Coming of the third wave: a move toward best practice, user defined tools and mainstream integration for virtual worlds in education

Marcus McDonald
School of Health Sciences
RMIT University

Sue Gregory
School of Education
University of New England

Helen Farley
Australian Digital Futures Institute
University of Southern Queensland

Jennifer Harlim
HealthPEER, Faculty of Medicine, Nursing and Health Sciences
Monash University

Jenny Sim
Faculty of Medical and Health Sciences
The University of Auckland

Christine Newman
eLearning Services
Queensland University of Technology

The Gartner Hype Cycle has placed virtual worlds on the climb up the Slope of Enlightenment. While some authors in the past have made much of the educational use of virtual worlds languishing in the Trough of Disillusionment, there has been a community of authors, designers and educators working to further understanding of the limitations and affordances of such technologies. It is time to pool this knowledge, experience, tools and practice to solidify best practice, focus research on development of specific elements and forge ahead to shape the third wave of educational virtual worlds. This paper attempts to outline this information and practice while offering solutions for further development.

Keywords: Virtual worlds, education, Second Life, Gartner Hype Cycle, Slope of Enlightenment

Introduction

While some may criticise the Gartner Hype cycle (Steinert & Leifer, 2010), it remains useful as a motivating indicator as to the adoption stage of a particular technology, in this case virtual worlds. Over the period from 2010 until 2012, virtual worlds were located in the Trough of Disillusionment, have moved a little along the hype curve, are now moving up the Slope of Enlightenment and are predicted to reach Plateau of Productivity in 5 to 10 years (Lowendahl, 2013). Despite the 'disillusionment', work has continued through this period with virtual worlds being employed for various educational uses including: venues for role-play (Farley, 2011b; Gregory, Dalgarno, Campbell, Reiners & Knox, 2011; McDonald, Ryan, Sim, James, Maude, Scutter, Wood,, 2012), for collaborative building (Wadley & Ducheneaut, 2009); to facilitate group work (Andreas, Tsiatsos, Terzidou & Pomportsis, 2010); as virtual class rooms (De Lucia, Francese, Passero & Tortora, 2009); for various kinds of assessment (Jarmon, Traphagan, Mayrath & Trivedi, 2009); as simulations of a certain vocational environment (Menzel, Willson & Doolen, 2014); as a self-contained Learning Management System (Becker Nunes, Stieler, Bierhalz Voss & Medina, 2013) or for bringing geographically dispersed students/educators together facilitating interdisciplinary learning (Jerry, Tavares-Jones, & Gregory, 2013).

For most of the above purposes, there is a great deal of redundancy built into commercial virtual worlds aimed at social and widespread appeal, which may detract from the specific uses in education. Even Linden Labs, the proprietors of Second Life, are developing a new high fidelity, low latency virtual world, which is still focused

on the open world concept and they state 'content creators are king' (James Au, 2014, online). With the beginning of the ascent up the Slope of Enlightenment, the future virtual worlds for education should be designed with the needs of educators and learners in mind. Features should be minimised and restricted, or enhanced to those needed for a particular educational task or activity. This would optimise bandwidth use, hardware requirements, useability and creating the necessary conditions for enhancing flow. In order to discern what this third wave of virtual worlds would look like, educators have to ask themselves some questions: What will it take to develop virtual worlds that are fit for purpose? What is required to ensure best practice teaching and learning in these environments? Will these changes be sufficient to propel virtual worlds up the Slope of Enlightenment and finally to the Plateau of Productivity? Or, are the pieces of the puzzle already there, waiting for some sort of critical mass to drive them on? This paper goes some way towards answering these questions and comforts the reader by asking them to keep calm and get on with it.

Climbing the slope

Many virtual world researchers concern themselves with little more than the fact that virtual worlds lie at the bottom of the Trough of Disillusionment (for example, see Schultze, 2010; Wasko, Teigland, Leidner & Jarvenpaa, 2011). Social media commonly has posts about the demise of Second Life, which, as a recent post shows, are little more than misunderstandings of the company's development efforts (Newitz, 2014). Some researchers have pooled their collective wisdom (for example, see Dalgarno, Gregory, Carlson, Lee & Tynan, 2013; Newman, Farley, Gregory, Jacka, Scutter & McDonald, 2013), analysed surveys (Yoon & George, 2013; Gregory, Scutter, Jacka, McDonald, Farley & Newman, in press), assessed projects (Warden, Stanworth, Ren & Warden, 2012) and along the way, identified the stumbling blocks that prevent virtual worlds from gaining mainstream acceptance and adoption. The virtual world educational research community is producing literature about what types of learning are most suitable for these environments, the affordances, the constructive alignments, preferred learning outcomes, assessment strategies and application (for example, see Farley, 2014; Girvan & Savage, 2010). All of this knowledge, shared in an engaged community of practice, should allow for the development of best practice principles and guide the future design of the new virtual world order. But, is the educational virtual world community listening and implementing those recommendations? Is research and refinement in those areas mentioned above ready to create a critical mass, sufficient to move virtual world technologies up Gartner's Slope of Enlightenment?

