and existing virtual worlds for Action Learning.

6.4.2 Technology problems – impact

Internet access is essential to participation so, in the same way that being sick will prevent participation in a face-to-face class, technological issues with 'sick' computer hardware or Internet access will result in lack of participation. One difficulty arises when participants have no other way to notify their colleagues in the Learning Set, such as a phone number, then people can hang around waiting for participants to arrive. For globally dispersed participants, even phone contact may be impossible due to cost. By establishing a group norm and agreeing to start meetings promptly on time with the people who are present, it may be possible to reduce the angst created by people having to wait around for tardy group members. Being late can also cause distress as this email demonstrated.

> For the first meeting I teleported myself to Terra Incognita OK but then started to panic as I got lost and was late for the meeting. Everyone was very helpful (Email, Sophie, Program 2).

6.4.3 Operational barriers

6.4.3.1 Familiarity with the interface: Gamers and Non gamers

The radically different interface of a 3D game-like environment was a challenge to some participants summed up in this quote from the questionnaire about prior experience,

> I was a total newbie [to virtual worlds], who found the gaming environment completely strange and uncomfortable. My equipment meant that everything was very slow and tedious which did not assist the experience. It is an environment that I'm determined to explore as I can see it is the way to reach many students who thrive here. However in order to do this I need 2 favourable conditions... equipment that will cope happily with this tool and time to devote to becoming familiar and comfortable within this world, so that will free me to think of the applications that I can use/share with others (Questionnaire, Barbara , Program 1).

Participants with a long history online using many new technologies also found they had to adapt and learn new skills because the interface to 3D was so radically different.

> When my 19yo walked past me last week and laughed and said to his brother, “She doesn’t even know how to walk.” Then proceeded to explain his metaphor for the arrow keys (up arrow for accelerator, side ones for steering wheel). I had so many layers happening in my head...grateful for the help...amused that he found it funny... more amused that he does not appreciate that I have been in the online space longer than he has been alive! ...and feeling my age that despite that experience I am so uncoordinated! (First Learning Set Meeting Chat Log, Madeline, Participant, Program 2).

Gamers might expect that all 3D environments are the similar enough for transfer of skills and that it would be simple to use any 3D environment. The quote below from an avid player of World of Warcraft indicates that this may not be the case.

> This is so different from WOW - I thought that addiction would at least help me here - but now I think not (Notecard diary entry, Jane, Program 2).

It appears there is a potential threshold barrier at the point of entry into the virtual world environment for both novice and experienced gamers. It is vital to get participants over this hump with effective orientation processes as well as adequate and timely support to avoid early drop out.

From the early interviews with some of the experienced Action Learning Facilitators, their unfamiliarity with these types of technologies and the belief that these

environments lose too much of the cue-filled richness of face-to-face environments may prevent facilitators from even considering virtual worlds as a potential venue for Action Learning at all.

6.4.3.2 Timezone alignment

With participants scattered across the world, finding suitable times for Learning Sets to meet was a challenge. This would be much easier for Action Learning Programs that had groups of people in each timezone but was difficult in these programs where there was one individual in another country. This should be a consideration when planning programs. However the availability of the virtual world as a persistent environment that does not disappear or shut down like a web based conference room or audio conference, means that formal and informal meetings can be conducted at any time that is convenient to participants. It also means that there are many opportunities for participants to create their own informal meetings or to serendipitously encounter other program participants when participating in asynchronous elements of the program.

6.4.3.3 Time management

Just like any other learning event, work and family commitments compete with professional development for time and attention. Program participants who didn't respond to emails, group notices or Instant Messages or missed Learning Set Meetings, Core Learning Events or Elective sessions were often just overwhelmed by busy lives as the following two examples from participants' email messages demonstrate. This message below from a member of the group of ten from one school was explaining where several of the group had been after they didn't show up or answer messages.

> It is because they are in [location removed] for the week and yes [it's] also reporting time and last week of school (Email, George, Program 2).

At other times, participants had little to report on their projects due to competing priorities as this email message in response to the upcoming Learning Set Meeting indicates:

> I don't have much to report. I have had a 4 day school camp and 2 days at the QLD robotics championships to contend with since we last chatted!!! (Email, Matt, Program 2).

The following Table 6-7 lists the frequency and type of reason for absences.

Table 6-7: Reasons people missed events or did not complete tasks.

Reason	Program 1	Program 2	Total
Joined or started the program late	3		3
Technical issues (hardware faults or incompatibility, no firewall access , Internet, platform instability)	1	4	5
Medical (Illness or accident)	1		1
Other commitments (family, personal, work, study)	2	12	14
Missed email messages about events	1	2	3

6.4.4 Commitment to being active participants in the research processes

Although this was a research project, it was also a fully functioning Action Learning professional development program. One of the challenges of this type of Design Research was engaging the participants in the research elements including data collection activities. Some people just ignored the commitments to report and contribute to the data collection, especially the questionnaire at the end of the program. Only seventeen of the thirty-two participants who completed the program completed the questionnaire.

6.5 Facilitation

Plans were in place during the early stages of the research to use two facilitators who had been trained in the process of Action Learning. One had conducted Action Learning based courses in a face-to-face environment. The other had conducted them in an online environment using a Learning Management System (LMS). These two facilitators would have bought these two different experiences to the planned courses. As it turned out both these potential facilitators were unable to take on the role at the time the courses took place. The first was involved in a car accident. The second found the environment very alien and challenging to master and did not have appropriate broadband access so it was decided to include her as a participant. If, by the second program, her confidence and access improved, she could take on the role of facilitator in the second program. This did not eventuate as neither of these prerequisites was met when her delayed installation of quality access prevented her from gaining the required experience.

6.6 Workplace Projects

There emerged a very diverse range of workplace projects and many advanced to completion whilst others carried on after the end of the formal program. Table 6-8 below lists the projects from their early descriptions by the participants and the educational sector in which they were conducted.

Table 6-8: List of project topics arranged by program including completion status.

Project topics	Education Sector	Program 1	Program 2	Project Completed	Project Incomplete
Part of a group from a single school starting a cross curriculum, international teen project using virtual worlds.	K - 12		8	5	3
Identifying the Curriculum applications and pedagogies of Second Life for educational contexts.	K – 12 and teacher professional development.	3	2	5	

Project topics	Education Sector	Program 1	Program 2	Project Completed	Project Incomplete
Exploring the educational potential of virtual worlds for professional association and state education system.	Professional development of teachers	2	3	5	
Professional association and education department partnership trail of virtual worlds in schools.	K – 12 and teacher professional development	1	2	3	
Presenting and facilitating an event in the Second Life environment challenge because it involves trying to bring together people from remote areas within a virtual environment to promote cultural sensitivity and an idea of global issues.		1		1	
Incorporating virtual worlds in teacher preparation, post graduate supervision, as part of a university research grant.	University		1	1	
Use of virtual worlds in middle school French language learning.	K - 12		1	1	
Online staff meetings in Second Life for distributed distance education teachers.	Teacher professional development and administration		1	1	
Mixed reality drama incorporating virtual worlds and a physical environment.	K - 12		1	1	
Exploration for incorporation into the program for an after school gaming group.	K - 12		1	1	
Considering SL for architectural students as a gallery for student work.	University		1	1	
Impact of Second Life on emerging spirituality in teens.	K - 12		1	1	

Project topics	Education Sector	Program 1	Program 2	Project Completed	Project Incomplete
Considering Second Life for a teacher community using Critical Friends consultancy protocol activity to compare the visual experience with one similar in just chat.	Teacher professional development		1	1	
Explore virtual worlds for using in schools who use gaming in the curriculum.	K - 12	1		1	
District administration awareness raising program about virtual worlds using weekly tours and discussion.	School administration	1		1	
Explore virtual worlds as an extension of MOO and MUD use for non linear narratives	K – 12	1		1	
English language learning and teaching in SL	University - teacher preparation		1	1	
Incorporating virtual worlds in psychology training.	University		1		1
Dropped out before project chosen		3	2		5
Totals		13	27	31	9

6.7 Course Administration

6.7.1 Learning Set Administration

Each cohort attempted to hold at least three Learning Set Meetings over the three month period after the orientation session. Some of these meetings were facilitated by a Learning Set Adviser (the program facilitator who was also the researcher), others were self-managed by the Set members using the sample agenda and protocol to guide the structure and process based on suggestions from Weinstein's book, Action Learning: A Practical Guide (1999, pp. 109-124).

It was interesting that online learning appealed to some who were very close geographically but, as demonstrated in this quote from email, busy lives made getting together less common than one might expect.

> It is nice that our Learning Set consists of [members from one city- name removed] and I'm excited about how many things we therefore have in common - yet rarely actually meet in such a small city! (Email, Liz, Participant, Program 2).

The program was conducted mostly synchronously with people in groups online at the same time. Sometimes for Core Learning events and electives, two sessions on the same topic were scheduled to allow for the challenges of aligning timezone or diary clashes. Some of these content activities were also asynchronous activities.

As a result of scheduling taking an inordinate amount of time for the facilitator during Program 1, and to encourage self-management in the Learning sets, in Program 2 a coordinator was nominated for each Learning Set. Their role was to schedule Learning Set Meetings and send out reminders such as the ones in these examples:

> How would it suit if we meet this Thursday 19th at 8 pm in the Tree House? (Email, Liz, Learning Set Coordinator, Program 2).

A second example includes some sharing of personal information.

> Hope you're all enjoying this gorgeous weathered weekend... I've been very domestic and done a premature "spring" clean (of the kids' rooms in particular) which now requires a trip to the tip! Yes it is possible to continue living in the normality of RL as well as play in SL. What a juxtaposition of entities! (Email, Liz Learning Set Coordinator, Program 2).

Learning Set meetings were scheduled for maximum participation but people still missed some of these for various reasons. Family and work commitments at times clashed with the meetings and some people experienced technical issues with broadband services or their own computers. The need for regular updates of the viewer used for Second Life at times caused people to be late if they went to log onto the system only to find they had a mandatory download to complete before they could attend. Telephone contact and email to the facilitator or the coordinator for the set at times solved these problems.

6.7.2 Learning Journals

Only four participants elected to complete a blog based learning journal, three were in the first program and one in the second program. One participant posted journal documents to the researcher by email and one used notecards in the virtual world as a form of journal and delivered these to the researcher in-world. Part of the issue may have been that setting up a blog was an unfamiliar activity to the group, a process underestimated by the facilitator and attested to by this blog post by one of the few who used blogs even though he was a very technically capable participant:

> Setting up a blog for a Secondlife (sic) Action Learning Project is a task in itself - you get that. (Blog Post, William, Program 1).

The blogs provided addition data for the researcher to support or challenge the prototype and the overall suitability of the environment for Action Learning. Participants' comments in the blogs showed that they too were identifying the strengths and challenges of the environment for their workplace projects as this post indicated.

> Some attendees expressed the feeling that the keyboard chat method in SL was perhaps no better than any normal Internet chat tool, so questioning the value of SL as a simple communication tool. The notion of the simulated realism in SL, and its worth in activities like meeting or learning is an interesting one. My background in [industry detail omitted to maintain anonymity] simulation suggests that even the most rudimentary environ simulation can add a significant amount of perceived realism. That realism, although limited by the model implemented, does very much affect the value of learning activities such as role-play...even just sitting together can generate a feeling of belonging. I have noticed this myself when meeting with a new group of friends. (Blog post, Geraldine, Participant, Program 2).

6.8 Program Orientation

In both programs the meeting that provided an orientation to Action Learning was conducted using streamed audio. This is a one way audio channel into Second Life. This made it more personal and prosodic elements were able to add an additional dimension to the dialogue, something that is missing in the text only chats normal in the virtual world at the time of the programs. Participants responded in text chat to the facilitator and each other.

> The meeting was amazing. The sound was as clear as a bell. (Email, Participant, Program 2).

