Chapter 5
What Is Real? Using Problem-Based Learning in Virtual Worlds

Maggi Savin-Baden, Terry Poulton, Chris Beaumont, and Emily Conradi

> Right now are we just inside a computer programme?
>
> *Your appearance now is what we call residual self image. It is the mental projection of your digital self*
>
> This isn't real?
>
> *What is real? How do you define real? If you were talking about what you can feel, what you can smell, and taste and see, then real is simply electrical signals interpreted by your brain*
>
> (Wachowski & Wachowski, 2000)

5.1 Introduction

Problem-based Learning (PBL) has become a central learning approach in many curricula, but this collaborative style of learning is threatened by the movement towards more self-directed and distance learning. Such was the concern that teams at Coventry University and St George's University of London sought to develop new approaches that would not only counter this movement but would also create new learning spaces for PBL. This project investigated, implemented and evaluated a user-focused approach to developing scenarios and materials, linking the emerging technologies of virtual worlds with interactive PBL online, to create immersive collaborative tutorials. The chapter begins by providing an overview of the research in this area to date, outlines the project and then presents the findings of the evaluations undertaken and discusses the impact on tutors and students.

M. Savin-Baden (✉)
University of Worcester (Formerly of Coventry University), Henwick Grove, Worcester, UK
e-mail: m.savinbaden@worc.ac.uk

T. Poulton
e-Learning Unit, Centre for Medical and Healthcare Education, St. George's University of London, London, UK

C. Beaumont
Edge Hill Business School, Edge Hill University, Ormskirk, UK

E. Conradi
International Higher Education, British Council, UK

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5.2 Background

PBL was popularised in the 1980s, partly in response to the predominantly content-driven transmission educative model of the time. It arose out of a desire to give students the opportunity to apply practical and theoretical knowledge to problems or scenarios within the professional or clinical setting, crucially in interactive collaboration with colleagues, thus replicating features of the real-life context of application. It has become an increasingly influential approach in curricula in a variety of settings, across a range of subject areas. The increasing adoption of PBL and the parallel growth in online learning each reflect the shift away from teaching as a means of transmitting information, towards supporting learning as a student-generated activity. To date PBL has been seen as a relatively stable approach to learning, delineated by particular characteristics and ways of operating. Most of the explanations of and arguments for PBL, thus far, have tended to focus on (or privilege) the cognitive perspectives over the ontological position of the learner. However, implementing this collaborative approach to participation and learning is considerably more challenging in self-directed and distance learning contexts, due to difficulties associated with effective discussion between geographically and spatially disparate learners.

5.3 Informing Literature

It could be argued, and increasingly is, that cyberspace has resulted in a sense of multiple identities and disembodiment, or even different forms of embodiment. The *sense* that is possible to remain anonymous and the assumption that this is possible through one's words rather than one's bodily presence, is becoming increasingly unmasked through worlds such as Second Life™. Second Life is a virtual world where it is possible to design learning scenarios that students can engage with using their own customised avatar. A pictorial example of problem-based scenario of a road traffic accident is presented below in Fig. 5.1

However, before issues of embodiment, and disembodiment as well as having a sense of multiple identities in virtual worlds, is explored it is perhaps helpful to explain virtual worlds and delineate current forms of PBL.

5.3.1 Virtual Worlds in Higher Education

Virtual worlds are 3D graphical online environments, which users can change and manipulate, as well as work simultaneously on specifically tailored or self-developed projects. The facilitation of teaching and learning through the use of technologies such as virtual worlds has expanded rapidly in higher education in recent years

Fig. 5.1 Second life street accident scenario (patient mannequin on the floor near his motorbike)

(Hew & Cheung, 2010; Wang & Burton, 2012). These developments have stimulated discussions about opportunities for educational change and the development of more flexible curricula that take account of the experiences and perspectives of students and tutors (Savin-Baden, 2008a). Reeves and Minocha (2011) argue that creating a learning space appropriate for students in SL is important to a large degree, but that it is important that tutors and students co-design spaces, so that the resultant SL spaces are ones in which students want to learn. In particular, they have suggested that there needs to be a relationship between the pedagogy and the design of learning spaces:

- Pedagogical underpinning (e.g. constructivist, exploratory) and the learning activity should guide the design of the learning spaces.
- Consider replicating real-life teaching methods and spaces in the first instance until the users are comfortable with the Second Life interface.
- Design learning activities that require students going to other islands for exploration and data collection. For example, the virtual world comprises different spaces that are denoted as islands, thus a company or university space would be an island.
- Design activities that promote active learning through role playing, reflection, 3D simulations and 3D modelling.
- Design activities that demonstrate the value Second Life provides in comparison with real life or 2D learning environments.