Current state of practice

Several authors, as outlined in the following paragraphs, have gone to some trouble to identify the concerns and advantages when implementing virtual worlds in education. These seem to be the same concerns or problems across many projects and institutions. There are also many positive aspects and notions that are common. It is these experiences that should be drawn from to inform the future direction of virtual worlds in education.

The Unified Theory of Acceptance and Use of Technology (UTAUT), as described by Venkatesh, Morris, Davis and Davis (2003), predicts how users will respond to a given new technology. It presents a useful framework by which to explore the questions that educators and other users experience in relation to virtual worlds as learning and social environments. It should be noted that the model is concerned with users' 'use' of a given technology. Users will be considered separately, depending on their role as learner, educator, researcher or even educational institution. The notion that users can choose to use any given technology in an educational context should be clarified. Learners would often have little choice about which tool they use in a set task. For this reason, perhaps it is user acceptance and user satisfaction that should be considered when a user or cohort of users is required to use, in this case, a virtual world. The UTAUT postulates four constructs: 1) performance expectancy, 2) effort expectancy, 3) social influence, and 4) facilitating factors (Venkatesh, Morris, Davis & Davis, 2003).

Performance expectancy

Performance Expectancy is the user's belief that the technology, in this case virtual worlds, will lead to gains in performance (Venkatesh, et al., 2003). Do learners believe that virtual worlds will enhance their learning? This is critically important as performance expectancy really describes the perceived 'worth' or outcome of the learning. This is a separate argument from whether learning in a virtual world environment actually results in better learning outcomes which can vary depending on the task and intended use of the virtual world. There are some positive results reported in the literature where students stated that the use of virtual worlds in learning increased their ability to empathise and that the reflective framework used was beneficial to their clinical learning (McDonald, et al., 2012). This is in contrast to other findings where some learners reported that they perceived no educational benefit in using a virtual world (Goh & Yoon, 2011).

The influence of user perception outlines the importance of ensuring the design of virtual world educational activities is underpinned by theoretical frameworks that explain how virtual activities assist in achieving the given learning objectives. In their research on the use of gaming technology in an educational context, Wu, Chiou, Kao, Hu and Huang (2012) found that within the studies they reviewed, theoretical foundations were rarely considered during implementation. An examination of databases and search engines reveals very few articles on the theoretical underpinnings of design for learning in a virtual world. It will be considered then that Wu and colleagues findings (2012) are also likely to be true for virtual worlds. It can be argued that traditional didactic methods often seen in contemporary university teaching are not well-suited to use in virtual world environments. If learners are not actively involved in the learning process, they are likely to become disengaged and become occupied with distractions in the physical world or with playing, instead of focussing on in-world activities. This ability to focus on the virtual world such that the learner feels that he or she is really 'there' is called 'presence' and is necessary for successful engagement with learning in these environments (Childs, 2010). Those pedagogical theories which actively involve the learner in the learning process are also most likely to result in a high level of satisfaction regarding Performance Expectancy in virtual worlds.

There are a number of other learning and teaching theories that have also been found to be relevant to engaging learners in activities planned for virtual worlds (Sim et al., 2012; Sim et al., 2013). Foremost among these pedagogical theories are Constructivism, Social Constructivism, Authentic Learning, Biggs' Constructive Alignment and Schön's Theory of Reflective Thinking (Biggs 2007; Ghaye & Lillyman, 2000; Herrington, Reeves & Oliver, 2010; Laurillard, 2002; Marlowe & Page, 2005; (Schon, 1983, 1987). Constructive Alignment is about aligning learning outcomes with learning objectives and learning activities (Biggs, 2007; Biggs & Tang, 2011) This is important because of the assessment-driven nature of learners (Biggs, 1999b; de la Harpe, Radloff, & Wyber, 1999; Gibbs, 1999). Thus, as part of Performance Expectancy, students will have 'buy-in' for virtual learning when educators are explicit about the goals, outcomes and criteria for assessment (Venkatesh et al., 2003). If the virtual world activities are for learning in the health disciplines, the inclusion of additional learning frameworks, such as models of clinical reasoning and theories of clinical judgment, may be appropriate (Nehring & Lashley, 2010). Similarly, other discipline-specific theories pertinent to certain tasks are likely to be relevant.