Voice chat was only introduced in beta at the very end of the first program. It required download of a beta version of the Viewer and was challenging to set up and relatively unstable. A few participants actually tried it as this blog post from a Learning Journal shows but this was from a participant who had completed the first program and continued their blog until their project had been completed some weeks after the celebration event at the end of the program.

> Recently, I had the good fortune to meet a Voice mentor who explained to me that I needed to download the First Look (Voice) client if I wanted to attempt to use the Voice aspect. We debated the merits for using Voice in the various SIMS of Second Life and both agreed for educational aspects it was most suitable. We also agreed that when in Role Play situations, text is definitely better! I sent a group notice to the [*project group removed*] SL members in order to pass on the information in the hope that we might get together and try it out. (Learning Journal Blog Post, Geraldine, Participant, Program 1).

No Learning Sets used voice during the second program of Action Learning although it was gradually improving. Now that voice is available within Second Life, this would be the preferred method for conducting all meetings and events during Action Learning although the value of the chat log as a record of a Learning Set Meeting has some merits.

An important change from Program 1 to Program 2 was the use of additional staff during the Orientation process. There were many new users and people experienced technical difficulties and required assistance and catch up when they were distracted

and missed the audio. By having an experienced assistant on hand, there was additional help for the steady stream of questions from the new users, affectionately known as nOObs. This assistant was a participant in the first program so was very familiar with the environment and empathetic. Separating technical support from the program delivery was extremely helpful for relieving the facilitator of all the technical side of the process allowing time to concentrate on the Action Learning aspects and answer more in-depth questions about the process and the projects.

The second part of orientation was the Orientation Party, an activity-based skill development session based around games and a dance party. The intent of this event was twofold. Firstly it was designed to reinforce, in a fun and relaxed way, all of the elements of the interface including communication tools, avatar movement and animation, using objects, changing clothing, managing inventory and search. Secondly it was a social event with lots of interaction between participants with the intent of building a community of learners who knew a little about each other and who could form Learning Sets. This was a highly successful strategy as this entry in one participant's blog demonstrates:

> After the 20 min presentation we all gathered near the Surf Club to practice our interface skills (movement, menu manipulation etc) all through games such as mud-wrestling, dart-throwing, and hangman. Of course trained teachers would recognise this as being where most of the learning actually took place for most of the learners. I will definitely incorporate games and fun activities into my learning delivery strategies. Blog post Wednesday, June 27, 200, Fred, Program 2.

6.9 Transaction Distance: Social presence and satisfaction

This study used Moore's theory of transactional distance (M. G. Moore, 1990, 1991, 1997) in developing the design of the virtual world based distance learning environment prototype used in this research. In Action Learning the role of teacher is distributed between the facilitator and participants because of the active role each participant plays in the learning of other participants during the Learning Set Meeting. Four methods were used to determine if the transactional distance was low for the element of dialogue which, in chapter two, was shown to be the vital element for Action Learning to be successful. Data collection targeted social presence (immediacy and intimacy) and satisfaction. The methods detailed below included chat log transcript analysis, self-reporting of social presence using a questionnaire that included two different scales, observation by the researcher and analysis of email and Learning Journals for relevant statements about social presence or satisfaction.

6.9.1 Triangulation

To achieve triangulation of the data, multiple measures of social presence were used. Transcripts of chat logs of the events were coded and the resulting Social Presence Density (Rourke, et al., 2001) was calculated. Participants self-identified their levels of social presence and satisfaction in the modified Global Ed Questionnaire (Gunawardena & Zittle, 1997). The questionnaire results include the Global Ed Social Presence used in the Gunawardena and Zittle study. These were used in conjunction with observation by the researcher and other participants and evidence

from email comments and Learning Journal entries that identified evidence of immediacy and intimacy, satisfaction and successful Action Learning events.

The following blog post from a Program 1 participant's blog attests to that group's success as a Learning Set:

> On June 10th I attended a final Learning Set Meeting with several others who had been taking part in their own Action Learning Projects. We all agreed that we had learnt so much participating in our varied projects. The chance to bounce our thoughts and ideas around with like-minded colleagues, even though they may have been in other parts of the world, was seen as the most important aspect of this sort of learning experience. A community linked by socially constructed knowledge and ideas. Blog post after Celebration event, Geraldine, Program 1.

6.9.2 Social Presence Density

Transcripts of the first Learning Set Meeting of two Sets, both with 4 members and the facilitator present, one set from each of the two programs, were coded using the Social Presence Density coding scheme developed by Rourke, et al (1999). This coding system identifies evidence of affective elements, interaction, and cohesive elements as indicators of social presence in text based chat logs as listed below in Table 6-9. Each line in the chat log was analysed as a unit. Two categories, marked with ** below, had a slightly different meaning in chat than they would have in a forum. Continuing a thread and quoting from a message in a threaded forum discussion differs in the chat context. In a forum, participants can use the reply feature that includes other messages in the body of the reply. When used in chat log analysis, these elements take on a different meaning without this reply feature. Chat is often typed in small, one line chunks to provide the "listeners" (readers) incremental parts of a longer statement within a conversation. This prevents long pauses and interruption of the flow. Experienced chat users will often put an ellipse at the end of these lines to indicate to others that they have more to say as shown in David's chat below. This also lessens the incidence of intertwining of multiple threads of several concurrent discussions.

> [3:15] David Avatar: I have two main interests in this. One is to see how effective the virtual space is for showing graphic design and artwork…
>
> [3:15] David Avatar: The other is to assess if the virtual world is a way of encouraging greater collaboration amongst the students.
>
> David, participant, Program 2, Learning Set Meeting.

Since each individual line of chat was used as the unit, the above post would form two entries with the second being coded as "continuing a thread".

Table 6-9: Model and template for assessment of social presence in text chat logs in the virtual world.

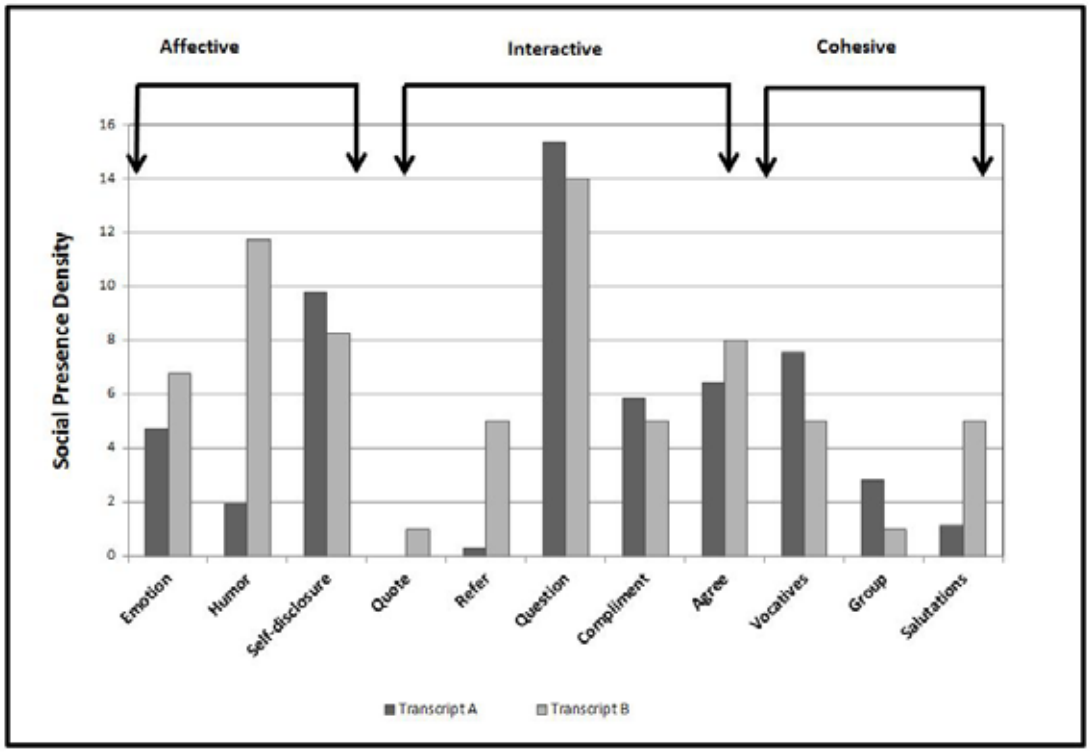
Social Presence	Indicators	Definition	Examples
Affective	Expression of emotion	Conventional expressions of emotion, or unconventional expressions of emotion, includes repetitious punctuation, conspicuous capitalisation, emoticons.	Sorry I'm so late; LOL; ☺; wOOt; that is so typical!!
	Use of humour	Teasing; cajoling; irony; understatements; sarcasm.	<joke!>; "the matrix is a little slow to the islands";
	Self-disclosure	Presents details of life outside class; or expresses vulnerability.	
Interactive	Continuing a thread	Using reply feature of software rather than starting a new thread.	** No reply feature so this was used to indicate continuing a single speaker's dialogue as well as a new speaker talking about the same topic.
	Quoting from others messages	Using software features to quote others entire message or cutting and pasting selections from others' messages.	** As there is no feature that does this, quoting was used to mark repeated phrases from a previous statement by another person.
	Referring explicitly to others messages	Direct references to the contents of others' posts.	"You just said…"; "When you were talking about…"
	Asking questions	Students ask questions of other students or the facilitator.	"Do you think…?";
	Complimenting or expressing appreciation	Complimenting others or contents of others' messages.	"Thank you"; "Great!"; "That's a really good question"; "greatly appreciated".
	Expressing agreement	Expressing agreement with others or the contents of others' messages.	
Cohesive	Vocatives	Addressing or referring to participants by name.	"Decka, I was just …"
	Addresses or refers to group using inclusive pronouns	Addresses the group as we, us, our group.	"I think we're all ready" ; Just mindful of our time".
	Phatics, salutations	Communication that serves a purely social function; greetings; closures.	"Hi everyone!"; "Bye all!"; "OK. let's go.";

*Based on Model and Template for Assessment of Social Presence (Rourke, et al., 1999, p. 61)

Table 6-10 below shows the results of analysis of two chat logs from the virtual world based events. In Transcript A 3584 words and in Transcript B 5450 words were coded. The participant researcher was the only one coder who coded the samples which limits the reliability of this analysis. To compensate for this, two

other methods of measuring the social presence were also used to validate the findings and the results of the section 6.9.3.

6-10: Social Presence Density[a] of all indicators in Transcript A[b] and transcript B[c].



a) Social Presence Density = total number of social presence indicators coded in transcript/total number of words in transcript. (Incidents per 1000 words.)
b) Transcript A: Number of words (n=3584), aggregate social density = 56
c) Transcript B: Number of words (n=5450) , aggregate social density = 72

High levels of Social Presence Density were indicated in the analysis which indicates that even though this group were newcomers to the virtual environment in which the meeting was conducted, they were able to engage in a dialogue rich in social qualities. This is indicated by the amount of self-disclosure, use of salutations, compliments and vocatives as opposed to a "terse exchanges of information in a purely pragmatic manner" (Rourke, et al., 1999, p. 57).

6.9.3 The Adapted Global Ed Questionnaire

The fourteen social presence questions that "embodied the concept of 'immediacy' as defined in the literature" (p. 15) from the Global Ed Questionnaire (Gunawardena & Zittle, 1997) were used to measure social presence. The items were slightly adapted to reflect the context and administered at the end of the program. Question wording was altered slightly to remove the word "conference" and replace with "Action Learning" and the name "Global Ed" and replaced with "Second Life". It was delivered online only using the web-based Learning Management System (Moodle) that was also used by the researcher/facilitator as a document repository during the program. Participants had not used this environment for accessing documents. The ten questions used to create a satisfaction scale in the same questionnaire were also used. Sixteen (50%) of the participants who completed the program also completed

the questionnaire. Responses to all the social presence questions can be found in **Error! Reference source not found.**.

