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A Literature Review On the Usefulness of Second Life As a Pedagogic Tool In the Postgraduate Teaching of Gerontology and Other Policy Relevant Social sciences In the UK

Mark Radford, Athina Vlachantoni, Maria Evandrou and Elisabeth Schröder-Butterfill

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Centre for Research on Ageing, Faculty of Social and Human Sciences,
University of Southampton, UK

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Authors:
Mark Radford completed the MSc Gerontology (Research) and worked as a Research Assistant at the Centre for Research on Ageing. He is currently enrolled on the MPhil/ PhD Gerontology at the University of Southampton, and funded by the ESRC Doctoral Training Centre.

Athina Vlachantoni is Lecturer in Gerontology at the Centre for Research on Ageing. Her research interests combine the areas of ageing, gender and social policy in the developed and developing world, and she is currently involved in a number of ESRC and EPSRC-funded projects in the UK, China and South Africa.

Maria Evandrou is Professor of Gerontology and Director of the Centre for Research on Ageing. She is also Co-Director of the ESRC Centre for Population Change, and of the EPSRC Care Life Cycle Project. Her interests lie in the areas of health and social care, income in later life, ethnic diversity in later life and mental health.

Elisabeth Schröder-Butterfill is a Lecturer in Gerontology at the Centre for Research on Ageing. Her research interests include social networks of older people, informal support, vulnerability, ageing and migration. Her background is in anthropological demography, and her research combines ethnographic and survey methods.

Abstract

Second Life is a virtual online world, which allows individuals to exist and engage with each other through assumed online identities (called avatars), and to participate in commercial, game as well as pedagogic activities. This paper reviews existing literature on the use of Second Life as a pedagogic tool, and considers its usefulness for teaching social policy-related subjects, such as Gerontology, at the postgraduate level. The review argues that Second Life offers the opportunity for simulation which can facilitate better spatial and experiential learning, for example through virtual world games which facilitate learning in a more stimulating and engaging environment. The paper concludes that virtual worlds can offer unique settings for learning and teaching but the real challenge for the future lies in how these can be incorporated in appropriate ways to support identifiable improvements in learning outcomes.

Introduction

Second Life (SL) is a virtual online world, which allows individuals to exist and engage with each other through assumed online identities (called avatars), and to participate in commercial, game as well as pedagogic activities. Since its launch, on June 23rd 2003, it has become a global phenomenon. The total number of signups to this particular virtual world today exceeds 24 million (Figure 1a) and numbers are increasing by more than ten thousand every day (Figure 1b). By 2009 it was estimated that more than 95% of UK universities were either using or experimenting with SL, making it by far the most popular multi-user virtual world platform being used in education (Kirriemuir 2009b).

Figures 1a and 1b: Total Signups to Second Life (left) and accounts created per day (right) Jan –July 2011
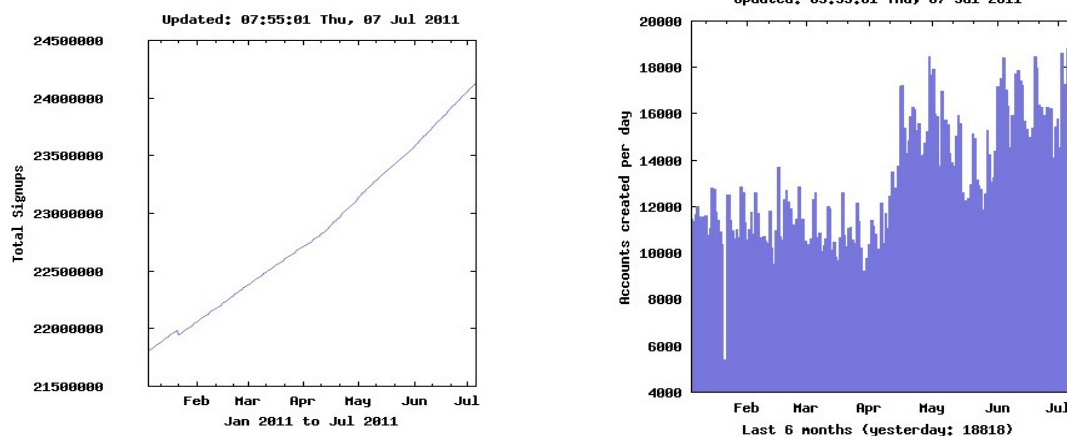
Source: Dwell On it: accessed 7th July 2011