Exploit the flexibility and ease of bringing out objects from the inventory to set up learning spaces in real time in Second Life to match with the learning activity (Reeves & Minocha, 2011, p. 53).

The advantage of using Second Life in higher education is that it is a space in which experimentation can occur in ways that are not possible in real-life. For those in online and distance settings, it offers an opportunity to develop communities, create trust and increase the sense of presence in learning. Yet it also provides a place to play with roles and identity in that it offers an opportunity to undertake activities not normally physically possible, such as flying and changing identity. Further, activities undertaken in virtual worlds in general tend not to have real-life consequences—such as gender swapping or flying into buildings.

There have been many discussions about the uses and advantages of using virtual worlds (for example, Warburton, 2009) but it is perhaps more important to consider the particular values it might bring to a given course or module. Consider for example, if it will facilitate learning at a distance, or will offer more flexibility for the students or programme. In some ways, virtual worlds would seem to be an unusual platform (or world) to be adopted in higher education, but it is one that seems to have been embraced by many tutors who see that value of it as it offers a similar sense of interacting as face to face PBL because of the use of avatars. However, it is important to understand that different forms of PBL affects learning, student engagement and the way in which problem scenarios are designed. The next section delineates the differences between face-to-face PBL, PBL online and PBL in virtual worlds.

5.3.2 Face-to-Face Problem-Based Learning

PBL was an approach popularised by Barrows and Tamblyn (1980) following their research into the reasoning abilities of medical students at McMaster Medical School in Canada. In this early version of PBL certain key characteristics were essential. Students in small teams would explore a problem situation and through this exploration were expected to examine the gaps in their own knowledge and skills in order to decide what information they needed to acquire in order to resolve or manage the situation with which they were presented. The "problems", also termed "scenarios", are central to student learning in each component of the curriculum (modules/units). The lectures, seminars, workshops or laboratories support the inquiry process rather than transmitting subject-based knowledge. Whether it is a module or a whole programme that is being designed, the starting point should be a set of problem scenarios that enable students to become independent inquirers and help them to see learning and knowledge as flexible entities. To date there has been little in-depth discussion about the design of problem-based curricula. Instead the discussions have tended to centre on what counts as PBL, ways of implementing it and types of PBL (Savin-Baden, 2014).

5.3.3 *Problem-Based Learning Online*

PBL online is defined here as students working in teams of four to six on a series of problem scenarios that combine to make up a module or unit that may then form a programme (Savin-Baden, 2007). Students are expected to work collaboratively to solve or manage the problem. Students will work in real-time or asynchronously, but what is important is that they work together. Synchronous collaboration tools are vital for the effective use of PBLonline because tools such as Chat, Shared Whiteboards, Video conferencing and Group browsing are central to ensuring collaboration within the PBL team. Students may be working at a distance or on campus, but they will begin by working out what they need to learn to engage with the problem situation. This may take place through a shared whiteboard, conferring or an email discussion group. What is also important is that students have both access to the objectives of the module and also the ability to negotiate their own learning needs in the context of the given outcomes. Facilitation occurs through the tutor having access to the ongoing discussions without necessarily participating in them. Tutors also plan real-time sessions with the PBLonline team in order to engage with the discussion and facilitate the learning. A useful recent example of using and evaluating online PBL is provided by Ng, Bridges, Law, and Whitehill (2014) in the area of speech and hearing sciences.

For students, the shift to new forms of learning, different from the more traditional didactic approaches they have experienced in school and further education, is often challenging. PBLonline introduces students to two new elements of learning: PBL and learning online. Students' lack of experience with one or the other or both has an impact not only on their experience of and outcomes from PBL and online learning but also on other forms of learning within the curriculum. If other curricula components are lecture-based, students invariably find the management of PBLonline troublesome and challenging. This is because there are few curricula where PBL is used as the only approach to learning and thus students have to manage not only the interplay of knowledge across modules but also different approaches to learning. However, there are also issues about the reasons for using PBLonline in the first place. For example, it is questionable as to whether there is value in using real-time PBLonline for students undertaking the same programme at the same university, unless it is used because of long distances between campus sites where students are using the same PBL scenario. There also needs to be questions asked about whether having asynchronous teams adds something different to PBLonline. Certainly, in distance education, across time zones and campus sites, this would be useful and suit different students' lives and working practices. Yet this raises problems about how cooperative and collaborative it is possible to be, in terms of sharing learning and ideas and developing forms of learning that are genuinely dialogic in nature.