6.9.4 Analysis of the Social Presence items

Overall participants' responses indicate that social presence was high during their Action Learning Program with a lower feeling of comfort at the beginning of the program when introductions were being made and many were new to the environment (75%) as compared with later in the program when they were participating in the Action Learning Set Meetings (94%). At that time their avatars were not yet customised and the participants had not yet mastered smooth movement and control of their avatars. Concerns about appearance and clumsiness that were obvious in the transcripts on the first night were less evident for many in the following events and reduced significantly over time especially for those who took some time to practice in between the scheduled events.

Table 6-11 Questionnaire Items in the Social Presence Scale (n=16)

#	Text	P1 Mean n=6	P1 SD	P2 Mean n=10	P2 SD	Both Mean *n=16	Both SD	% Agree & S. Agree	Difference P1 to P2 Means
1.	Messages in Action Learning in Second Life were impersonal. **	3.17	0.98	3.9	0.74	3.38	1.02	56%	0.73
2.	Computer-mediated communication is an excellent medium for social interaction.	4.50	0.55	3.6	0.84	3.94	0.85	75%	-0.90
3.	I felt comfortable conversing through this text-based medium.	4.67	0.52	3.8	1.55	4.13	1.31	88%	-0.87
4.	I felt comfortable introducing myself during Action Learning in Second Life.	4.00	1.10	3.6	1.43	3.75	1.29	75%	-0.40
5.	The facilitator created a feeling of online community.	4.00	0.63	4.0	0.47	4	0.52	88%	0.00
6.	The introduction enabled me to form a sense of online community.	4.67	0.52	4.0	0.94	4.24	0.83	88%	-0.67
7.	I felt comfortable participating in Action Learning in Second Life discussions.	4.33	0.52	4.2	0.63	4.25	0.58	94%	-0.13
8.	The facilitator facilitated discussions in the Action Learning in Second Life.	4.50	0.55	4.1	0.57	4.25	0.58	94%	-0.40
9.	Discussions using the medium of computer-mediated communication tend to be more impersonal than face-to-face discussion. **	3.33	1.03	3.4	1.17	3.25	1.13	56%	0.07
10.	Computer-mediated communication discussions are more impersonal than audio conference discussions. **	3.33	1.03	3.4	0.70	3.5	0.73	63%	0.07
11.	Computer-mediated communication discussions are more impersonal than video conference discussions. **	3.00	1.10	3.0	0.82	3.13	0.89	44%	0.00
12.	I felt comfortable interacting with other participants in the Action Learning Program.	4.67	0.52	3.6	1.17	4.00	1.10	88%	-1.07
13.	I felt that my point of view was acknowledged by other participants in Action Learning Program in Second Life.	4.33	0.52	4.1	0.88	4.19	1.10	94%	-0.23
14.	I was able to form distinct individual impressions of some participants in the Action Learning Program in Second Life.	4.17	0.41	3.9	1.10	4.19	0.75	88%	-0.27

*Likert scale used: 1 =Strongly Disagree 2=Disagree 3= Uncertain 4=Agree 5=Strongly Agree

** These items in the questionnaire were reverse coded for analysis. P1=Program 1. P2 – Program 2.

6.9.5 Satisfaction

In total 94% of the participants who responded to the questionnaire felt they were able to learn in this environment and found it a useful learning experience and 88% would participate in Action Learning in this environment again. (See questions marked with ** in **Error! Reference source not found.** below.)

The 44% who identified they had to put in a "great deal of effort to learn" how to use the environment (see question marked with *** in **Error! Reference source not found.** below) is slightly less than the 50% who said they had no experience whatsoever with games or virtual worlds. This suggests that further research is needed to determine if the effort required learning the environment is a deterrent to participation and a challenge to completion of programs.

Overall in both programs there were high levels of satisfaction with the Action Learning Program suggesting that the methods used in the virtual world of Second Life were effective in achieving the conditions to conduct an Action Learning Program for these participants. Differences on key indicators between the groups are not significant.

Table 6-12: Questionnaire Items on the Satisfaction Scale (n=16).

Item #	Text*	P1 Mean n=6	P1 SD	P2 Mean n=10	P2 SD	% Agree & S Agree	Both Mean n=16	Both SD	Difference P1 to P2 Means
1.**	I was able to learn through the medium of computer mediated communication.	4.83	0.41	4.20	0.63	94%	4.44	0.63	-0.63
2.**	I was able to learn from the Action Learning in Second Life discussions.	4.50	0.55	4.10	0.88	94%	4.25	0.77	-0.40
3.	I was stimulated to do additional reading or research on topics discussed in Action Learning in Second Life.	4.17	0.75	3.60	1.43	69%	3.81	1.22	-0.57
4.	I learned to value other points of view. As a result of my experience with Action Learning in	4.00	0.63	3.40	0.84	56%	3.63	0.81	-0.77
5.**	Second Life, I would like to participate in the use of another 3D virtual world as a learning environment in the future.	4.67	0.52	4.00	0.67	88%	4.25	0.68	-0.67
6.**	Action Learning in Second Life was a useful learning experience.	4.67	0.52	4.40	0.70	94%	4.50	0.63	-0.27
7.	Projects like Action Learning in Second Life enhance face-to-face courses. As a result of my participation in Action Learning in	4.67	0.52	4.00	0.82	81%	4.25	0.77	-0.67
8.	Second Life, I made acquaintances electronically in other parts of the country/world.	4.33	0.82	4.00	0.94	81%	4.13	0.89	-0.33
9.	The diversity of topics in Action Learning in Second Life prompted me to participate in the discussions. I put in a great deal of effort to learn the computer mediated	3.83	1.17	2.90	1.10	44%	2.88	0.81	-0.93
10.***	communication (3D virtual world) system to participate in Action Learning in Second Life.	3.33	1.51	3.00	1.25	44%	3.13	1.31	-0.33

*Likert scale used: 1 =Strongly Disagree 2=Disagree 3=Uncertain 4=Agree 5=Strongly Agree

** Questions indicating success of this environment.

*** Question indicating how much effort was required to learn the environment.

For validation of the instrument in the original study, the Global Ed Questionnaire also included seventeen semantic differential items taken from Short, Williams and Christie (Short, et al., 1976). Strong positive correlations (varying between .58 and .87) were found between the social presence scale and the semantic differential items, supporting validity. Social presence was found to be a strong predictor of satisfaction. The validity of the Global Ed Questionnaire has therefore been established so the bipolar questions are not used within this study.

6.9.6 Modifications from Program 1 to Program 2

Members of the first group successfully negotiated access to the virtual world and achieved their goals to create and implement a workplace project with the only attrition being due to a car accident and changed work conditions. One participant who had limited connectivity partially completed the program, was unable to complete a project and stayed positive about the benefits of virtual worlds for Action Learning right to the last session. Both the satisfaction and social presence responses indicated that the virtual environment was achieving the intended outcomes.

There were few dramatic changes in the larger second program due to the success of the first program. There were many minor refinements to the environment as a result of comments from participants and issues encountered during the first program. Additional signage was erected on the island to make navigation simpler and the addition of automatic lights that allowed participants who did not know how to control the daylight settings to work on the island when the world was in the darkness of night. Feedback from participants indicated that the signage helped make meeting locations easier to find. Fewer participants arrived late and this meant meetings started promptly.

More personalization of identity was made possible by a larger range of resources available in the stores and a wider range of help notecards were added to the Resource Centre. Avatar appearance and its impact on users comfort levels and willingness to participate is another area worth investigating further including whether resistance to being an avatar would prevent participation in the Action Learning Program entirely.

With the community growing with the alumni of the first program using the island, there were more people around the island for the new cohort to interact with as they created their avatars and began their own projects. Feedback from participants at events indicated the value of community in making new avatars feel more comfortable and being able to access just-in-time help. Providing a formal system of experienced technical mentors for a group or pairing each person with a buddy would have been another way to provide support for the early orientation process. Individual support was made available by the facilitator but in larger programs, this would not have been scalable. More in-world support and web based help in video and text forms could provide additional support for individuals.

The larger group meant that it was harder to coordinate Core Learning events so multiple offerings for the same event were made available where possible. Each Set had its own coordinator to manage date setting and reminders for the larger numbers in the second program. This reduced the administration overhead dramatically and aided autonomy of the Learning Sets.

By far the most common issue for missing events (53%) was time to participate with busy people challenged to find time to participate in the program because of formal study, work, family and personal commitments preventing them maintaining full participation. One participant expressed the challenge of turning guests away when faced with the choice of attending the virtual event of the Learning Set Meeting. At times people would log out because dinner was ready or children demanded their attention bringing into question whether virtual events were prioritized less than face-to-face events in the physical world that required travel to a different location. It is unknown whether this was related to the voluntary nature of participation in a free program with no academic credit or simply because the event was online and being accessed from home. This would be a fruitful area for further investigation as it relates to the success of all online learning not just the use of virtual worlds.

The most significant impacts on attendance in the program that were actually related to the virtual world were technical difficulties (19%) with computers that could not run the program without crashing or Internet bandwidth that was too slow or allowed too little download per month for this graphically demanding, bandwidth hungry environment. With adequate access to a stable environment, Action Learning using the prototype environment was a successful learning experience that left people willing to come back for more as this comment from a participant exemplifies.

> I am hoping that I can continue in the research, as I am far from finished and feel there is still lots to learn. I have found the environment stimulating, rich and the comparison to other online environments I use fascinating. Questionnaire comment, William, Program 1.

Chapter 7 - Design Principles

This study set out to investigate the affordances of virtual worlds for professional development using an Action Learning approach by designing a prototype learning environment purpose built for this role and using it to conduct two iterations of an Action Learning Program. After some preliminary investigations in ActiveWorlds, the study used the virtual world of Second Life but identified many elements that could be considered in the use of any virtual world for this purpose including orientation of new users, management of virtual Learning Set logistics and processes, creating conditions for effective dialogue in virtual worlds, and identifying the roles for virtual worlds in the education process. This chapter begins with the final phases of that process with discussion about local and broad Impact. It goes on to individually address each of the research questions originally stated in 1.6 with a summary of the findings of the study aligned to the questions addressed by this research.

This study drew on the experiences of Action Learning in the physical world to inform the design of the virtual places, tools and processes. Since many people want to participate in online learning instead of face-to-face learning for reasons of convenience, time efficiency or remote access (Lawson, 2010), this research study set out to determine how many of the same kinds of practices that successfully take place in face-to-face Action Learning Programs could be replicated using the virtual world. It also identified issues and barriers that were encountered and what new opportunities were created with the technical features and social processes that the virtual world afforded. Some of these affordances were due to the feature set of the virtual world itself with some being specific to the platform selected for the study (Second Life) and others being generic across many virtual worlds platforms. Some tools were created through customizations or the development of bespoke tools within this virtual world made possible using the in-built building and scripting tools of Second Life. The evidence in this study indicated that Action Learning Programs could be successfully conducted in the virtual world of Second Life. An opportunity exists for further research into the comparative effectiveness of the virtual and the physical environments for Action Learning Programs.

7.1 Researching a moving target

Research in naturalistic settings is at the same time enriched by the naturalistic setting and challenged by it (Barab & Squire, 2004, p. 4). A constant challenge to developing a set of design principles in this context was the ever changing feature set of the virtual world technology on which the study was based. This would have applied to almost any virtual world as these emerging technologies were in a state of continuous development during the period of the study (Johnson, et al., 2006, 2007) and continue to be at the time of writing.

7.2 The research questions

In the final phases of methodology used for the study, the ILDF, the following questions are suggested in the Local Impact Phase and will also be addressed in this chapter. They are:

> Is the enacted design usable, valid and relevant?

> Is the design instance accessible and efficient in delivering instruction or supporting learning?
>
> What is the local impact or effectiveness of the design instance?
>
> How effective is the design solution in achieving learning targets at its highest fidelity in full context? (Bannan, 2007, p. 54)

The Broader Impact Phase of the ILDF can "encompass an entire research effort in itself" (Bannan, 2007, p. 65) and this phase is still in progress for this research study. In this phase the following questions have been suggested and will be addressed in this chapter as they relate to the work of the participant researcher, the dissemination of the findings of the study, the potential for uptake by other Action Learning Facilitators and the future research potential that could follow as a result of the outcomes of this study.