Computer-based virtual worlds have existed since the information technology revolution began in the 1970s, and their roots can be traced back to the Dungeons and Dragons type of role playing game. Over the past forty years, the development of computer-generated virtual worlds has been rapid. Partly as a result of continual refinements and modifications, it has to date proved impossible for academics and others to agree upon a definition of computer-generated virtual worlds. Bell (2008) produced the following definition by combining the essential elements of previous definitions: 'A synchronous,

persistent network of people, represented as avatars, facilitated by networked computers' (Bell 2008:2). In contrast to this definition, Schroeder (2008) emphasises the sensory dimension of virtual worlds, a sensory experience quite separate from that experienced in the real world, by noting that 'virtual worlds are persistent virtual environments in which people experience others as being there with them – and where they can interact with them' (Schroeder 2008:2). Virtual worlds can be defined by the following properties: they are populated by avatars that represent users; they have many users; they provide the illusion of movement in 3-Dimensional (3D) space; they exist whether a user is logged in or not; and they have interactive chat functions (De Lucia, Francese, Passero and Tortora 2009).

Virtual worlds, or 3D immersive worlds such as SL, are sometimes described as multi-user virtual environments (MUVEs). They are to be distinguished from massively multi-player online games (MMOs), which have a fixed storyline or plot for players to follow. In contrast, MUVEs are open-ended, affording participants freedoms and restrictions similar to those expected in the real world and allowing them to choose from a wide range of actions. SL is not a game, and there are no objectives to achieve or levels to complete. Participants can build and create within the virtual world, and buy and own objects within a virtual economy, using the Linden dollar which can be bought with ordinary currency. They can buy, construct and furnish buildings, and purchase other items such as cars. The inherent open-endedness and flexibility of SL and similar 3D immersive worlds has proved attractive to educationalists and lecturers from across a wide range of academic disciplines (Daden 2010; Walburton 2009).

This paper draws on literature on the use of SL in order to evaluate the potential use of this tool in the postgraduate teaching of Gerontology at the University of Southampton, as well as other policy-relevant subjects such as social policy and social work. Gerontology, the study of ageing over the life course, straddles several disciplines within the Social Sciences and beyond, which include sociology, social policy, social work, demography, social statistics, economics, psychology, and medical and biological sciences. The Centre for Research on Ageing at Southampton has offered the MSc

Gerontology (Distance Learning) since 2009 and is involved in initiatives aimed at trialling new technologies in postgraduate teaching, which colleagues from a range of policy-relevant disciplines can benefit from in the future.

Second Life In Higher Education – Opportunities for Policy Related Social Science?

There has been great attention on and interest in virtual worlds and their potential capability to support and enhance higher education learning, teaching and pedagogy since the launch of SL. Several scoping studies have been undertaken in order to establish the nature of current and planned applications of 3D immersive technologies as a pedagogic tool. In the UK, Kirriemuir (2007, 2008b, 2009a, 2009b) produced a series of eight snapshots of virtual world activity in UK Higher Education and Further Education. These snapshots suggest a rapid growth in activity during the period between 2007 and 2009, reflecting an increase in the pool of academics with virtual world skills and an increasingly positive attitude among educational institutions towards the use of virtual worlds. Although a considerable array of application types and disciplines are represented in the report by Kirriemuir, trends of use have emerged in specific subject areas. For example, medical, health and biological sciences account for a large proportion of projects, perhaps because such practical subjects lend themselves to immersive worlds, for example role play between doctors and patients, or perhaps because of funding opportunities for medicine and health related learning. In addition, health and safety, art, performance and design, languages and computer science are well represented. By contrast, there is no reference to SL being used as a pedagogic tool in the Social Sciences. The evidence presented in these studies is largely anecdotal, and there was little effort made to encourage contributions from institutions reluctant to participate in the survey.