5.3.4 Problem-Based Learning in Virtual Worlds

Learning in virtual worlds (simulations and virtual worlds such as Second Life could become a central learning approach in many curricula, but the socio political impact of virtual world learning on higher education remains under-researched. Much of the recent research into learning in virtual worlds centres on games and gaming and is largely underpinned by cognitive learning theories that focus on linearity, problem-solving and the importance of attaining the "right answer" or game plan (Gee, 2004; Rieber, 1996; Savin-Baden, 2008b) Most research to date has been undertaken into students' experiences of virtual learning environments, discussion forums and perspectives about what and how online learning has been implemented. Although PBLonline combines problem-based and online learning, in doing so it is recognised that students learn collaboratively through web-based materials including text, simulations, videos and demonstrations. Resources such as chatrooms, message boards and environments have been purpose-built for PBL; both synchronously and asynchronously, on campus or at a distance. Practising skills within a virtual environment online offers advantages over learning through real-life practice, in particular the exposure of learners to a wide range of scenarios (more than they are likely to meet in a standard face-to-face programme) at a time and pace convenient to the learner, together with consistent feedback.

5.3.5 The PREVIEW Project

In 2008, Coventry University purchased an island in the virtual world, Second Life™ and then gained funding, with St George's Medical School, London to develop, test and implement PBL scenarios in virtual worlds. The PREVIEW project (PBL in Virtual Interactive Educational Worlds) investigated, implemented and evaluated a user-focused approach to developing scenarios and materials, linking the emerging technologies of virtual worlds with interactive PBL online, to create virtual collaborative tutorials. Coventry University has an innovative track recorded of PBL since 1999 in nursing and professions allied to medicine. In 2012, the Faculty of Health and Life Sciences also decided that all curricula in the faculty would become problem-based. The PREVIEW project sought to combine pedagogy with virtual world technology, which had been tested in health, medicine and social care and has since been tested and implemented in education, physiotherapy and psychology (for example, Parson & Bignell, 2011 and other examples may be found here: http://previewpsych.org/?page_id=148)

Research into learning in virtual worlds has tended to focus on cognitive learning theories. Laurillard (2002), in particular, has argued for an information rich environment in which the student has control in discovering knowledge, but the discovery is supported and scaffolded by extra guidance functions. Yet it is argued here that

virtual world learning offers new perspectives about the socio-political impact of learning in higher education. This is because virtual worlds such as Second Life are universal, not bound by time or geography, and many now using such virtual worlds appear to adopt different learning values from other learning spaces. For example in a study on spatial practice in virtual worlds, Savin-Baden (2013) found that ownership, spatial violation and replication were concerns raised by participants in relation to spatial practice. However, in terms of proxemics, participants suggested that an understanding of social cues, spatial negotiation and spatial consideration were important considerations for effective teaching in Second Life. The findings of this study suggest there remains relatively little in-depth understanding of the way space is implicated in learning in Second Life and that spatial practice and proxemics require further research in order to understand the pedagogical implications of using Second Life as a learning space.

The PREVIEW project was implemented as it was recognised that existing campus-based PBL carries a legacy of limitations from its paper-based nature. The paper cases used in tutorials can only proceed in a single direction, and in so doing; they prevent the user from tracking through any wrong paths by immediate correction. Such cases, therefore, have limited use in developing clinical reasoning, and are often unrealistic for emulating real life, where there are often several ways to tackle a problem and mistakes are often not immediately obvious (Conradi Kavia et al., 2009). This approach is unlikely to engage online students particularly in the same way as more complex, multi-choice scenarios. The project team therefore created (1) specific PBL environments within Second Life, (2) PBL scenarios (3) strategies, guidance materials, and good practice guides, all of which was evaluated under the guidance of users, and made available to the higher education community. Practising skills within a virtual environment online offers advantages over learning through real-life practice, in particular the exposure of learners to a wide range of scenarios (more than they are likely to meet in a standard face-to-face programme) at a time and pace convenient to the learner, together with consistent feedback. It offers learners the chance to make mistakes without real-world repercussions. This project is investigating implementing and evaluating a user-focused approach to developing scenarios and materials, linking the emerging technologies of virtual worlds with interactive PBL online, to create immersive collaborative tutorials. This environment differs radically from that of a virtual learning environment, such as Blackboard or Moodle in that it draws on a primarily visual set of semiotic resources with each participant having an online presence, or avatar, to aid their communication. The aims of the PREVIEW project were to:

(1) Deliver problem-based learning in Second Life
(2) Develop eight interactive PBL scenarios
(3) Evaluate the scenarios from users' perspectives alongside users
(4) Develop guidelines and best practice for delivering PBL in virtual worlds
(5) Share open source materials and technology
(6) Publish findings in medical and higher education literature

5.3.6 *PREVIEW in Practice*

Based in two different health sciences curricula, the scenarios were created as the starting The curricula in which Second Life was implemented were: (1) the *Paramedic Foundation Degree* (Second Year) that is run by the Faculty of Health and Social Care Sciences (a joint faculty of St George's and Kingston Universities); and (2) the 2–3 year part-time *M.A. programme in Clinical Management* at Coventry University. The foundation degree is a 3-year in-service blended learning course with 70 % of its materials delivered via the institutional VLE (Blackboard). The M.A. programme is a distance and online curriculum for those wanting to be effective health service and social care managers.

In the context of this project, PBL scenarios were designed with reference towards the different types and modes of knowledge. For example, the question, "what is the matter with this man?" results in students seeking explanatory knowledge; knowledge that offers some reason for the symptoms the man is experiencing. Whereas if the students were asked, "what would you do if you were this man's physiotherapist?" then the emphasis becomes one of action rather than explanation. Thus the assumption is that the student always understands the explanatory knowledge and can take action, thereby using procedural knowledge. Such a distinction is important because it helps students to begin to understand how they recognise and use different types of knowledge. An example of these forms of knowledge is illustrated in Table 5.1, below.

Gibbons Limoges et al. (1994) argued for Mode 1 and Mode 2 knowledge: Mode 1 knowledge is propositional knowledge that is produced within academe separate from its use and the academy is considered the traditional environment for the generation of Mode 1 knowledge. Whereas Mode 2 knowledge is knowledge that transcends disciplines and is produced in, and validated through, the world of work. Knowing in this mode demands the integration of skills and abilities in order to act in a particular context. Barnett (2004), however, argues for Mode 3 knowledge, whereby one recognises that knowing is the position of realising and producing epistemological gaps. Such knowing produces uncertainty because, "No matter how creative and imaginative our knowledge designs it always eludes our epistemological attempts to capture it" (Barnett, 2004, p. 252). What is missing from the arguments and formations of knowledge and knowing is not only the way in which the spaces between these forms of knowledge are managed, but also what it is that enables students and tutors to make the connections between all of them. Such missing links would include capabilities such as knowing when to keep your mouth shut and the virtues of tact, which are forms of knowing that are required in many professions. Disregarded forms of knowledge then might have been termed Mode 4 knowledge since it transcends and overlays Mode 1, 2, and Mode 3 knowledge but is also a mode in its own right, since it involves not only realising and producing epistemological gaps but also realising the ways in which these gaps, like knowledge and knowing, also have hierarchical uncertainty. Mode 5 knowledge is a position whereby one holds a number of modes together in a complex and dynamic way.

Table 5.1 Types of knowledge and types of problems

Types of knowledge	Explanatory knowledge	Descriptive knowledge	Procedural knowledge	Personal knowledge
Types of problems	Explanation problem	Fact-finding problem	Strategy problem	Moral dilemma problem
Examples	People in the fifteenth century used to believe it was possible to fall off the edge of the earth	Following recent political changes relating to land use in Zimbabwe many internal borders have changed	A 43-year-old woman cannot lift her right arm more than 45° and she complains of pins and needles in her hand	A mother breaks into a chemist's shop at night to obtain life saving drugs for her baby. She contacts her local physician the next day to explain what she has done
Example of question	Explain why	What would a legal map look like?	If you were this client's physiotherapist what would you do?	What should the doctor do?