Constructivism places the learner at the centre of learning and is ideally suited to supporting the process of reflection (Titchen & Higgs, 2001). It shifts the focus to the cognitive development of the learner and requires them to construct, create, invent, develop their own knowledge and make meaning for their own learning (Fosnot & Perry, 2005). Social Constructivism takes this theory a step further by recognising that learning is a social activity and learning cannot be uncoupled from the social and cultural context of the learner (Jonassen, 2001; Lave & Wenger, 1991). Due to the collaborative nature of learning, learners are exposed to multiple perspectives, which is also consistent with the Authentic Learning proposed by Herrington, Reeves and Oliver (2010). Authentic Learning involves problem solving, with learners experiencing the ambiguity and complexity of the real world. It promotes group reflection, multiple perspectives and collaborative construction of learning which can be enhanced by using reflection to assist students in framing and reframing the problems (Schon, 1987). Mezirow (1990, 1997, 2009) suggests that reflection is required for 'Transformative Learning'. Learners need to reassess their assumptions and expectations which frame the way they think, feel and how they undertake actions when learning. An awareness of personal assumptions is very important and Mezirow (1997) argued that 'educators must help learners become aware and critical of their own and others' assumptions' (Mezirow, 1997, p. 10). In addition, learning activities which involve collaboration with others in the virtual world environment are likely to lead to enhanced presence (Childs, 2010). Hence, social constructivism and authentic learning theories fit in well with the use of virtual worlds where learning is immersive, active and often socially and culturally mediated.

Together, these theories support a virtual learning environment that is constructive, learner-centred, authentic, reflective and socio-culturally mediated. When learning activities are appropriately designed, students assume an active role in learning by constructing, exploring, negotiating and reflecting on their learning within a virtual community of practice (Educause Learning Initiative, 2006). Explicit articulation of how these theoretical frameworks fit into the overall curriculum of the program is critical to ensure 'buy-in' and contribute towards perceived usefulness and job-fit criteria, from university learning and teaching committees, relevant funding bodies and at the ground level, educators and students. Future educators should ensure that the tools used never leave the question 'why are we here?' unanswered.

Effort expectancy

Effort Expectancy refers to the ease of use of, in this context, the virtual world environment (Venkatesh, Moris, Davis & Davis, 2003). There is robust literature reporting on the difficulties that learners encounter in virtual world environments. For example, McDonald, and colleagues (2012), and Dudeney and Ramsey (2009) relate similar stories of users getting lost, unable to adjust user interface settings and variables, as well as being unable to undertake even the simple tasks of moving and interacting. Some of these difficulties have at least in part been blamed on the user interfaces of platforms such as Second Life and OpenSim, which are described as clunky, out-dated, complicated and poorly set out, with this being even more problematic for the casual or first time user (Farley, 2011a). These issues result in learners disengaging with or abandoning the virtual world before becoming immersed and realising the affordances of such an environment with 'it's too hard' being the catch cry, perhaps even before the learner has even engaged in the learning task (El Tantawi, El Kashlan, & Saeed, 2014). Adding to this, Selwyn (2009) posits that the current generation of learners are not 'digital-natives' or talented users of technology. He argues instead that these users are unspectacular and perhaps can be considered consumers rather than users of technology (Selwyn, 2009).

Faiola, Newton, Pfaff and Smyslova (2013) ascertain the feelings of immersion, focus, enjoyment as well as a loss of perception of time known as 'flow' is achievable and a highly desirable aspiration for learning design of education in virtual worlds. They describe an evaluation of Csikszentmihalyi's (1990) seminal work on 'flow' within the context of virtual worlds such as Second Life and state that in order to achieve telepresence and flow, the interface must enable naturally flowing movement and promote interactivity. They do not suggest that this needs to replicate real life though, which perhaps opens possibilities to tools such as Head Up Displays (HUDs) (for example see Griffiths 2014, online). Faiola and colleagues (2013) also maintains that this feeling is key to having users engage deeply with the learning tasks.