Research by Kelton (2007) in the USA indicates that usage of MUVEs such as SL in tertiary education is growing steadily across a broad range of subjects but in a variety of differing ways. Kelton notes that 'because Second Life is such a flexible environment, it is a tool that can be applied to many different ends. In that respect, it seems as if each institution is using this tool in a way that reflects of its own perceived need' (Kelton

2007: 5). The study makes reference to just one initiative in the Humanities and Social Sciences, reporting that Montclair State University in New Jersey had recreated a virtual amphitheatre and active learning areas supporting the teaching of literature, law and history.

Recent research conducted in Australia and New Zealand (Delgarno et al 2011) also supports the notion that many institutions are developing applications to suit individual teaching and learning requirements and suggests that SL, used by 78% those surveyed, is by far the most popular virtual world platform. In contrast to the United Kingdom snapshot reports, the research on Australia and New Zealand found different subject emphases. Of the faculties using 3D immersive worlds, 29% were in Arts and Humanities, 21% in Education and just 9% in a category described as Health Professional. A sociology project was included within the Arts and Humanities group, however the study failed to discover any more social science policy-related initiatives, despite extensive literature searches by the authors. The project comprises three phases, and the results of the third phase, a series of in-depth interviews with educationalists, are due to be published later this year.

A study by Hew and Cheung (2010) reviewed empirical research projects on the use of virtual worlds across primary, secondary and tertiary settings internationally. It considered fifteen published research projects and reported that virtual worlds were most commonly being used for communication, simulation and as experiential spaces by educators, for example teaching students within a virtual classroom (Hew and Cheung 2010). Of the fifteen projects, the most popular subject areas were media, the arts, health and the environment; none of the fifteen studies was in social science.

A recurrent theme in much of the existing literature is the call for further research to consider, firstly the unique properties of SL and other virtual worlds as a teaching and learning tool, and consequently the effectiveness of the use of SL in terms of adding value to learning outcomes for the students. The research methodologies utilised to date are criticised for lacking a solid grounding in contemporary learning theory and for their

shortcomings in terms of academic rigour (Salmon & Hawkridge 2009; DeFrietas 2008; Jacobsen et al 2008).

3D Immersive worlds as a pathway leading to improved learning outcomes in Gerontology and the Social Sciences

Quantitative Social Science teachers and learners have long used computers for statistical analysis and other types of data processing. As the technology has developed, sophisticated electronic information systems have provided a means for social scientists to analyse, model and even predict social behaviour on a scale that was unimaginable just a few years ago (Burton & Appleford 2009). Such information systems have provided wider access to items previously held in museums, classrooms and libraries such as manuscripts, visual art, sound, video and printed text. In addition, there are new ways to visualise data which assist the system user to make sense of complex data sets and even reorganise data to suit personal requirements.

Figure 2: Key components of a Cyberenvironment

Burton and Appleford (2009) illustrate how cyber environments allow social scientists to address an entire information cycle by creating a transparent workflow that allows non-technical users to develop shared data libraries and apply various computational tools to their data without worrying about the underlying technical issues (Figure 2). At the same time as technological developments have allowed social scientists to address research questions using digital technology, there has been the development of web-based instruction and resources for educators and learners. These tools are known as Learning Management Systems (LMSs). WebCT (for example used by the University of Nottingham), Moodle (for example used by the University College London) and Blackboard (for example used by the University of Southampton) are amongst the most popular LMSs. Within such systems, the learner is not required to have any great technical skill, and uses templates and forms to create interactive class based environments. As well as offering document storage and retrieval, LMSs provide discussion forums, online chat rooms, self-scoring multiple-choice questionnaires, audio and video streaming of presentations and lectures amounting to flexible access to all course materials (Kemp & Livingstone 2006). Such systems have supported distance learning for some years and have supplemented on-campus learning. Whilst some teachers and students have required training and support to use these systems, learning outcomes appear to be at least as good as with traditional face to face methods and they have provided more flexibility for learners (Roberts-Gennario & Clapp 2005).