Reprinted with permission from McGraw-Hill. Savin-Baden M, Major C. Foundations of problem-based learning. Maidenhead: Open University Press/SRHE; 2004, p. 67

Table 5.2 Modes of knowledge (Savin-Baden, 2007 p. 82)

Mode 1	Propositional knowledge that is produced within academe separate from its use and the academy is considered the traditional environment for the generation of this form of knowledge
Mode 2	Knowledge that transcends disciplines and is produced in, and validated through, the world of work
Mode 3	Knowing in and with uncertainty, a sense of recognising epistemological gaps that increase uncertainty
Mode 4	Disregarded knowledge, spaces in which uncertainty and gaps are recognised along with the realisation of the relative importance of gaps between different knowledge and different knowledge hierarchies
Mode 5	Holding diverse knowledges with uncertainties

Gaps, like knowledge, have hierarchical positions and this makes both the gaps and the knowledge, and the knowing and the knower eminently uncertain and liquid. Table 5.2 summarises modes of knowledge

PBL is an approach to learning that challenges students to think beyond Mode 1 knowledge, propositional knowledge, often even in the first year of a programme and it is important for staff to be aware of this and to design scenarios in the first year and second year that allow for engagement with higher level Modes of Knowledge. In this project, PBL scenarios were developed within Second Life. The students' avatars would be directed to the appropriate scenario for that week through a Second Life (SL) URL, often referred to as a SLURL, in the institution's virtual learning environment. For each of the curricula, it was planned that two avatar-driven scenarios would be developed, as well as two information-driven scenarios. This has since changed and currently 7 out of 8 scenarios are avatar-driven:

Avatar-driven: The PBL is set in the appropriate surroundings (for example, at the patient's home, in the hospital ward) and the patient is represented by a non-player character (NPC). Initial information would be given by the NPC and the students would then discuss how to proceed, as in any PBL. Additional information may be presented on display screens (via text, image, video, animation or external links), notecards or sound streams or through the "chat" function of any NPCs involved in the scenario. An example of one of the PBL scenarios at Coventry University, based in a virtual care home for those with learning disabilities, is a difficult situation about an outbreak of disease within the facility.

Information-driven: The scenario is presented through multiple interactive screens in SL. These screens output text, images, sound and video footage as necessary. The information on display changes depending on the students' decisions, similar to the virtual patient model already used at St George's; the difference being SL allows multiple information screens and a collaborative environment so that the students can interact with one another as well as the scenario.

The role of the students, as a collaborative exercise, is to gather as much information about the situation and the disease as possible using a variety of information-driven methods before moving on to an avatar-driven method. Thus, in practice, students undertake the information-driven scenarios first to familiarise themselves with learning though PBL in Second life™. The students then undertake avatar-driven scenarios and are required to interact with a "chat bot" to distinguish what their next actions should be. Feedback suggested that the information-driven scenarios did not work as well as avatar-driven, and the scenarios were restructured slightly to compensate for the students' comments that they did not feel as immersed into the environment with information-driven scenarios. The decision was made to design all the health care scenarios as avatar-driven to provide for a truly virtual and realistic experience. An iterative process was used when implementing and evaluating the PBL scenarios. At several stages throughout the project, testing of each scenario was undertaken, and the feedback from the students' experiences was analysed to improve on the scenarios. The scenarios were then reviewed further alongside students to ensure the feedback had been beneficial to the project. The scenarios are exemplified in Table 5.3 below.

5.3.7 New Developments for PBL in Higher Education

Specific development emerged both during and as a result of this project, which have been developed in response to the need for pedagogically driven scenarios that fit with a virtual world. These include:

- Chat bots—These non-player characters (or chat bots) are artificially intelligent Second Life avatars, which respond to things said in local chat. These were used in two scenarios and took on the roles of a councillor and manager character respectively. These chat bots were programmed via a web service, which allows advanced detection of keywords and phrases. The chatbot was assigned a real Second Life avatar, and logged in to take part in the scenario.
- Machinima—Two other scenarios featured machinima videos, which provided an overview of the virtual situation for students. A machinima is a video created in world, in real time. These were made using screen recording software called Fraps and by enabling lip sync within Second Life so the characters' lips appeared to move when they spoke. The machinimas are then streamed into Second Life and shown on a large screen to participants.
- Holodeck—We used a Second Life object called a holodeck to allow dynamic redesign of the virtual space. The holodeck responds to commands from buttons in the virtual care home reception, and transforms the office space according to the choice made. In practice this meant that it was possible to have four different office spaces, each relevant to the specific scenario. The holodeck also generated content to the main care home building for one scenario, to give the impression of a post-fire situation.