Luse, Mennecke and Triplett (2013) afford some insight to the cost benefit of using a virtual world in a cohort of graduate MBA students. They reported that as learners became more experienced with the virtual world, their view towards it changed. Their findings suggest that virtual worlds are useful for 'high-level' functions such as creating a sense of presence, though this perception diminished if the use of virtual worlds during implementation proved to be difficult. In these cases, simple modes of communication prevailed.

Social influence

Within the UTAUT, social influence is defined as 'the degree to which an individual perceives that important others believe he or she should use the new system' (Venkatesh, et al., 2003, p. 451). Cheung and Vogel (2013) found that there is no significant effect of the subjective norms originating from instructors or mass media on students' intentions to use a given technology. Their study addressed attitudes to collaboration using Google applications and, admittedly, this is very different to a virtual world environment. However, this would seem to have similar implications when introducing a new technology such as a virtual world. As outlined earlier, the students may not have a choice over whether or not to use virtual world and may not have an option over the mode which is decided upon by the teaching team. However, there is the issue of whether the learners accept and enjoy the task. This issue may have more impact outside of higher education. When in the area of continuing professional development, previous learners may influence subsequent incoming learners by sharing their experiences. In the scheme of these constructs, it can be seen that addressing concerns in the other three will heavily influence the effect of social influence.

Educators too are affected by the opinions of the teaching community around them. Research conducted by Gregory, et al. 2013 explored use of virtual worlds in higher education and perceptions of users (in press). It was found that the perception of other educators is important in the decision to trial a virtual world as a teaching tool. Results from the research found that, in the cohort of educators that had not used a virtual world and also did not intend to use one in the future, 50% said it was due to: 'My colleagues don't think it is a good idea' and 20% because: 'No-one else I know is using them.' In the cohort that had used a virtual world in the past but did not intend to in the future, 75% responded that: 'My students gave poor feedback' as one of the reasons. This supports the need to deal with the problems in other areas to positively affect the social influence of people that have engaged in educational tasks in a virtual world. While it is not clear that this also extends to an institution's view on virtual worlds, one could safely imply that this would have to be a factor when considering funding or resource support.

Facilitating factors

The UTAUT states that facilitating factors are those that engender a belief that there is an infrastructure supporting the given technology. Two subsets of concern are considered here: one is what the institution has provided with hardware, bandwidth and access and, the second is the infrastructure the students may have themselves. Both are important and vary depending on the given mode of interaction. In a fully off campus/distance learning task, the student would be relying on their own resources. In an on campus delivery, it also depends on what the institution has provided. Again, this returns to the 'it's too hard' argument. If the learners' equipment is not up to the task or takes some 'special' configuration, they are likely to feel frustrated and abandon it. If the infrastructure is lacking, under specification, or is not configured ready for use at the institution, then they may feel resentful and annoyed (McDonald, et al., 2012). The key is to make virtual worlds easier, less demanding on bandwidth and computing resources, and catering to a range of platforms or operating systems.

Viewing the educator as a user, it becomes apparent that, here too, facilitating factors are extremely important. Institutional-level technology, technical, teaching or funding support, are the most common reasons why educators are not teaching in virtual worlds (Gregory, et al., in press). These researchers surveyed educators who had some involvement or interest in virtual worlds. It was found that an institution's lack of commitment to supporting teaching and learning in virtual worlds is the major impediment preventing adoption of such technologies. It is also evident that this is the perception of prospective users and the real experience of those who have attempted to use virtual world environments (Gregory, et al., in press). Aside from the hardware infrastructure to support use of a virtual world, institutional policy towards permitting access to virtual worlds is another critical factor. For instance, many hospitals, corporations and even universities do not permit their firewalls to be breached to enable access to virtual worlds hosted outside of their network (Wiecha, Heyden, Sternthal, and Merialdi (2010). This has implications in terms of extending virtual world education activities to practitioners as part of their continuing professional development or during clinical placement. It implies that users will only be able to participate in virtual world activities after hours. This may serve as major deterrent to uptake of virtual activities among health care practitioners or for integration into clinical placement programs.

Yoon and George (2013) maintain that one reason that corporations do not adopt or maintain their presence in virtual worlds has very little to do with the technology. The same is most likely true of higher education institutions. They maintain that institutional theory plays a part here; that the external pressures to maintain parity with one's competitors is behind the adoption of virtual worlds (Yoon & George, 2013). From the perspective of any given corporation, if all of the other corporations are not adopting virtual world technologies, then there is no motivation for them to. This would seem, however, counterintuitive in those institutions that promote innovation. A second factor they propose is the perception that the other organisations that are in or have been in virtual worlds are not gaining anything significant by their involvement with the technology. With the pervasive perception that virtual world-use is languishing in the Trough of Disillusionment, it is hardly surprising this factor may be influential in decisions surrounding involvement with virtual worlds.