Developers and educators have sought to produce networked systems that combine the best of LMSs with virtual learning environments such as SL, believing that the potential of virtual worlds in education is best harnessed in the context of networked support. Such combinations can facilitate students making the most of the benefits of each domain. For example, the Sloodle project integrates SL Multi-User Virtual Environments (MUVEs) with Moodle, allowing students to benefit from the qualities inherent in both systems (Peachey 2009).

Potential learning affordances of Second Life and other 3D virtual environments for policy-related Social Science

Social Sciences teaching and learning has already been influenced by the rapid technological changes of recent years. The changes are significant in terms of data management and flexibility of access to course materials. The challenge now for educators in Social Science is to identify a set of contributions to learning that 3D immersive environments can make, either on their own or as an addition to existing learning management systems. Several authors have used the term 'affordance' to identify the relationship between an educational intervention and the characteristics of a learner that allows learning to occur (see for example Warburton 2009; Bower 2008). Delgarno and Lee (2010) emphasise the point that 'technologies themselves do not directly cause learning to occur but can afford certain learning tasks that themselves *may* result in learning or give rise to certain learning benefits' (ibid 2011:17). In other words, any appraisal of Second Life as a pedagogic tool in Social Science must recognise that it is the teaching strategy in terms of tasks and activities facilitated by the technology that will influence learning and not the technology itself. For the purposes of this literature review, the applications of SL facilitating potential innovations in pedagogy will be grouped into the three broad categories (3D environment as simulations; access to learning resources; engaging in learning) and within these categories, five affordances will be identified. The categories cannot be seen in isolation but overlap one another. This framework is derived from Delgarno and Lee. Attention will also be given to the potential these applications have to work in tandem with existing cyber environments and LMSs to enhance learning.

3D Environments as simulations

When compared with a traditional simulation or role-play, SL has the potential to provide an enhanced sense of realism and the sense of 'being there'. Ryan (2009) draws a distinction between SL as a role playing device and a simulator. The author contends that

simulations are often designed to allow students to practice a process, for instance a student participating in the classroom, whereas role play, for instance between doctors and patients, is generally designed to help the student practice a skill. Simulations can help a student learn through trial and error in a safe environment, where he or she can visually see the components of the process. In addition, Ryan believes that the anonymity created as a result of a learner 'hiding' behind an Avatar, helps him or her feel empowered to take risks because of the lack of consequences associated with actions taken in a virtual 3D environment. Students can express themselves honestly, express private concerns and overcome fears. This removal of anxiety and fear is echoed in Martin 2007 (cited in Daden 2010). Kirriemuir (2008) notes that the key advantage of SL is that it requires the student to be more than a passive learner in order to progress. For example, in SL students of Medicine may be required to ask a patient certain key questions in order to ascertain the patient's health issue. Inman et al (2010) found that where Second Life was being used in education, it was predominantly in student-centred forms of education rather than traditional lecture-based teacher-centred learning. The study by Inman et al found many examples of role play as well as instances where SL was being used to facilitate collaboration.

SL simulations have significant potential for the teaching of Gerontology. For example, a student could take on the character of an older person faced with difficult choices about housing, health or care whilst another could be part of that person's support network, for example a friend, relative or healthcare professional. The learners could be working in the immersive situation of the older person's longstanding family home. The students' avatars could be dressed according to their roles, allowing students to fully engage in the learning situation. Alternatively, a student could take on the role of an older person with limited mobility in an inappropriately designed building. The exercise would be to adapt the building to maximise mobility and functioning within a certain budget. This would help the student to learn elements of design of 'Lifetime Homes', which are homes designed to cater for people's needs across their life course, through simulation (DCLG 2008). It is this ability to move around a virtual world, developing knowledge in a way only possible in a 3D environment that leads to the Affordance Number 1. This

Affordance argues that 3D virtual learning environments can be used to facilitate learning tasks that lead to the development of enhanced spatial knowledge representation of the explored domain. In order to benefit from simulation in virtual worlds, a learner must interact with the objects in the virtual environment. This benefit is consistent with constructivist learning theories which contend that knowledge is constructed rather than transmitted, and that learning occurs as a result of direct experience, observation and interaction (Jonassen et al 1999; Biggs 2003).