> What factors influence diffusion, adoption and adaption of the innovation?
>
> What are the pragmatic demands of the learning environment that influences adoption of the design?
>
> What policies and cultures shape participants use of the innovation? (Bannan, 2007, p. 54)

The study was guided by the following specific research questions (as outlined in chapter one) that together addressed usability, validity, relevance and accessibility. As the first prototype of its kind, the study addressed effectiveness only in terms of achieving a workable environment not comparative effectiveness with other methods of delivery such as face-to-face or web based Action Learning. It did not address the question of efficiency in comparison to other methods of online or face-to-face delivery. These two areas would require further investigation. The research questions were:

1. In what ways can environments be designed in virtual worlds that can cater for Action Learning to be conducted?
2. What properties inherent in the world support the processes of Action Learning?
3. Can embodiment of individuals as avatars support social presence to create an environment suitable for Learning set dialogue?
4. Will it be possible to reduce transactional distance that would be indicated by high levels of social presence, high completion rates and high participant satisfaction with the program?
5. What bespoke tools and resources can be built in these environments to support Action Learning processes including:
    a. Various teaching methods employed for the Exploration Phase;
    b. The Learning Set Meeting and the role of the Learning Set Adviser;
    c. Personal reflection such as Learning Journals; and
    d. Program administration and management.
6. What barriers may prevent participation in virtual worlds based Action Learning Programs?

Chapters four, five and six address a lot of the detail of the findings driven by these questions and the processes used to address them. The following design principles, considerations and the guiding framework of the "Roles for Virtual Worlds in Education Typology" identify key points for deliberation when planning Action Learning Programs in the virtual world. These target the virtual world of Second Life but provide a starting point when considering designing learning environments in other virtual worlds, such as OpenSim[11], with similar feature sets. Future directions for continuing research are also embedded throughout this chapter which will begin by looking at the principles relevant to the overall design and prototype and how it functioned, identify the barriers to participation and issues encountered and then address diffusion, potential adoption and suggestions for adaptation of the model.

7.3 Opportunities for Action Learning in a virtual world

In this time of exponential change (Kurzweil, 2001; G. E. Moore, 1965) and knowledge growth when lifelong learning is essential , taking advantage of every online tool to provide access to quality learning experiences that actually change practice is important to both learners and their employers. At the beginning of the research process an overarching question was posed of whether it was possible to design and create an environment in virtual worlds that could cater for Action Learning Programs to be conducted? Within the Local Impact Phase of the ILDF methodology, whether the enacted design is usable, valid and relevant was questioned. Together these two questions address the possibility and practicality of this concept of virtual worlds-based Action Learning Programs.

The success of the prototype during deployment of two Action Learning Programs within the virtual world of Second Life was demonstrated by the 80% retention rate which compares favourably to retention rates other types of online courses that use other platforms. The majority of drop out could be attributed to technical faults, extremely busy lives compounded by changed work circumstances, or sickness. Ninety-four percent of respondents to the exit questionnaire agreed or strongly agreed that the Action Learning Program in Second Life was a useful and effective learning experience and that they would like to participate again in the future. This data leaves little doubt that the Action Learning Programs, as designed and delivered using the prototype, were functional in the virtual world.

Access to working technology and the online site used in the program applies to any online learning program whether it is based in a virtual world or on the web. However, access may be limited to those who can meet the technical requirements of fast broadband access and a compatible graphics card for rendering 3D graphics and this would be a consideration when considering an appropriate online technology for an Action Learning Program for a specific client group. This may also be a factor affecting adoption in certain contexts where there is limited access to high speed Internet and relatively high end hardware.

Although some of the richness of face-to-face communication is sacrificed in the leaner media of text and voice chat, virtual worlds provide suitable opportunities for online Action Learning Programs to be accessed by remotely located participants as

[11] OpenSim http://opensimulator.org/wiki/Main_Page

demonstrated by the high retention rates in the Action Learning Programs in this study, the capacity of the participants to successfully conduct their Learning Set Meetings and the successful projects completed as detailed in chapter six. This can provide flexibility, global access, a larger pool of participants and guests for programs, and reduce the time lost to travel minimising the interruption to work for in-service professional development. When employing virtual worlds based Action Learning, it is important to negotiate participant and facilitator access through corporate and institutional firewalls prior to commencement of programs to ensure participants can avail themselves of these opportunities without the technical issues that contributed in whole or in part to two of the participants dropping out of the programs in this research. Lack of access through the firewall could also prevent adoption and adaption of this prototype in such contexts.

With high completion rates and dropout mostly due to external factors such as technical faults, lack of firewall access and life commitments, the design of the environment withstood the test of use in that the vast majority of participants stayed in the program and achieved successful outcomes in their workplace projects and conducted Learning Set Meetings on a regular basis throughout the programs. Many of these participants have continued using virtual worlds in their contexts beyond the initial project as shown in Table 7-1: Where are they now (2011).

Table 7-1: Where are they now (2011).

	Group 1	Unknown Group 1	Group 2	Unknown Group 2	Total
Known to use virtual worlds in 2011.	7	4	13	8	20 of 32 still known to be using virtual worlds.
					12 No data available.

Beyond the formally organised Action Learning Program such as those in this study, the research highlighted the potential of the prototype learning environment and the associated resources and tool set to have further use by self-organised Action Learning Sets. This occurs in the physical world through professional associations and organisations that support Action Learning. The virtual environment could be used by self-facilitated, informal networks with minimal support providing there were enough self-help resources available such as those on the island of Terra incognita. The Resource Centre on the island provided publicly accessible resources on both Action Learning and Second Life in the virtual filing cabinets and tool boxes. The stores in the village contained free clothing for customising avatars. The games on the Play Deck supported both asynchronous and synchronous skill development in relation to the interface. Virtual worlds could, therefore, also provide a virtual venue for self-organising Action Learning Sets to meet and network. Public worlds such as Second Life, with the large user community, can also provide opportunities for skill development for these groups as they could tap into the range of other educational events available there. The wider this research is disseminated, the more chance there will be of others taking advantage of the opportunities for Action Learning that virtual worlds afford.

7.4 Publications and presentations

Dissemination of findings to others who could make use of the design also happened during the ILDF Broader Impact Phase. This research project involved creation and testing of a prototype that could be implemented and reused by the researcher and other online learning facilitators including the Queensland Government who were the funding body for the research. Hence an important outcome of the research has been disseminating this design to the Action Learning and online learning communities for adoption, adaptation and critique. This has the potential to stimulate more discussion and research. To disseminate information about the prototype, a range of activities was conducted and others are planned following publication of this document.

The researcher has presented 22 keynote addresses and conference presentations and participated as a presenter or contributor to 28 seminars, workshops, research symposia and meetings that were conducted in face-to-face, online and blended modes using a range of virtual conference environments and Second Life. These events have included many tours of the 3D prototype of the Action Learning environment to share the research in progress, prototype design and various tools and products. Journal articles and book chapters have been published about the prototype. Print-based dissemination includes contributions of one peer reviewed journal article and two book chapters. See Appendix D for the full list of dates, organisations and events and publications.

At the time of writing there are plans to pursue further adoption and adaptation of the existing design following the recent presentation of this the research at the International Federation for Action Learning (IFAL) Conference and AGM on the 27th October 2011 where the theme of the conference was “Action Learning and the Virtual World” (IFAL, 2011). As another future forum for broader impact of this research, it is intended to share the study at the next Action Learning and Action Research Association World Congress which is “held every two to three years to provide a global forum for people to meet to develop concepts, ideas and possibilities, exchange of experiences, ideas, and reflection on where we are 'at' in our thinking and practice”(ALARA, 2010). Since the previous one was in 2010, the next is not expected until 2012 at the earliest.

The program that was first used to trial Action Learning using virtual worlds at Appalachian State University has continued to develop courses based on this methodology with Dr. Sanders commenting, “I'm still very active in using Action Learning as a framework for teaching my classes. My students are likely sick of hearing me talk about it but they can't deny the impact that it's had on them or the amazing products they've developed in working through the cycle.” (R. Sanders, personal email, 16 June 2011)

7.5 Creating a 3D Action Learning Environment

In relation to research question one about whether environments could be designed in virtual worlds that could cater for Action Learning to be conducted and research question two about what properties of the virtual world could support the process of Action Learning, several components of the overall prototype will be addressed individually and design principles for each will be addressed within the following sections. It is difficult to separate discussion about the inbuilt feature set and the

bespoke tools that were the results of inquiry in research question five so this section will also address those tools that were custom made to meet the needs of the Action Learning Programs. As outlined in chapter four, experienced Action Learning Facilitators who use face-to-face methods identified several essential elements for an Action Learning Program. These elements formed the design brief and included facilities for large whole of cohort meetings especially at the beginning of programs and during skill development and smaller group meetings especially the Learning Set Meetings; access by participants to content and experts in the field of the workplace project during the Explore Stage of each Action Learning Cycle; access to tools for participants to create Learning Journals if they desired; and tools for recording notes from skill development sessions and Learning Set Meetings. These elements of the design will be addressed individually.

7.5.1 Locations for large and small groups: Form and function in the virtual world

When designing tools in a virtual world it is important to work within the parameters of the feature set of the virtual world to maximise functionality, not merely replicate the appearance of the physical world at all times. In Second Life, walls provide divisions in space but do not block sound so they do not afford privacy. A roof is not required for shelter since there is often no naturally occurring weather. Conventions of the physical world may constrain functionality if applied without forethought to the virtual world. For example, range between avatars in which text chat in Second Life can be received is twenty metres and the voice chat range is sixty metres. This means that two adjacent rooms provide no privacy for conversations conducted in text chat or voice chat as walls do not prevent voice or text chat from being "heard" by nearby avatars outside that room. To achieve privacy, rooms must be separated by a minimum distance greater than the sixty meters corresponding to the voice range. To achieve this, scattering buildings on the ground or teleporting avatars to gravity-defying rooms located in the sky, referred to as skyboxes, can provide the illusion of being in a room as well as the privacy that is out of earshot of the public. In this way, the privacy required for the Learning Set Meeting can be designed into the learning environment. When designing for functionality, the old architectural axiom "form ever follows function" (Sullivan, 1896, p. 403) also applies in virtual worlds and designers must work within the constraints of certain lost affordances of the chosen virtual world .

One of the bespoke tools that demonstrated the creation of specific tools to meet the requirement for both a large meeting area and small group discussion for practising Learning Set protocols was the building named 'Decka's Decks'. This modular building, made of interconnecting hexagonal pods as shown in Figure 7:1, allowed the small break-out groups to fly their pod to a private chat distance from other group pods as shown in Figure 7:2, or for all group pods to remain on the ground as a large group teaching space. This tool met the needs expressed by all the Action Learning Facilitator's interviewed prior to the design and worked extremely well in practice. Over fifty copies of Decka's Decks scripted buildings have been acquired by other educators in Second Life for use in a variety of educational applications. Reports in personal communication and blogs of its suitability for that combination of large group classes with small break out groups have been extremely favourable (Bogle, 2008; Ryan, 2008).

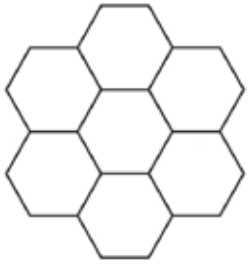


Figure 7:1: Pattern of interlocking pods for the group facility.