Table 5.3 Problem-based scenario types for use in virtual worlds (adapted from Savin-Baden, 2010, p. 43)

Scenario type	Level of complexity	Example	Problem type	Type of knowledge	Form of knowledge students required to use
Avatar-driven scenario Type 1	Critical contestability	C-difficile	Moral dilemma	Contingent, contextual and constructed	Mode 4/3 Disregarded Knowledge and Knowing in and with uncertainty
Avatar-driven scenario Type 2	Knowledge (re)framing	The unhelpful manager	Strategy	Procedural knowledge	Mode 2/3 Knowledge validated through, the world of work/Knowing in and with uncertainty
Avatar-driven scenario Type 3	Guided discovery	Road traffic accident	Explanation	Explanatory knowledge	Mode 2, Knowledge that is produced in, and validated through, the world of work
		Heart attack			
Mixed mode Type 1	Critical contestability	Lions for Lambs	Moral dilemma	Contingent, contextual and constructed	Mode 3, Knowing in and with uncertainty
Mixed mode Type 2	Knowledge (re)framing	The commissioner	Strategy	Procedural knowledge	Mode 3, Knowing in and with uncertainty
Information-driven scenario	Linear trajectory	Alzheimers	Fact finding	Descriptive knowledge	Mode 1, Propositional knowledge
		Burns case			

5.4 Evaluation

The approach adopted was illuminative evaluation designed originally by Parlett and Hamilton (1972, 1976), originally due to concerns about traditional approaches to evaluation being used to examine innovations in education. The aims of illuminative evaluation were:

> … to study the innovatory programme: how it operates; how it is influenced by the various school situations in which it is applied; what those most directly concerned regard as its advantages and disadvantages; and how students' intellectual tasks and academic experiences are most affected. It aims to discover and document what it is like to be participating in the scheme, whether as teacher or pupil; and, in addition, to discern and discuss the innovation's most significant features, recurring concomitants and critical processes. In short it seeks to illuminate a complex array of questions.
> (Parlett & Hamilton, 1972, p. 144)

This move was away from psychology-based models of evaluation towards one that was based on sociology. This form of evaluation was designed to increase understanding of what is being evaluated. It focused on the explorations of the learning situation (Parlett & Dearden, 1977). The idea is that the evaluation is conducted through the three stages of observation, inquiry and explanation. Therefore, data collection involves:

1. Observation: the evaluator creates a portfolio of events that might at first appear to be on the edge of the study such as meetings, social events and seminars
2. Interviewing: the focus is to explore and examine the interviewee's perceptions from a clearly personal and storied perspective

5.4.1 Ethics

Ethical approval was sought from the relevant University ethics committees. Data collected was confidential. Safeguards to confidentiality included the coding of data and the code was kept separate from the raw data. All names used throughout were fictitious to preserve the identity of participants. However, it should be acknowledged that the individuals concerned might recognise some excerpts within the text used to illuminate the interpretation of data.

5.4.2 Data Collection

The evaluation was designed to increase understanding of what is being evaluated and focuses on the explorations of a learning situation. Data collection involved:

1. Observation by an evaluator whose role was to collect and collate data. He observed a number of events such as meetings, social events and seminars and sessions in the virtual world

2. Interviewing tutors ($n=8$ and students ($n=36$) to explore and examine the interviewee's perceptions from a clearly personal and storied perspective

The objectives of the evaluation were to:

- Explore the impact of problem-based learning scenarios in 3D virtual worlds on learning by observing session, interviewing tutors and students and undertaking focus groups
- Assess the usability of the learning environments and user acceptance analysing students' perspectives and the use of the scenarios by the students both within and outside classroom hours
- Evaluate the effectiveness of feedback mechanisms and guidance materials through interviews and focus groups
- Offer an analytic account of the experience of the project from the perspective of all the key stakeholders through feedback at meetings, creating an interactive feedback cycle to ensure best practice
- Be responsive and flexible enough to capture unintended outcomes and unanticipated effects
- Provide an overall summary of the project, highlighting strengths, weaknesses and areas of development
- Inform current and future developments, paying particular attention to their structures, procedures, working practices, relationships and practices through publications and conference presentations

5.5 Findings

The findings in many ways were more positive than initially anticipated, but there were also a number of challenges. The three themes that emerged for the data were Technological and Pedagogical challenges, Usability and Avatar identity, Collaboration and Interaction.