Affordance Number 2 notes that 3D virtual learning environments can be used to facilitate experiential learning that would be impractical or impossible to undertake in the real world. Second Life can create simulations of environments, including settings that may be too expensive to recreate or to visit in real life, or are inaccessible for any other reason. For example, Rogers (2011), when considering healthcare education, describes computer-based clinical simulations as a powerful teaching and learning tool, and found that students were able to work in an artificial social structure incorporating essential learning materials with effective learning strategies. In this situation the tasks being performed would be too expensive, dangerous and risky to perform in the real world. This has potential applications in Gerontology, for example familiarising students with living arrangements within an older persons' care home, and such application is outlined below together with Affordance Number 4.

Simulations can also be intrinsically motivating, especially when the learner has the ability to make choices that will result in the attainment of individual goals. Although SL cannot be described as a game, the virtual world environment supports the development of games and user participation in games. As with any good game, virtual world games have the potential to enthuse and motivate the participant (Falloon 2009). Toro-Troconis & Boulos (2009) illustrate the value of in-world games with reference to the space created by the Faculty of Medicine at Imperial College London, where a game has been developed in a 3D immersive world designed to motivate the students in making decisions regarding diagnoses, investigations and treatment. The game incorporates a specific instructional strategy, which determines the learning environment, for example a

hospital, in order to produce desired learning outcomes. Using a similar strategy, business students at Lancaster University were given the task of searching for items on a variety of SL islands, each with its own distinct business culture. The game involved observing and comparing cultures (Ryan 2009). Games of this nature could be designed to address issues in Gerontology such as the impact of life course events, transitions and trajectories on circumstances in later life. This is linked to Affordance Number 3, which states that 3D Virtual Worlds can be used to facilitate learning tasks that lead to increased intrinsic motivation and engagement. The remaining two Affordances will be discussed in turn.

3D Environments as interfaces to learning resources

Maier & Warren (2000) contend that there is potential for learners to get lost if the structure of the technology they are using is not clear, and that this will have a negative impact on the users' motivation. Ideally, interfaces within SL, and between SL and other resources, should provide simple pathways enabling the user to retain a sense of its overall structure and the connections between ideas (Delgarno & Lee 2010). In policy-related Social Science, virtual world applications which make use of the learner's sophisticated spatial cognitive skills could be linked to non-virtual world learning objects from a variety of sources including video clips, text-based documents, interactive spreadsheets, blogs and wikis. Many organisations, both from within government and from the wider society, offer free online educational material, much of which can be used interactively. For example, the Gapminder website (www.gapminder.org) allows the visitors to manipulate statistical data and create customised graphs on a wide range of demographic and socio-economic topics such as life expectancy and economic growth. This type of innovation has much in common with virtual world technology, in that it allows the learner to experience and visualise the data from a variety of perspectives. Data libraries from other sources, such as the Office for National Statistics and Government Departments, also represent an excellent resource for Gerontology learners. Through links in Second Life, the student would have the opportunity to explore an expansive virtual world library.

The quality of learning improves if the environment where teaching takes place is modelled on the environment where the knowledge will be applied (Mc Keachie 2002). For example, Baddeley (1993) shows that divers retained knowledge better when they have been instructed underwater than on dry land. Several studies, notably by Walker (2009) using SL in counsellor education and Rogers (2011) teaching nursing students, have found that the contextualisation inherent in situated virtual learning environments is conducive to developing effective professional skills. Mayrath et al (2007) used SL in an English course and designed a Greek amphitheatre for role play. Feedback from students indicated that the role playing activity was more successful in the context of the virtual environment than in real life. Affordance Number 4 posits that 3D virtual learning environments can be used to facilitate learning tasks which lead to improved transfer of knowledge and skills to real situations through contextualisation of learning.