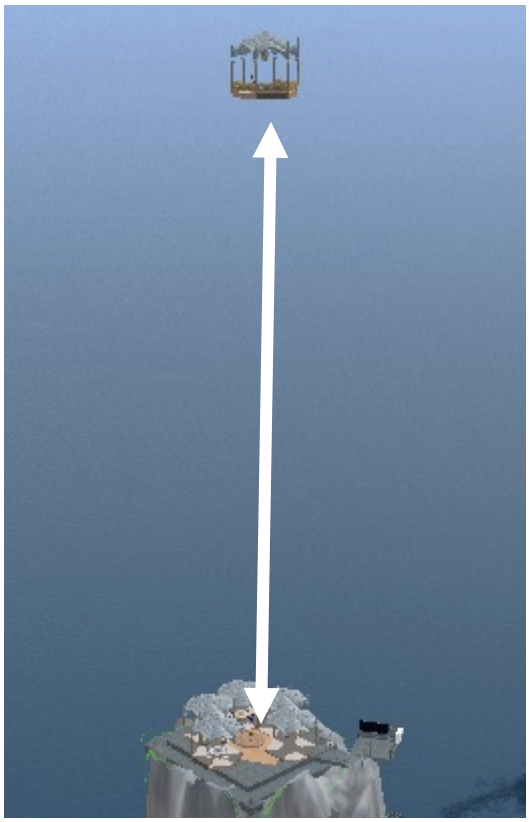


Figure 7:2 :The Deck's Decks building with a single pod at altitude.

When a pod is at altitude like the one pictured, it is out of chat range of the main building on the ground.
The arrow marks the trajectory of the pod when separating to private chat range or returning to the ground.

The remaining group pods are at ground level.

Several other scripted furniture items for groups that had been created by other Second Life users and were sold in the marketplace[12] were also purchased and used. The marketplace and other such online sources of readymade, scripted tools, provide a valuable source of affordable and, at times, free resources for the designer. See chapter five for more detail on these tools and their roles within the program. Access to a pool of amateur and professional content developers within the virtual world makes customisation of form and function possible and affordable on almost any budget.

[12] Second Life™ Marketplace https://marketplace.secondlife.com/

7.5.2 Reporting on Workplace Projects and the Action Learning Program themes

In Action Learning, participants are able to choose their workplace projects related to the content theme of the Action Learning Program which in this research was 'Teaching using 3D Virtual Worlds'. So this research project was situated in the context of an Action Learning Program for teachers and teacher educators conducted *in* a 3D virtual world (the course location) and was *about* teaching in 3D virtual worlds (the course content). However, the Action Learning Program could have been about any topic appropriate to teachers. Further research is needed using other topics where only the location of the program is the virtual world. This will determine if the prototype is usable beyond this local context. Further research using the prototype could also determine if it was a functional system for Action Learning for groups other than teachers.

Opportunities for using text and images when reporting about the workplace projects during the Learning Set Meetings were available using both the built in tools of the virtual world and bespoke tools. Second Life allows the creation of notecards which serve the role of digital paper. They were extremely limited in their capacity for formatting and used a clumsy method of showing images, making them barely adequate for the task. The additional cost of uploading images for inclusion in notecards although small, was annoying for participants who had no funds available in the virtual world to pay for this service.

As an alternative to including images as attachments to notecards, the building blocks of the world, called primitives (commonly abbreviated to prims), could be textured with images uploaded onto the virtual environment to create galleries about projects. Tools for displaying images have been created using the scripting tools and form a more elaborate graphical reporting system for sharing workplace projects and are similar to showing presentation slides in the physical world. This method still faced the issue of the cost of uploading the images.

One of the shortcomings of the virtual world at the time of the Action Learning Programs in this research was the lack of an effective, publicly viewable, note-taking tool to emulate the paper and markers or whiteboard of the physical world. However at the time of writing, this has been solved by the use of shared documents, such as Google Docs, made accessible in the virtual world on the media texture of a prim as shown in Figure 7:3 below. This method can also be used instead of the notecards or prim based galleries to avoid the cost of uploading images into Second Life.

Figure 7:3: Shared Google Doc as media on a prim in Second Life.

7.6 Emerging Technologies

7.6.1 Text and voice chat

As the technological landscape continues to change, the affordances of virtual environments are likely to expand as well. In the time between the beginning of this study and the end of the second trial of the prototype, voice communication became available as a feature. This change enriched the paralanguage capabilities including voice quality, rate, pitch, volume, and speaking style as well as prosodic features such as rhythm, intonation and stress that convey additional nuance to meaning. This richer medium has the potential to impact the quality and quantity of dialogue in Learning Set Meetings. It has also made communication easier and quicker. Although this was not tested during the program, ongoing use of the environment by the researcher has demonstrated the value of voice chat to dialogue in the virtual world during other teaching experiences. Interestingly, voice has not eliminated the use of text chat and a combination of both modes is commonly used in group discussions to ask questions of a speaker, make notes and sidebar points, to introduce group members rapidly and simultaneously and to avoid noise clutter in the voice channel. Private one-to-one and group voice conversations are also possible using the 'Call' feature which operates like a telephone and does not require participants to be within the sixty metre limit for local voice communications. In addition to these methods, people often still communicate privately using the text based Instant Message feature as a private back channel to discussions happening in public voice or text or to contact others who are not in the immediate vicinity.

The ability to record audio is a skill that requires additional software but would be worth exploring so that both the researcher and the participants could make use of the recordings for their reflection. Designing these recording tools into the processes for both facilitators and participants could, however, have an unexpected negative effect on communication. This may carry the risk of discouraging open discussion as the permanent record may make some participants uncomfortable about discussing

workplace issues. There is potential for further research about the use of voice in future iterations of the prototype.

Recently developed technologies emerging in the gaming community include haptic and web cam based interfaces, such as the Microsoft Xbox 360 Kinect (Microsoft Corporation, 2011), which use body movements and voice input as opposed to games controller, mouse or keyboard input. These are examples of the kinds of developments that could have a dramatic impact on level of detail in non-verbal communication during the use of virtual worlds in the near future. Interfaces that use the web cam to translate human movement and facial expressions to avatar movement have been demonstrated in experimental situations but are yet to be mainstreamed into Second Life. Technologies such as these have the potential to improve users' ability to access their other senses and to interact in ways that mirror their actions and facial expressions in the physical world by mapping them onto their avatar to add some of the currently unavailable facial expressions and body language cues. Figure 7:4 below shows where virtual worlds sit on the continuum of transactional distance of various media before and after these developments. The figure is based on the summary Figure 2:3 in chapter two that graphically represents Moore's continuum of transactional distance based on the medium of delivery .

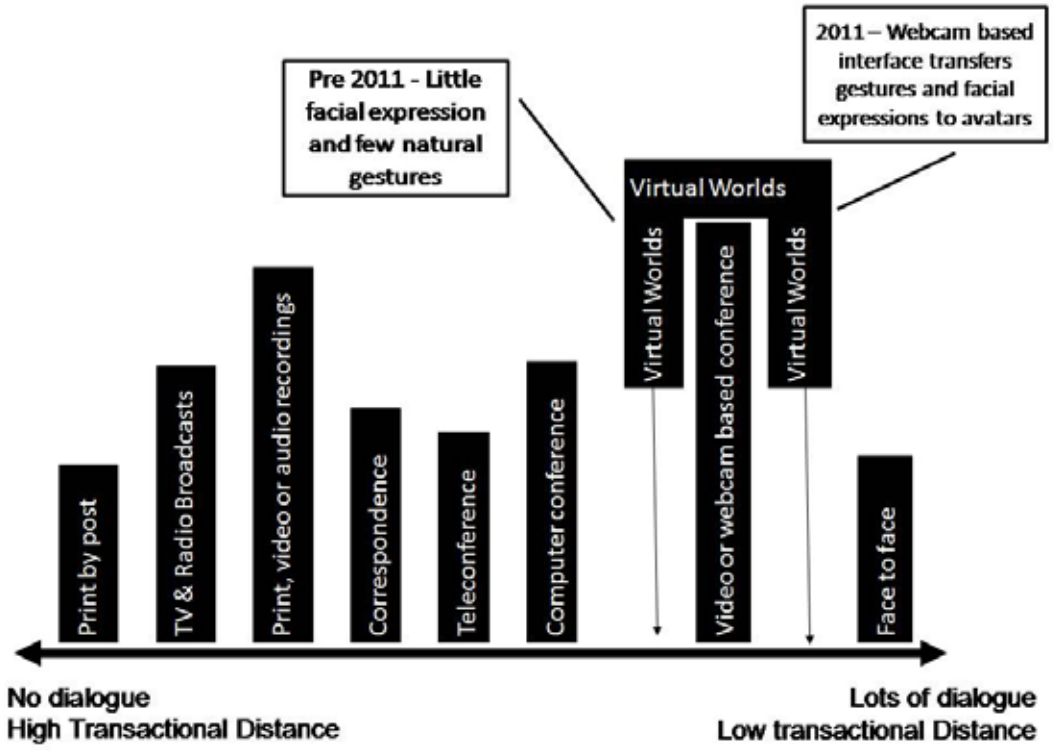


Figure 7:4 Modified continuum based on Moore's Theory of Transactional Distance that includes virtual worlds.

Changes in the Viewer interface to mimic the familiar web browser also have the potential to impact the user experience and reduce the technological barrier to participation in virtual worlds based Action Learning. Norman (2004) described

cultural constraints as “learned conventions that are shared by a cultural group” and these impact new users of 3D virtual worlds as they may not be able to carry over cultural conventions from other computer interfaces to the virtual world interface. During 2010 and 2011 there have been changes in the Second Life Viewer software towards the look and feel and functionality of the web browser in an attempt to bring more of the web browser conventions that are very familiar to many potential virtual world users. At the time of the research, however, there were many new conventions to learn when the Viewer software was encountered for the first time by new users. So the interface as well as the content displayed within that interface - the visual representation of the virtual world – were both potentially unfamiliar to the Action Learners as they approached the virtual world. If virtual worlds are to be used as locations for Action Learning, improvements that reduce the complexity of the interface at the threshold to entry have the potential to improve participation and retention.

7.7 The relationship of embodiment, environment and Transactional Distance

The third research question which asked if embodiment of individuals as avatars supported social presence, an essential condition for reducing transactional distance, was examined by looking at dialogue during the synchronous events of the Learning Set Meeting and Orientation activities. The exit questionnaire and the Social Presence Density measures provided a strong indication that social presence was high for the majority of participants. Since high social presence is both linked to satisfaction with online learning (Gunawardena & Zittle, 1997) and reduced transactional distance (Albion, 2008; Rourke, et al., 1999), the creation of an environment and processes that support high levels of social presence is vital to hosting effective Action Learning Programs in a virtual world. This extract of a blog post from one of the participants identifies one of the key differences between web based text chat and embodied text chat in a virtual world that has both place and avatar embodiment:

> The phenomenon of 'lurking' in an Internet chatroom is much less likely in a SL virtual meeting, with the group tending to invite quiet people to contribute. Being 'seen' is a significant factor in group dynamics and relationships. Blog post, Fred, Participant, Program 2

7.8 Realistic environment and sense of place

That phenomenon of ‘being seen’ ties closely with being ‘there’ and being ‘there together’ or that sense of place that a virtual world location can create, an almost out of body illusion of non-mediation where the user feels transported to another place where they are together with the other people whose avatars are co-present with them (Lombard & Ditton, 1997). In the design and building of the prototype a holistic approach was taken creating a realistic, detail-rich, persistent location resembling a beachside village. The question remains unanswered about how much detail and realism is appropriate or necessary to achieve high levels of presence? More research needs to be conducted to determine what levels of fidelity are required to achieve high levels of social presence in learning environments in virtual worlds.

The sense of place achieved by embodiment in a location in a virtual world is something other online technologies do not afford. That sense of being 'there' together has a quality of virtual face-to-face even though participants are embodied through the avatars and, in reality, are far apart. It has the potential to provide a level of social presence beyond what is available in web based environments. Using the WWW has been likened to looking in the window whereas the virtual world is like walking into the room. The was ample evidence in chat logs and email of the use of language that refers to the virtual learning location as though it was a physical place and of participants being somewhere other than their physical location. This aspect of virtual worlds as environments for Action Learning deserves further exploration at a time when there is less free time for travel to professional development and such rapid change that lifelong learning is the expectation not the exception.