Discussion: the way forward, the third wave

Those technologies in the third wave, or third generation, are products, concepts and thinking that are informed by the failures and successes of the past. They evolve by mitigating all of the problems that precluded their predecessors from attaining universal success, forged in the failure and experimentation of those that choose to push through when many are disillusioned and critical. This is not a criticism of second generation products which may include Second Life and OpenSim. The vendors, including Linden Labs and ReactionGrid, provided the framework, tools and products to create a socially networked open community providing wide appeal. By way of contrast, this third wave of products will be user-driven and optimised to facilitate specific tasks. There is unlikely to be one virtual world product that meets all of the needs of educators. It is more likely that there will be a variety of bespoke virtual worlds built for a specific function common to the needs of certain cohorts. Lessons from above can be taken, accepted that they have already informed the direction(s) that virtual worlds must take to push them into the third generation tools and on into mainstream educational use. For consistency, the UTAUT constructs will be used to frame the areas of development.

Performance expectancy

To sell the idea that virtual worlds can be a useful, contextual, productive and a serious educational tool to learners, educators and institutions, much of the work does not lie within the tool itself. Much of the effort should come from the consideration of the intention and framework in which the virtual world is to be used. It is

abundantly clear that the motivation for using a virtual world should be sound and be of the foremost concern.

There is little reason for educators to 'reinvent the wheel'. As outlined, there is a suitable base and strengthening community of practice concerning the appropriate frameworks and motivations for tasks using virtual worlds. Virtual worlds are not the venue for didactic learning and there are enough solid frameworks that have proven themselves effective in virtual world settings, that this should be now left behind. A shared resource and future scholarly works which pool digital assets, lesson plans, framework descriptors and best practice guidelines would add consistency and surety to the use of virtual worlds in education.

Explicit positive assurance that there is a rationale behind the adoption of virtual worlds as part of learning activities needs to be made clear. This would help to counteract the stigma of virtual worlds being located in the Trough of Disillusionment on the Gartner Hype Cycle or only being suitable as a game.

Effort expectancy

Future virtual worlds should be built around features that would allow users to focus on the learning task. It should shorten or negate the learning curve associated with current virtual worlds. There is great potential to achieve this in many ways. The user interface is one area of improvement that may assist in flow and decrease effort. Shortening the sign up process by logging directly into the virtual world without the need to create an account and selecting from pre-set avatars with only necessary modifications, then allowing the avatar to be dropped directly into the space appropriate for the task would assist, especially *ad hoc* or infrequent users in avoiding the potentially distracting and lengthy process not central to the learning objectives. While for long term users allowing avatars to transfer across platforms would facilitate moving from one platform to another while decreasing time expenditure, maintaining a sense of ownership and identity.

Within the world, navigation could be made simpler and more task-specific by the use of intuitive controls or Heads-Up Displays (HUDs) built into the default interface. This would provide users with quick and easy access to conversational gestures and animations while allowing them to maintain a level of immersion and flow. Peripherals, while perhaps adding a level of complexity, would make the user interface more approachable to the new or inexperienced user. Keyboard short cuts or motion sensing peripherals such as the Wiimote from Nintendo, Kinect from Xbox or Move from Sony PlayStation could also offer a more intuitive and potentially richer experience. The goal of the next generation of bespoke virtual worlds for use in education should indeed make it as simple as possible to achieve educational goals with the effort in learning to control the virtual world as easy as possible. It should enhance connectedness, flow and allow the learner to express themselves adequately.

From a staff and institutional point of view, it should not take great effort, time and teams of people to implement a virtual world into their teaching. Turn-key solutions that can be curated, archived, packed up and then unpacked should be able to be shared or purchased then implemented with little more effort than any other educational asset. It is paramount that such resources can be hosted externally or internally and accessed either on or off campus securely to ensure flexibility delivery. Policy and procedure informed by best practice should do much to assist institutions facilitating access for staff and students. Even in the open and social virtual worlds such as Second Life, the ability to curate, store and manage digital assets could go a long way to making institutional support more practical and remove a significant barrier for implementation.