In Gerontology, contextualisation of learning could be achieved in a variety of ways. For example, it would be possible to create a virtual social services department of the future. Learners could choose from a variety of policy options and demographic projections in order to create a social services system for future cohorts of older people. The student would be able to see the likely impact of policy on outcomes for older people in the future and gain a deeper understanding of the complex relationship between policy and its impact on people's lives. In the same way, past situations could be recreated in a virtual world, and this would perhaps assist a better understanding of today's policy choices from the perspective of the past. This example not only illustrates the potential of SL to improve learning outcomes through the contextualisation of learning (Affordance 4), but also how it can provide a setting which would be impractical to provide in the real world (Affordance 2).

3D Multi-User Virtual Learning Environments

Inman et al. (2010) and De Lucia et al (2009) highlight the potential of Second Life to provide a platform for collaborative learning. Using computer-mediated communication tools, students can engage in group work and group projects, as virtual worlds allow

students to explore an environment concurrently even though they may be physically thousands of miles apart. This infrastructure for learning and research represents an advance from teleconferencing and videoconferencing in terms of participant engagement, as participants can engage with each other virtually within the same physical space (De Frietas 2008; Ryan 2009). Learning in this context may be enhanced by conversation, collaboration and discourse in accordance with constructivist theory (Jonassen et al. 1999; Inman 2010; Rogers 2011). Warburton (2009: 7) emphasises the capacity of SL to facilitate extended or rich social interactions between individuals and communities and a sense of community presence which gels 'groups, subcultures and geography'.

Delgarno & Lee (2010) suggest that the most significant refinement that SL and other virtual worlds bring to collaborative learning is that they allow learners to carry out tasks together, rather than simply communicate. The authors note that 'three-dimensional virtual environments that allow learners to engage simultaneously in shared tasks and/or produce joint artefacts by operating on the same objects in real time can pave the way for rich and truly collaborative experiences that foster positive interdependence within a learning group' (ibid 2010:22). This leads to the fifth learning Affordance, which notes that 3-D virtual learning worlds can be used to facilitate tasks that lead to richer and/or more effective collaborative learning than is possible with 2-D alternatives.

In the study of Gerontology and other policy related subjects, virtual worlds can provide a platform for continuing and developing social discourse which can serve as the basis for a collaborative education. Online communities are evolving continuously, offering opportunities to engage with, and learn from, people with shared interests across a broad range of cultural, political, economic and social systems. For the Gerontologist, SL could provide links to older people's groups and organisations representing their interests. Cross-disciplinary contact, communication and collaboration could also be supported through the potential integrated functionality of SL combining simulations with oral communications and shared documentation. This potential is particularly relevant to cross-disciplinary subjects such as Gerontology, where some links with related subjects

across the academic disciplines are necessary and are already established in the real world. Cross-disciplinary communities and forums within SL are in their infancy, and the capabilities and infrastructure to actively collaborate between different disciplines has not yet been developed. Nevertheless, this innovation has the potential to change the focus around which learning and research takes place (De Frietas 2008; De Frietas & Veletsianous 2010).

Challenges to be addressed in the use of Second Life in teaching Gerontology and policy related Social Science

Training in SL is essential for both educators and learners. Although it only takes a few minutes to create an account in order to log onto SL, it takes much longer to learn the necessary skills of movement navigation and communication. Berge (2008) concludes that it takes at least a dozen hours in SL for a newcomer to feel comfortable, and much longer to acquire the skills to build islands and create buildings and objects. Indeed, 50% of those who register an account fail to return to SL (De Frietas 2008). The need to invest time and gain skills for navigating in a virtual world has been recognised in several studies as an obstacle to learning in a virtual world. Vernon et al. (2009) suggest that learners make use of SL training websites and skill-mastery assignments before embarking on learning with SL. Demonstration avatars are available which can be pre-programmed to show the new student around a particular island. Training issues are likely to be more significant for those without a specific IT background and those returning to education in later life.