Another related aspect to the sense of place is the aspect of persistence of the environment and access to it outside of scheduled meeting times. This quality of virtual worlds allows participants to conduct informal meetings with other participants. These may happen by arriving early or staying after scheduled online events or in between scheduled times as arranged by participants. There can even be serendipitous meetings when participants run into each other when they are logged in for other purposes such as preparing for a presentation or collecting resources. The persistent nature of the virtual world providing a space for private conversations aside from the publicly shared conversations can be seen as a valuable addition to the online learning experience.

7.8.1 Social Presence and dialogue

Social presence has been shown to be a predictor of satisfaction with online learning (Gunawardena & Zittle, 1997; Rourke, et al., 1999) so particular attention needs to be paid by designers to achieving high levels of social presence in their virtual world learning environments for Action Learning. Immediacy and intimacy are qualities that can be supported in dialogue by facilitator modelling as well as using tools such as Heads Up Displays (HUDs) that add emotion and other nonverbal communication either graphically or in text chat. Talking about experiences outside of class, using humour, addressing participants by name (including avatar names) and praising participants are all possible but it is important in the preparation of inexperienced facilitators to ensure they are familiar with these strategies for improving social presence and know to encourage their participants to engage in these behaviours as well. Some of these behaviours can be built into protocols used in the program such as 'Checking In' at the beginning of events in which participants talk about their day outside the virtual world.

The results for the social presence elements of the Exit Questionnaire (n=16) indicated that when using the prototype environment, more than 88% of respondents found they could form distinct impressions of the other participants, felt comfortable interacting with them and felt their point of view was acknowledged by other participants. Only 44% of respondents found this form of communication any more impersonal than face-to-face communications and the majority found the environment to be more personal than both audio and video conferences. When asked about the facilitation, 88% felt the facilitator created a feeling of online community. Below in Figure 7:5 (a) and (b) are two of the avatars wearing their

souvenir “Lab Rabbit” t-shirts intended to aid recognition of other program participants and build the sense of community among the groups.

Figure 7:5: (a) and (b) Avatars of participants wearing their souvenir “Lab Rabbit” t-shirts.

The high Social Presence Density scores provide additional evidence that the environment was capable of supporting the kind of dialogue that is required for Learning Set Meetings. With the flexible structure of the programs, the choice of workplace project and the supportive learning environment, these scores support other structure and autonomy indicators that the transactional distance was low.

7.9 Content in the Action Learning Program – A Typology of Roles for Virtual Worlds in Education

The first part of research question five led to an investigation of the capability of the virtual world to cater for the more traditional learning that might accompany the Exploration Stage of an Action Learning Program. As many professional development programs for teachers include mandated content such as new curriculum guidelines, teaching methods or assessment strategies, the prototype needed to be capable of hosting a variety of learning events related to that content. Since an Action Learning Program can also include a broad array of content learning to inform the participants’ individual workplace projects and cater to individual needs, understanding what elements of those learning experiences can be achieved in a virtual world and how that might occur is an important element of conducting Action Learning Programs in virtual worlds for teacher professional development. This is useful whether the content required is core to all participants in a program of Action Learning, just a series of electives for a select few who need them or self-initiated information seeking by the individual.

Summarised in Figure 7:6 there is a comprehensive typology of roles for virtual worlds in education. This list was developed by coding each example of educational use based on the role the virtual world played in the educational experience. Codes were refined over time until there were five that encompassed all the roles. These were location, content, context, community and materials. Combinations of any of these simultaneously were also common. The final codes were validated during a workshop with over 80 participants from the education community in Second Life

during the 2010 Virtual Worlds Best Practices in Education conference. Participants of the workshop analysed their own use of virtual worlds using the five codes as well as applying them to any educational application in their experience with virtual worlds to test if the codes encompassed all the roles within their experience which they did. No participant could find any example of an educational application that did not fit within one of the five categories or combination of some of the five categories.

This analysis was conducted after collecting examples found by scanning email lists for educators; visiting many educational sites in various virtual worlds and reading the associated blogs and wikis; attending seminars, conferences and professional groups and roundtables; and speaking in person and online with other educators. It was developed to classify the content and process uses of virtual worlds in education that could be used in the Explore Stage of any Action Learning Program.

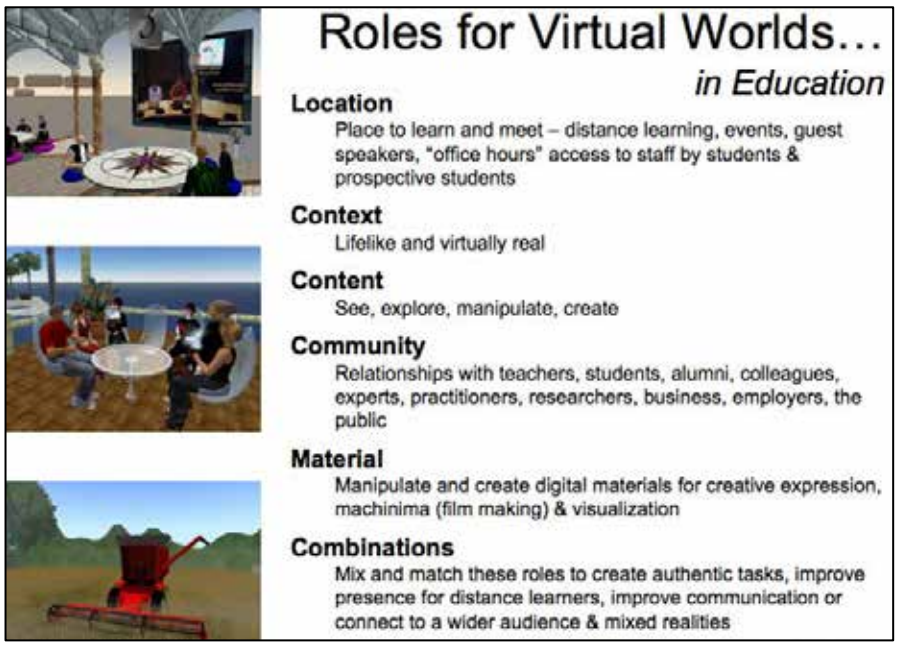


Figure 7:6 A Typology of the Roles for Virtual Worlds in Education.

This typology could be used by potential facilitators and their guest presenters or by Action Learners themselves as a planning guide when determining how to approach content or "Programmed Knowledge" (Revans, 1998, p. 29) to be delivered in the virtual world for the Explore Phase of each iteration of the Action Learning Cycle.

The virtual world may be merely a location for a presentation, discussion or instructional class that is very similar to the same event in a face-to-face context. A presenter may not even be logged into the virtual world as an avatar but instead may be beamed in via video onto a screen, reducing the technical overhead for the presenter.

In situations that involve simulations or roleplay, the virtual world may provide a lifelike context that emulates the physical world. This could involve lifelike scale models, bots that interact with natural language or scripted artefacts that mimic equipment and deliver realistic data or attach to external devices to provide actual data fed into the virtual world from the physical world.

The world itself may be the content as it was within the two Action Learning iterations conducted in the prototype as they were about virtual worlds, but content may take the form of an interactive or static display that is used to impart the content learning required.

The community of other people using the virtual world can also provide the Action Learners with access to the lived experience of others and so sub-groups of the community of users can provide input in the Exploration Stage.

The virtual world can also be a material for creating other teaching resources such as a set for making training videos or stimulus material for discussion. This process of making films in a virtual world is called machinima. It can also be a useful technique for teaching about the virtual world itself or Action Learning processes in the Orientation to Action Learning.

As the name applies, combinations of these five role types may be used to create learning experiences. There is definitely a sharp learning curve for the novice user of virtual worlds to come to terms with new and different pedagogies in the 3D environment. However, as more resources become available and more people gain experience with virtual worlds as they have done in the past with distance learning technologies, this will become less of a challenge.

7.10 Action Learning Facilitators in virtual worlds

Another aspect of research question five related to the development of tools to support the role of the facilitator and program administration. As an experienced Action Learning Facilitator in both face-to-face and web based online environments as well as an avid technology enthusiast, the researcher was comfortable with both Action Learning and the technology. Differences in the attitude and skill set of the facilitator in relation to technology could significantly impact the willingness of the facilitator to even consider the use of virtual worlds. Adequate training of facilitators in the use of the virtual world based learning environment could alleviate these reservations. Mentoring a new facilitator during implementation was demonstrated to be successful in the ActiveWorlds trial prior to using Second Life. Part of this process would need to address finding alternative virtual tools for well-loved, non-digital technologies such as the flip chart and paper and making these facilitators comfortable with those digital alternatives. Different approaches to Action Learning by different facilitators may require additional tools to be developed to meet the needs of future programs. However the basic environment had enough generic spaces and tools to meet most of the needs expressed by other more experienced but less technically adept Action Learning Facilitators during their interviews.

7.11 The technology overhead - Access and orientation to the platform

Research question six addressed the issue of barriers to participation in virtual worlds by both facilitators and participants in Action Learning Programs. More detail on this can be found in chapter six (6.4), but some key points will be mentioned here. The importance of selection of an accessible environment and adequate orientation for beginners to the new learning environment of the virtual world cannot be over stressed. If facilitators and potential participants in Action Learning Programs cannot

get into the virtual world due to firewall restrictions, hardware incompatibility or fear of the environment, there is no hope of conducting online Action Learning programs there. Choosing a stable, accessible platform for the intended client group reduces frustration and may prevent dropout.

Orientation and early training in the use of the platform with asynchronous access to practise and revisit these skills combine to make users comfortable with the interface. Having multiple choices of different viewer software to access the same environment complicates this process so choosing one viewer to support for new users is recommended. As users' skills develop, they may choose to use other viewers but this then is a personal choice. This has implications for the amount and type of reusable support materials the facilitator needs to provide in the form of web sites, videos, notecards, email and 3D orientation areas. Making a single set of these orientation resources reduces workload. When tapping into existing resources it is important to check versions to determine if recommended videos and websites have current information so as not to confuse the new participants.

In this study, even with the challenges of the evolving technology, a large number of participants tenaciously continued when faced with these challenges. However, since 50% of those who responded to the questionnaire stated they had previous experience with computer games or virtual worlds, further research is needed to determine if groups in which larger numbers were unfamiliar with games or virtual worlds would find the environment accessible.

There is also room for more investigation of the feeling of being incompetent that embarrasses and stresses some new users of 3D environments who are competent, adult, professionals outside of the virtual world but clumsy, stumbling amateurs when they encounter a virtual world for the first time. Many virtual worlds users state in workshops and meetings that feeling comfortable with both the look of their avatar, movement and communication is the first goal towards gaining acceptance of the platform. This blog post from Geraldine, a participant in Group ,1 points to the agreed need for early support to get people over the threshold at the entry point to the virtual world:

> The main experience shared by all was the feeling of being a nOOb when first experiencing Second Life. I believe it remains a hurdle for all educators who are trying to engage adult learners who are unused to game interfaces. The need for buddies and mentors to help one through the initial steps is paramount if the use of virtual worlds in education is to flourish. There are many ways of overcoming this like having face to face workshops so that participants are gradually introduced to the online virtual world with immediate situational help available or holding weekly in-world meets during which participants learn a new skill to use in the virtual world or visit a place which holds educational potential.

Adding additional experienced staff as designated technical support to help new users during the orientation sessions provided users with access to timely technical help and the facilitator was able to stay focussed on the program content. The use of technical assistants in the early stages is highly recommended to ensure problems are overcome swiftly and learning is maximised. This also has the potential to make new facilitators more comfortable as they would not have to multitask. Notecard based

summaries and copies of the slide deck would also be useful take home material for participants to support those who need additional reinforcement of concepts or who missed vital information whilst distracted with technical issues or learning new skills such as avatar movement or camera control.