5.5.1 Technological and Pedagogical Challenges

Feedback suggested that the information-driven scenarios did not work as well as avatar-driven, and the scenarios were restructured slightly to compensate for the students' comments that they did not feel as immersed into the environment with information-driven scenarios. It was anticipated that the technological demands and initial lack of user friendliness of SL would be barrier to participation. However, the technology also had a strong influence on the pedagogical model, as explained one of the tutors,

> I don't feel it (Second Life) lends itself very well to a group (3–4)…– quite high boredom factor for those not directly participating with the non-player character, … they were checking email, adjusting appearance—so from facilitator's point of view it is a good decision making exercise but not for what we understand as traditional PBL (Tutor, paramedic programme)

Thus, the difficulties by tutors identified were not those that are particular to those mentioned in the PBL literature such a poor group work or team members not contributing significantly. When the PREVIEW project underwent testing by tutors and students, few access barriers were reported, although this may become more of an issue with wider implementation of this approach. However, students who were beginners to the Second Life environment needed more time than anticipated to explore and experiment with the virtual world, and familiarise themselves with the new environment; mock scenarios became an important strategy in this process.

> This is my greatest concern. In order to get the students close to a point where clinical reasoning/learning is both valuable and the prominent area of concern. It seems to take a large amount of effort to overcome the heavy interface of Second Life. (Tutor, paramedic programme)
>
> The only problem for me was that there were too many other things to do to distract you from the main objective. (Student, paramedic programme)

This suggests that a degree of initial strangeness and discomfort may have been experienced by the participants, which is significant when considering that they would need a tolerable degree of conformity with the visual/kinetic/semiotic resources of the world and their avatar identity, before they could devote meaningful attention to group collaboration around a problem. One of the difficulties with using PBL, designing interaction learning in virtual worlds and developing simulations is the ability to design and build effective complex and challenging scenarios. There is a tendency to focus on knowledge and content coverage, rather than the way learning will be managed and the design and complexity of the problem scenarios as discussed above in relation to forms and modes of knowledge.

5.5.2 Playing to Learn

Designing learning in higher education has often focused on covering content and ensuring that discipline-based pedagogies are adhered to. What these evaluation data appear to indicate is that the experience of learning with and through an avatar differs between people, and invariably relates to identity transitions and transformations in virtual worlds. Students remarked:

> I got distracted when my avatar was sitting on the cupboard instead of what I wanted 'her' to do. (Student, M.A. programme)
>
> It does distract you when your avatar gets in the way. Just as I wanted to pick up information she started flying and I got confused and it interrupted the experience since I had to deal with the tech. (Student, paramedic programme)

The sense of doing things differently, playing with learning, playing around and exploring were all seen as advantages to PBL in Second Life. Yet these advantages were often seen by tutors as troublesome in the sense that the learning boundaries were not necessary controlled and managed by them, but by the students. Yet for students it was the opportunity to play, which challenged the immutability of knowledge and the perception that learning was static and tutor centred. Findings indicate that SL held a great deal of potential for the development and extension of PBL.

Students seemed able to use their avatars to communicate, collaborate and problem solve effectively.

I liked it! It's more entertaining certainly! More fun. But I'm not sure that we'd have gotten different results if we sat around a table with a bunch of papers chatting (Student, M.A. programme)

I liked the team collaboration aspect to it… I think it's a different way of working out solutions to problems. I liked it and it was fun! (Student, paramedic programme)

Playing to learn seemed to enable an exploration of the ways in which past, current and future identities are present and embodied and multiply interacting with each other in these spaces. Students spoke of fun, of changing clothes and body shapes which indicated a sense of wanted to experiment and play with avatar identities. This raised the issues about the bodily markers that are used to present ourselves in life, clothes, ethnicity, gender and speech and the ways in which these may be re-presented (differently) but they also indicate choices about how we wish to be seen or the ways in which we might like to feel differently "in world" (i.e. in the virtual world). Yet the notion of playing to learn seemed to be at odds between tutors and students. Students saw play as part of or integral to learning whereas their perception was that tutors did not always see it as such. Two students both saw SL as space for play and experimentation which they felt was unexpected by tutors:

> I was instantly engaged. I like debating and this fitted the bill. I also don't mind a bit of humour and a few jokes and that is inevitably involved in SL … There is a real dimension there to do all sorts of creative things you might not have thought of … For some a few the whole thing is off putting, not really serious, you know odd boy, that sort of thing. When I speak to friends who are teachers you have to overcome their prejudice that it's all just a joke. (Student, M.A. programme)
>
> I think the course tutors, they are supportive but they can be quite directive on the course at points and I think their understanding of what education in an online space was quite different from mine. And also I was being quite experimental and in a way I think they hadn't expected and I think they were quite thrown by that. (Student, paramedic programme)

The sense of doing things differently, playing with learning, playing around and exploring were all seen as advantages to learning in virtual worlds. Yet these advantages were often seen by tutors as troublesome in the sense that the learning boundaries were not necessary controlled and managed by them, but by the students. Yet for students it was the opportunity to play, which challenged the immutability of knowledge.

5.6 Discussion

The evaluation of this project indicated that students respond to well-designed, pedagogically driven scenarios that have been specifically created for virtual world learning. The level of realism and immersion of the scenarios seemed to be enhanced by the virtual world environment, including the option to use voice in addition to text-based communication, and students reported that it felt like a more "authentic"

learning environment than PBL based in virtual learning environments. Students responded enthusiastically to the Second Life environment, interestingly tending to initially treat it as a "game". This (common) association of the look and feel of SL with online gaming may arguably be a limitation in the educational setting - in that it could encourage individualism rather than collaboration, and may simplify scenarios in which more nuanced critical engagement is required and no one clear solution is available. However, it is likely to also be an advantage in that it may increase student enjoyment and motivation via memorably novel forms of participation.

Using PBL in Second Life embraces issues such as student diversity and improving student engagement (Wimpenny & Savin-Baden, 2013) connected with complex curriculum design and the need for complex PBL scenarios to be developed. All the planned scenarios were delivered and significant changes were made during development to take most advantage of Second Life. Students appreciated the value of Second Life as a collaborative environment, but also viewed such practice-based simulations as valuable for individual work. An interesting consequence of the richness and authenticity of the Second Life scenarios is the large amount of detail provided, which was much more than is usual in paper-based face-to face PBL sessions. Second Life can provide a more authentic learner environment than classroom based PBL and therefore changes the dynamic of facilitation, but at this stage it is not clear how this impacts on the way the scenario is used and facilitated. However, more recent work undertaken by Chan, Lu, Ip, and Yip (2012) examined paper-based and video scenarios and found that although they had hypothesised that as video-triggered cases tend to be less well defined, students were likely to need more discussion time on problem identification and description, this was not the case. They also had concerns that the video may provide information overload and distraction but this was also unsupported.

It has been pointed out that facilitation of PBL is itself a source of concern for many teachers (Savin-Baden & Wilkie, 2006) and that there are differences and tensions to be resolved between online and face-to-face facilitation. However, there were also technical considerations such as the relatively high specification computers/high bandwidth are required, and the interface is not as intuitive as might be hoped. Interface complexity can provide memory overload. Furthermore, it is essential to prepare users through structured, context-related orientation sessions prior to use as a learning tool. Yet the user-guided development process adopted by PREVIEW, involving the whole development team and students from the target course worked effectively in highlighting strengths and weaknesses in many aspects of the scenarios.

Developing open source, pedagogically-driven PBL scenarios such as these may offer a new liquidity to learning, combining technology with pedagogy in ways that are mutually beneficial not only in distance education, but also as a means to enrich the face-to-face learning environment. However, these environments must be examined not only in terms of the new freedoms they may afford, but also in recognition of their intermittently strange and "troubling" nature, which may in itself provide potential for creativity (Bayne, 2006). Virtual world environments have been

considered as opportunities to move away from the scaffolding of teaching and learning in Higher Education (Savin-Baden, 2008a, 2010). In particular, these characteristics, alongside their creative opportunities, can support the adoption of different learning values from other learning spaces.

5.7 Conclusion

The case study presented here indicates that virtual worlds can provide: (a) greater realism; (b) active decision-making; and (c) a suitable environment for collaboration. These innovations and the evaluations of this project illustrate that it is vital not only to consider what "learning" means in such spaces, but also to address more fundamental questions raised, such as the nature of emergent modalities of educational communication, practices and identities in the "digital age". Such a vision however, will require that we stop seeing the curriculum as a predictable, ordered and manageable space, but instead re-view it as an important site of transformation where risk and uncertainty are central.

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