Such issues relating to training and a learner's exposure to new technologies are likely to affect Gerontology students, among whom are often postgraduate returners to education. Salmon et al. (2010) have developed a structured model for scaffolding learning in groups in order 'to ensure that for learners, and teachers, confidence in the environment and in each other builds up in a productive way' (ibid:180). For example, new students can shift from acquiring the basic technical skills to socialising with fellow students online, exchanging information and finally constructing knowledge and developing as

learners (Figure 3). Although all stages shown in the Figure are important, Salmon et al emphasise the importance of the online socialisation stage, which provides the framework for subsequent group learning, and facilitates the student's move away from an isolating learning experience.

Figure 3: Five-stage model of teaching and learning in Second Life
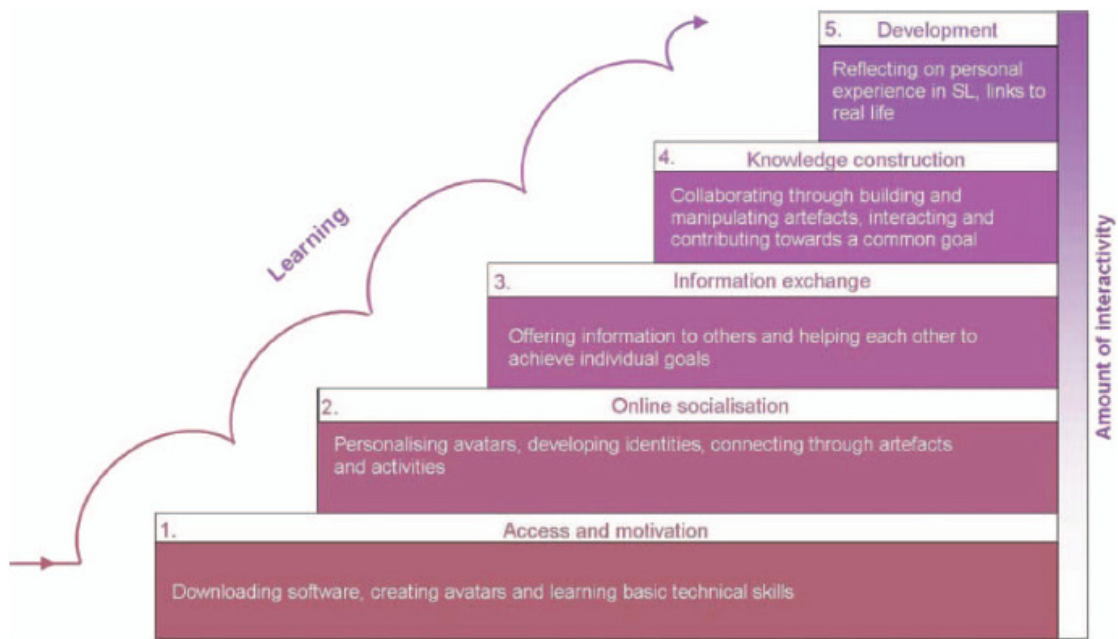
Source: Salmon et al (2010), p 181

Inman et al. (2010) and Mayrath et al. (2009) support the principle of scaffolding learning in SL to allow students to address basic themes first, before moving on to complex activities. They also argue that it is crucial to identify the learning objectives of any virtual world involvement and ensure there is a link between course objectives and course activities. Such alignment of learning objectives with course objectives can ensure that all activities are geared towards contributing to the creation of new knowledge on the part of the student (Biggs 2003). Second Life is highly visual, and users with impaired vision may require additional support. This will also apply to students with hearing impairment if the voice feature is used (Vernon 2009). Those with motor difficulties may encounter difficulties with keyboard and mouse control. That said, for some participants with

physical disability, SL can represent an opportunity for immersion and engagement without the need to travel (De Frietas 2008). Prior to adopting SL as a teaching tool, educators from all disciplines should consider whether the use of virtual worlds has the potential to discriminate against any particular learner or group of learners and, if so, offer appropriate support in terms of access (Inman et al 2010).