The highly interactive party format to orientation activities used in this program embedded the learning in a playful way based on an apprenticeship model of peer teaching and allowed participants to get to know one another and have fun. To scale this to larger groups or to determine levels of acceptance of using this strategy in corporate training programs would require further investigation. However, with or without this element, good quality, asynchronous orientation areas for practice before and after synchronous events and for those who miss synchronous events would be a practical addition to orientation. Some video based materials on the web to establish expectations for users who have never encountered a virtual world could lay a foundation of conceptual understanding as well as introduce movement controls and settings customization before participants entered the environment. The challenge remains in getting participants to adequately prepare ahead of time as many people did not make any attempt to do the advised preparation which meant they were unprepared and caused delays. This is the time when the additional helpers at early sessions are invaluable.

Already, since this research began, the virtual world provider of Second Life has introduced changes to the new user experience including more sophisticated avatars and improved orientation experiences upon arriving in the virtual world. Some educational institutions have developed alternative entry points (Linden Lab, 2011a) with their own orientation experiences to keep their community away from the public areas where there is little control over inappropriate behaviour such as swearing and nudity. Taking the time early to ensure participants can access the environment and are comfortable with the interface has the potential to make the user experience more comfortable and that may impact outcomes and retention. Opportunities for asynchronous training in these aspects could also support users who want to practise or who miss vital orientation sessions. Further research into alternate orientation practices and refining the new user experience and its impact on retention would be valuable.

7.12 Timezones and cultural differences

Another potential barrier develops when a program draws participants and facilitators from many timezones creating the challenge of finding suitable times for everyone for Core Learning Events and Learning Set Meetings. At times it leads to running events twice to give everyone an opportunity to participate. There may be a risk of dropout with some participants working out of normal office hours if they are a lone person in a timezone. Language issues may also be a factor in truly global programs . Understanding each other's context when in different education systems and cultures is another challenge to be addressed. Similar considerations would apply across many industries other than education. All these factors should be taken into consideration when determining the scope of an Action Learning Program intended to be conducted in a virtual world. However, most of these challenges can be met with planning, open discussion of potential issues and timely technical support.

7.13 The future

Participants expressed their satisfaction with their projects in the questionnaire, blog posts and email as well as in text chat during the celebration events pictured in Figure 7:7. These provide a clear indication that virtual worlds were a successful environment in which to conduct Action Learning Programs as long as technical barriers could be overcome and time made for the program in people's busy lives.

> "All in all, I am so pleased to have taken this journey – and pleased also that it is to continue to its fruition!" Blog post, Geraldine, Group 1.

For many, the content of the program was the beginning of an ongoing learning experience as the following participant indicated in a blog post:

> "I am hoping that I can continue in the research, as I am far from finished and feel there is still lots to learn. I have found the environment stimulating, rich and the comparison to other online environments I use fascinating." Blog post, William, Group 1

For the researcher, the Learning Sets for the pre-conference program of the 2011 International Federation of Action Learning are already being organized. The conference theme is Action Learning and the Virtual World.

Figure 7:7: Celebration Event Learning Set 1, Program 1.

In the field of web based online learning as described by Siemens and Tittenberger below, highlights one of the "lost affordances" that creates that sense of isolation for online learners.

> While the online medium has many affordances it also has many "lost affordances" over physical classrooms. As discussed, sense of isolation, learner expectations and experience, and other factors are important for educators to consider in their design and delivery of online courses. Continual experimentation and reflection will produce a model that works

> well for the individual educator, learners, and subject matter. (Siemens & Tittenberger, 2009, p. 17)

The use of virtual worlds has the capacity to reduce this feeling of isolation by bringing learners together in a virtual place where they can interact successfully in ways similar to face-to-face Action Learning. Further research that takes advantage of new technological developments in virtual worlds will provide deeper understanding of how their affordances can be maximised and the lost affordances minimised or compensated for using alternative strategies. This research can be used to inform design decisions as more educators take up virtual worlds as learning environments. More Action Learning Programs hosted in a range of virtual worlds by more facilitators will be able to provide the broader community with further understanding of virtual worlds as an alternate medium for Action Learning. This exploratory study may provide a starting point for this exploration. The researcher intends to continue to participate in the ongoing professional dialogue about virtual worlds through the professional associations for Action Learning, Virtual Worlds and technology education of which she is a member and contributing author and presenter. The potential exists for further trials within new work contexts for this and other researchers to build upon the initial findings of this research.

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Appendix A - Research Question Set 1

Interview questions – Action Learning Facilitators / Learning Set Advisers

Intent:

- Identify operational characteristics of Action Learning programs that would need to be incorporated in an online environment to create a requirements definition (What it needs to do).
- Define user personas (Who will use it and how).
- Find out what is important to Learning Set Advisers (facilitators).
- Determine the common tasks of facilitation.

1. What are the essential elements within an Action Learning process when you facilitate? You might like to describe the typical sorts of activities and events that occur during an Action Learning Program or relate stories of examples if there is no 'typical' example.
2. In what kinds of topics, themes or projects have you used Action Learning?
3. What are the essential characteristics, as you see them, of these elements of Action Learning, if you use them? (Omit those already mentioned in answering question 1).
   - Learning Set meetings.
   - The opportunity to reflect using a learning journal.
   - Collection by the facilitator of 'programmed knowledge' (things already known about the topic, issue or theme) such as books, journals, case studies, first-hand in-person accounts of the lived experience of others
   - Participants collecting their own resources to use and share.
   - Your interaction with the participants.
   - The interaction between participants.
   - The project
   - The development of the skills of the participants such as group process skills, listening skills, reflection skills, *(others as suggested by informant)*.
   - Other elements identified in question 1.
4. How do you go about the process of clarifying the project with your participants?
5. Have you ever conducted an Action Learning Program partly or completely online?
   If yes, what tools did you use for what purposes?

   What worked well?

   What were the challenges?

   What would you avoid next time?

6. Identify some characteristics of Action Learners who make up the participants in programs you have facilitated. Describe some of their traits and behaviours that might influence the design and delivery of an environment for Action Learning online.
7. Can you describe your some characteristics about yourself that would influence how you would participate as a facilitator in an online Action learning program?
8. Can you suggest some barriers to participation in an online Action Learning program?
9. Can you suggest some barriers to facilitation in an online Action Learning program?
10. Do you have anything else to add?

Appendix B - Questionnaire Items

Modified items from Gunawardena, C.N., & Zittle, F.J. (1997). Social presence as a predictor of satisfaction within a computer-mediated conferencing environment. The American Journal of Distance Education, 11(3), 8-26.

Social presence

1. Messages in Action Learning World were impersonal
2. Computer-mediated communication is an excellent medium for social interaction.
3. I felt comfortable conversing through this text-based medium.
4. I felt comfortable introducing myself on Action Learning World.
5. The introduction enabled me to form a sense of online community.
6. I felt comfortable participating in Action Learning World discussions.
7. The moderators created a feeling of online community.
8. The moderators facilitated discussions in the Action Learning World program.
9. Discussions using the medium of computer-mediated communication tend to be more impersonal than face-to-face discussion.
10. Computer-mediated communication discussions are more impersonal than audio conference discussions.
11. Computer-mediated communication discussions are more impersonal than video teleconference discussions.
12. I felt comfortable interacting with other participants in the program.
13. I felt that my point of view was acknowledged by other participants in Action Learning World.
14. I was able to form distinct individual impressions of some Action Learning World participants.

Satisfaction Scale

1. I was able to learn through the medium of computer mediated communication.
2. I was able to learn from the Action Learning World discussions.
3. I was stimulated to do additional reading or research on topics discussed in Action Learning World.
4. I learned to value other points of view.
5. As a result of my experience with Action Learning World, I would like to participate in the use of another 3D virtual world as a learning environment in the future.
6. Action Learning World was a useful learning experience.
7. Projects like Action Learning World enhance face-to-face courses.
8. As a result of my participation in Action learning World, I made acquaintances electronically in other parts of the country/world.
9. The diversity of topics in Action Learning World prompted me to participate in the discussions.
10. I put in a great deal of effort to learn the computer mediated communication (3D virtual world) system to participate in Action Learning World.

Likert scale to be used

1 = Strongly Disagree, 2 = Disagree, 3 = Uncertain, 4 = Agree, 5 = Strongly Agree

Appendix C - Presentations and publications

Publications

McKeown, L. (2009). Action Learning in a Virtual World. In Molka-Danielsen J. & Deutschmann, M. (Eds.), Learning and teaching in the virtual world of Second Life. Norway:Tapir.

Jakobsdottir, S., McKeown, L. & Hoven, D. (2009). Using the New Information and Communications Technologies for the Continuing Professional Development of Teachers through Open and Distance Learning. In Umar, A. & Danaher, P. A. (Eds). Perspectives on Teacher Education Through Open and Distance Learning. Vancouver, Ca.: The Commonwealth of Learning

Sanders, R. L., L. McKeown (2007) Promoting Reflection through Action Learning in a 3D Virtual World. International Journal of Social Sciences. V. 2 No. 1.

Workshops, seminars, keynote addresses and presentations by Linda McKeown Orwin related to the research from 2007 – 2011

2007

Date	Location	Institution	Title
19 - 21 Nov	Melbourne	VITTA Conference	3D learning tools and environments keynote
17 Nov	Swinburne University, Melbourne	Second Life Conference	Learning in Virtual Worlds keynote
8-9 Nov	USQ, Toowoomba	Research Symposium	Online Action Learning in a 3D world research report
Nov 3	Online in Elluminate	CIDER: Canadian Institute for Distance Education Research	Online Action Learning in a 3D world research report
Oct	Online in Second Life	University, Ontario, Canada	3D learning tools and environments
Oct 9	Online in Second Life	League of Worlds Conference	Online Action Learning in a 3D world
4 Oct	Online in Centra and Second Life	Australian Council for Computers in Education - National Computer Studies Summit	3D learning tools and environments
Sep 19	In Second Life	USQ Corporate Club	Second Life demonstration
Sep 13 -14	Sydney	MLC School	Teaching on the Teen Grid of Second Life
Sep 12	Adelaide and online	Department of Education and Children's Services	Masterclass: 3D learning tools and environments
Aug 24 - 25	Mandurah, Western Australia	Educational Computing Association of Western Australia	Keynote, A new direction for the Internet - the 3D web and virtual worlds
Aug 8-10	Adelaide, South Australia	The Action Learning, Action Research & Process Management Association Annual Conference	Online Action Learning in a 3D world

Date	Location	Institution	Title
June	Brisbane, Queensland, Australia	QSITE state conference presentation	The learning is real, the location is virtual: Action Learning professional development in the 3D virtual world of Second Life.
May - Jul	Online in Second Life	University of Southern Queensland	Using Second Life to support teaching and learning and community involvement at the university.
May 25	Second Life	Second Life International Conference: Best Practices in Teaching and Learning	Action Learning in Second Life (Keynote)
May 18	Brisbane, Queensland, Australia	Lutheran Schools Curriculum Committee	Second Life in education.
Apr 30	Brisbane, Queensland, Australia	Education Queensland - Virtual Worlds Visioning Summit	Progress Report on the Smart State PhD Funding Grant Project: Social and technical affordances of 3D virtual worlds for Action Learning.
Apr 27 -28	Hobart, Tasmania, Australia	TASITE state conference	Web 2.0 A toy story: To infinity and beyond. (keynote)
Apr	Online in Second Life	education.au Elearning insights podcast	Second Life as an educational tool.
Mar 25	Online in Second Life	Book launch of "Second Life" edited by Mario Gerosa / Frank Koolhaas (SL avatar)	Chapter - Interview with avatar Decka Mah on Education and Action Learning in Second Life (in Italian)
Mar 23	Cairns, Queensland, Australia	Health and Community Services Workforce Council Inc. Cairns Skills Development Network	Workshop - Planning Professional Learning and Development
Feb 26	On radio	ABC Radio National	Australia Talks - Guest panellist What a (Second) life!
Feb 18-20	Salamanca, Spain	IADIS International Conference Web Based Communities 2007	Promoting community through Action Learning in a 3D immersive world. With Dr. Rob Sanders
Feb 14	Terra incognita island, Second Life	Kuurian Expedition Meeting	Action Learning in Second Life and demonstration of the scripted conference facility.
Jan 15- 18	Seattle, Washington, USA	ALISE (Refereed paper) with Dr. Rob Sanders	Promoting reflection through Action Learning and virtual learning.