Technical concerns relating to issues such as graphic resolution, hardware capacity and processing speeds have frustrated many academics and students wishing to incorporate SL in research or teaching at UK universities (Kirriemuir 2007). However, more recent surveys have indicated that many have either worked around or addressed these issues. This has generally been a result of investment in technology by the host university (Kirriemuir 2010). Whilst budget pressures may impact on the level of engagement in SL on the part of the institution, educational establishments can invest in updated information systems. In addition, there are other economic issues for new users to consider, for example a basic account on SL is free, however anything more than an individual's presence within the SL must be bought, including land and creating teaching spaces, uploading images, acquiring tools and building materials. At present, SL avatars cannot move to another virtual world platform and consequently investment with Linden Lab is locked within a single non-transferable setting (Kelton 2007).

Warburton (2009) provides a succinct analysis of the barriers to the use of Second Life. He highlights the individual's identity as a potential barrier which could be disconcerting and confusing because of the inherent fluidity and playfulness of the avatars' format. A person's identity through their avatar can be amended at any point, and this has implications for the reputation and accountability of tutors as part of educational establishments. In a similar vein, Salmon & Hawkridge (2009) see the establishment of identity as fundamental to developing trust in virtual worlds. They believe that trust is achieved with reference to personal history in the real world and point out that there is no such automatic referencing mechanism in SL at present. The authors also contend that collaboration will be hindered if trust is absent or eroded. Raising similar concerns, Warburton (2009) argues that cooperation and co-construction needs to be built slowly

and advocates building trust and authenticity through external services such as wikis or blogs. He is concerned that the virtual world identities associated with each avatar are insufficient to develop the social discovery of others and that at present 'external websites and social services form an important dimension in the mediated process of relationship formation and sustain synchronous in-world activities beyond the virtual world' (ibid 2009:423). Finally, the link between an individual's identity and its impact on the development of trust with fellow users of the SL, remains a key concern for educators in any discipline.

At the same time, SL can be an isolating experience in a demanding environment. There are concerns expressed in several studies about the potential for 'griefing' from malicious avatars. Some 'griefers' will intentionally wreck websites whilst others will restrict the movements of fellow avatars and even commit verbal and 'physical' assaults (De Frietas 2008). Whilst problematic behaviour can be reported to Linden Lab, there are no binding standards and no assurance that learners will be safe or that they will not be subject to discriminatory behaviour (Vernon et al 2009). Finally, the present lack of open standards is a problem for system developers who wish to integrate technologies.

Conclusion

At present Second Life is the virtual world of choice as an educational tool in British universities and is popular amongst educationalists throughout the world. It is being used across a wide range of disciplines but particularly in health and medical science, and there is evidence of growth in its use to assisting learning in art, performance, design and languages. There is remarkably little literature evaluating SL's potential as a pedagogic tool in policy-related Social Science, despite the fact that several scoping studies have attempted to assess the impact of virtual learning environments across all academic disciplines. Conclusions to be drawn from these studies are limited because they are either incomplete, rely upon small samples or contain anecdotal evidence that cannot be generalised. There is a need for further research in this area.

In the absence of powerful evidence that SL improves learning outcomes, studies have at least identified the learning affordances or learning potential of SL. They have concluded that SL offers the opportunity for simulation which can facilitate better spatial and experiential learning. Through virtual world games, SL can facilitate learning in a more stimulating and engaging environment. SL has the potential to provide access to learning resources that promote contextualisation of learning and collaboration amongst learners and facilitators. These affordances can usefully be applied to learning objectives in Gerontology and the Social Sciences indicating there is potential for better learning with SL.

Social scientists have become familiar with cyber environments and LMSs and recently there have been initiatives to integrate these with MUVEs. This will ensure that Social Science educators do not forego existing pedagogic tools should they choose to incorporate virtual worlds into teaching programmes. In addition, multi-disciplinary subjects such as Gerontology are likely to benefit from SL's yet unfulfilled potential to revolutionise cross-disciplinary and international collaboration.

The research reviewed in this paper is likely to represent just a starting point for future analysis in this field; SL is young, having only recently reached its eighth birthday. Virtual worlds can offer unique settings for learning and teaching but the real challenge for the future lies in how these can be incorporated in appropriate ways to support identifiable improvements in learning outcomes.

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