2008

Date	Location	Institution	Title
Nov 29	Australian Virtual Worlds Workshop, Business and Enterprise Panel, Swinburne University, Melbourne	Australian Second Life Educators and Researchers (AusSLERs)	Virtual Worlds as corporate learning environments
Nov 24 - 26	Shift Happens: Technology alone will not save us	Victorian IT Teachers Association (VITTA)	Hands on workshops - Second Life and Wonderland
Nov 14	Videoconference: Professional Certificate group	Swiss Centre for Innovations in Learning (scil), University of St. Gallen, Switzerland	Virtual Worlds for Corporate Learning Part 1 Part 2 Part 3
Nov 11	Bipartite 1008 Partnering for Success: Employers, Universities and Graduate Talent Conference, Novatel Brighton le Sands, Sydney	The National Association of Graduate Careers Advisory Services	Virtual Worlds: The game gets serious
Nov 8	Ritsumeikan University, Language Education & Information Systems , Kyoto Japan	Ritsumeikan University, Language Education & Information Systems, Kyoto Japan	Language Learning in the Virtual World of Second Life
Oct 14	CPA Congress 2008	CPA Australia	Learning in Virtual Worlds PHOTO
Sept 5	Second Life Community Convention - Online Education Track - Opening keynote address	Second Life community Convention and International Society for Technology Educators	MUVE-ing learning into Virtual Worlds - the tools of the trade and the types of learning they support.
Aug 29	State Legal Educators and Young Lawyers Conference, Brisbane	Queensland Law Society	Cyber-law in Second Life. Joint presentation with Prof. G. Mackenzie, USQ.
Aug 13-14	Enterprise 2.0 for Information Professionals Conference, Sydney	Key Forums	What next? 3D Virtual Worlds
Jul 31 - Aug 2	Skoolaborate Congress at the MLC School, Sydney	Skoolaborate Project (Teen Grid Second Life)	Teaching tools in Second Life
July 18	Seminar, Inns of Court, Brisbane	Continuing Legal Education Association of Australasia	Using Virtual Worlds in Law Education. Joint presentation with Prof. G. Mackenzie, USQ.
July 11	QUESTnet2008: Green and greenfield … Social engineering the network Crowne Plaza Royal Pines, Gold Coast	Queensland Education Science & Technology Network	Beyond the Web - Jacked into the mesh through virtual worlds
Mar 7	Queensland Law Society	Queensland Law	Virtual Worlds and the

Date	Location	Institution	Title
	Symposium	Society	Law community. Joint presentation with Prof. G. Mackenzie, USQ and Nick Abrahams, Deacons.
Feb 29	Online in Second Life	Xerox, Leesburg	Presentation of learning tools in Second Life
Feb 28	Online in Second Life	NCCE	Using Second Life as a learning environment

2009

Date	Location	Institution	Title
Oct 1-2	QSITE Conference 2009	Queensland Society for Information Technology in Education	1. Hands on workshop - Using Exit Reality 2. Presentation - 3D Virtual Worlds for learning
Jun 18	State of Play Graduate Symposium	New York Law School	Research into Virtual Worlds
Apr 15	Australian Computer Society Toowoomba Chapter meeting	Australian Computer Society Toowoomba Chapter	A tour of virtual worlds for business and learning - Second Life and Exit Reality
Mar 27	Videoconference: Professional Certificate group	Swiss Centre for Innovations in Learning (scil), University of St Galen, Switzerland	Virtual Worlds for corporate learning and training

2010

Date	Location	Institution	Title
Apr 6-9	ACEC2010: Digital Diversity. Australian Computers in Education Conference, Melbourne, Australia	Australian Council for Computers in Education ACCE	Virtual Worlds - their roles in learning, teaching and professional development
Mar 12 - 13	Virtual Worlds Best Practice in Education keynote, Second Life	Virtual Worlds Best Practice in Education conference	Taking Virtual Worlds from Enthusiast Project to Mainstream Technology
Mar 12 - 13	Virtual Worlds Best Practice in Education workshop, Second Life	Virtual Worlds Best Practice in Education conference	Roles for Virtual Worlds in education.
Feb 3	University of Southern Queensland Learning and Teaching Week	University of Southern Queensland	Using Second Life in tertiary learning and teaching

2011

Date	Location	Institution	Title
July – 26 – Oct 24	Second Life	International Foundation for Action Learning	Trying Action Learning in Virtual Worlds
Oct 27	Second Life & London	International Foundation for Action Learning conference	Real Virtuality: Conducting Real World Action Learning in a Virtual World

Appendix D - Consent Form and Information Sheet

THE UNIVERSITY OF SOUTHERN QUEENSLAND

FACULTY OF EDUCATION

Consent form for persons participating in research projects

PROJECT TITLE: Technical and social affordances of a virtual perpetual world designed for use with an Action Learning Model of professional learning.

Name of participant: ……

Name of investigator: Lindy McKeown

I consent to participate in the project named above, the particulars of which - including details of interviews, computer logging, recording and questionnaires - have been explained to me. A written copy of the information has been given to me to keep.

I authorise the researcher or his or her assistant to use with me the interviews, computer logging, recording and questionnaires referred to under (1) above.

I acknowledge that:

The possible effects of the interviews, computer logging, recording and questionnaires have been explained to me to my satisfaction;

I have been informed that I am free to withdraw from the project at any time without explanation or prejudice and to withdraw any unprocessed data previously supplied;

The project is for the purpose of research;

I have been informed that the confidentiality of the information I provide will be safeguarded subject to any legal requirements.

I consent to being recorded:

During interviews, use of the 3D Virtual World including chat, audio-conferences, teleconferences, video conferences or other electronic communication service or tool;

Using computer log files that include time, date, duration, items accessed,

Including documents I create that are stored within the 3D virtual world.

I acknowledge that participants to be referred to by pseudonym in any publications arising from the research unless I request to have my real name used.

Name (Participant): Signature Date

Only to be completed if the participant is under 18 years of age,

Name(Parent/guardian): Signature Date

If you have any concerns regarding the implementation of this research, please contact: The Secretary, USQ Human Research Ethics Committee on 07 4631 2956 International +61 7 4631 2956

Information about the research project

Project title:

Technical and social affordances of a virtual perpetual world designed for use with an Action Learning Model of professional learning.

Researcher:

Linda McKeown, University of Southern Queensland

Purpose of the research:

The results of this study will be published in a thesis for the purpose a Doctor of Philosophy (PhD).

Topic and significance of the research:

In a time of rapid change lifelong learning is essential. One of the problems in lifelong learning, including professional development, is the "knowing-doing gap". That is, translating new learning into effective action is a challenge. Action learning, in which learners apply what they are learning to real workplace challenges, is a successful method for professional development but the need for learners to meet regularly limits access to this method.

Transactional distance theory suggests that traditional distance learning methods may not effectively support the level of engagement typical of Action Learning. This study will investigate the potential of 3D virtual spaces for supporting Action Learning at a distance.

A design-based methodology will be applied through a participatory process in which Action Learning facilitators, people experienced in the use of online learning and technically skilled programmers will answer questions in interviews, focus groups or on surveys that may require approximately 2 hours of your time out of work hours. This is a cyclic process of information gathering, design, implementation and refinement. After development, data from successive iterations of the design will be used to refine both the practical design and theoretical understanding of how the affordances of 3D virtual environments can increase learning through decreasing transactional distance.

If you are a participant during one of the programs hosted in the online environment, in addition to answering questions about your activity and perceptions of the 3D environment as a learning space, your log files may be accessed to track patterns of use and purpose for use of various technological elements of the 3D environment. The researcher may also watch and listen to your interactions while in the 3D learning environment but at all times this will be overt and you will aware of the observer. All names will be changed to protect your identity unless otherwise negotiated.

Findings from the study will inform development of future 3D virtual spaces for learning in schools, universities, government departments or other providers of adult learning.

Data storage:

Electronic data will be stored in a password protected computer-based environment securely in my private home premises in accordance with conditions of Australian research ethics standards. This research process has passed the University of Southern Queensland approval process for ethical research. Paper data will be placed in a locked file cabinet for a period of five (5) years. Electronic data will be archived to CDROM and stored with paper records after the submission of the dissertation. The only people permitted to view data will be informants and their approved nominees, my supervisors, Associate Professor Peter Albion and Dr. Jon Austin, and the researcher.

Participation and withdrawal:

You involvement is voluntary, confidential and they can withdraw at any time, without penalty.

This research is proudly supported by the Queensland Government's Growing the Smart State PhD Funding Program.

Appendix E - Sample Program

"Teaching in Second Life®" Action Learning Program Overview Timeline

Week	Between	Event	Notes	Location	Resources
1	June 10-16	Get your avatar and do orientation to Second Life Practice walking, sitting,	Self organised Help available from Lindy McKeown (Decka Mah in SL)	Get you avatar and do the Orientation Island activities for new avatars Terra incognita *** http://slurl.com/secondlife/Terra%20incognita/128/128	Download client software and register for a free account at http://secondlife.com Hand out: SL Cheat Sheet
2	June 17 - 23			Practice and completion of admin forms. **Post research consent form please.**	
3	Wed June 27	**Orientation** to Action Learning	8.30pm EST au Group with Lindy McKeown (Decka Mah) as facilitator	Decka's Decks learning facility on the island of Terra Incognita	Action Learning overview Camera controls Welcome to Terra incognita
4	Wed July 4	**Core Learning:** Examples of education resources in Second Life	8.00 – 8.30pm EST au	edu-Gallery – explore existing items in the gallery as a stimulus for ideas Project clarification process	Project clarification tool Money $50L per person Learning set group lists

5	July 8 – 14	**Learning Set Meeting**	Each group differs	Share initial ideas for you projects	Learning Set Agenda Question starters Learning Set Protocol
6	July 15 - 21	**Core** **Learning** Edu-Gallery event	Lindy in Sydney – limited access	No meeting Personal time to complete photographic activity for edu-Gallery (plus notecard and landmark)	Edu-Gallery Activity Guide
7	Thursday July 26	**Elective**: Education tour or guest	8.00 – 8.30pm EST au	Location to be advised	
8	July 29 – Aug 4	**Learning Set Meeting**	Each group differs	Progress reports on projects	
9	Aug 5 - 11	**Elective**: Education tour or guest	Lindy in Adelaide– limited access	Location to be advised This will be participating in an ISTE Social or a visit with friends or alone – not a group event	
10	Tuesday Aug 14 9.30am – 1.30pm	**Elective** USQ Virtual Worlds Symposium f2f or SL or WWW	Lindy with Guest Presenter at USQ	F2F location USQ Toowoomba SL Terra incognita Location to be advised Registration [Link removed] Program [Link removed]	
11	Aug 19 - 25	**Learning Set Meeting**	Each group differs	Progress reports on projects	
12	Aug 29	**Celebration**	End of program event	Terra incognita – to be advised Display of project posters Party!!!	

*** This is an SLURL, or a Second Life URL. If you go to this web page while you are logged into Second Life at the same time, you can select teleport on the web page and your avatar will be teleported to the island.

Abbreviations:

RL = Real life

SL = Second Life

Q&A = Question and Answer

EST au = Eastern Standard Time, Australia – Brisbane/Sydney/Melbourne time for local times see

http://timeanddate.com/worldclock/converter.html