Facilitating factors

Institutional support was considered to be the main obstruction by staff in adopting virtual worlds. Improving the availability, accessibility and removing the elements that cause frustration for staff and students would be the primary purpose addressed in this construct. The proposed simple way forward is for educational institutions to provide the same support to staff wanting to use virtual worlds as they do with other online tools such as a Learning Management System or collaborative communication tools. The curation of the resources, documents, papers and experience ensures that educators do not need to wholly create new systems of implementation and practice from scratch, project after project. The accessibility of a virtual world is of great importance and should be made as easy as possible, with future bespoke virtual worlds optimised for implementation within institutions. There are a growing number of platforms that allow access via a web browser and such platforms accommodate use across operating systems and a large range of hardware. This would also make maintenance of workstations easier and avoid the need to constantly update proprietary viewers. It would also fit into a 'Bring Your Own Device' (BYOD) framework which facilitates flexible and equitable access.

Caution should be taken when redesigning the virtual world to suit educational use. While second generation products like Second Life and OpenSim have not been ideal, they did free the educator or project team from needing specific expertise in game design. Someone in the team would have been needed to build the digital assets, but the product itself provided the mechanics, interface and systems administration. In the travel up the slope of Gartner's Hype Cycle, the virtual world educational and research community will need to be informed by the methods of evaluation and development from the discipline of game design. Such sources would warn against relying too heavily on existing products (games) for answers, as this often leads to limitations by denying other unexplored design elements (Mateas & Stern, 2005). Eladhari and Ollila (2012) warn that it is tempting to try and design a good game in its entirety, in this case perhaps a virtual world, while not paying enough attention to specific elements or questions. Changing too much, they suggest, would lead to muddied answers of limited use to further developments. Perhaps though, with the right community, user modification abilities and communities, such as that in the gaming world of Half-Life (a science fiction first-person shooter game) would allow fast optimising of a generic role-play virtual world to a wide range of applications.

Bandwidth can be saved and system requirements lowered by having only the elements required for educational needs being part of any new given bespoke virtual world. If user generated content is not necessary and free roaming is not part of the learning design, then not all the digital assets need to be dynamic and streamed. Much of the world could to be stored or cached locally. This would speed up performance and lead to better quality experience. In addition, the size of the virtual world would make a great impact on the amount of resources needed to support it too. If the task involves a fixed virtual room or given space, there is hardly the need for the existence of a whole world. A defined or constrained virtual space specific to the usable educational purpose, will again save on resources and time while also preventing users getting lost, trapped or wandering about.

The NMC Horizon Report – 2014 Higher Education Edition no longer mentions virtual worlds *per se* in its educational outlooks (Johnson, Adams Becker, Estrada & Freeman, 2014). However, what is significant is that social media is predicted to have maximum impact on higher education within the next year. If virtual worlds are to survive and thrive, they need to integrate with social media. Earlier this year, Cloud Party, a virtual world accessed through Facebook, closed down. It could be that this virtual world was simply ahead of its time. In contrast, gamified virtual worlds such as Farmville have been enormously popular on Facebook, aligning with the Horizon Report's identification of gaming and gamification as an important development in higher education. Virtual worlds may also be set for a renaissance with the NMC Horizon Report also flagging that students will be moving from being content consumers to content creators. Many virtual worlds allow for content creation but the scope of that creation is almost limitless. Houses, cities and even countries can be recreated and respond to parameters set by the creator. Models can be built and trialled, scrapped and rebuilt again. These designs could be exchanged and built open. The scope is limitless. The NMC predicts this shift will occur in three to five years.

Conclusion

Education in virtual worlds has suffered because it was attempting to use a platform built for entertainment, social interaction and wide appeal. This meant working on a platform that is often not learner-friendly, difficult to manage, and hard to support, which in turn discouraged educators from adopting it. Institutions have failed to provide adequate infrastructure resulting in staff being not fully supported and consequently, educators and institutions have been reluctant to adopt virtual worlds as a mainstream educational tool.

As more and more virtual world solutions are presented, educators will need to find, or indeed work to create the tool that best suits their needs. They may require a virtual world that is easy to implement and use, or provides better graphics, a more immersive experience, or perhaps one that simulates a specific environment. Because of this, the need for involvement from the discipline of game design and the research methods inherent will be of increasing importance. When all is said and done, the affordances of virtual worlds still hold true. It promotes interdisciplinary learning, alleviates the sense of isolation for distance-learning students by providing them a community where they can interact with other learners. Virtual worlds create new learning spaces by providing virtual environments for activities that are otherwise too costly to create or are impractical in the real world, where experimentation can occur and complex scenarios and learning can be undertaken. Within this paper the authors have demonstrated that there is sufficient amassed wisdom to forge those paths and produce the kinds of tools and best practice that will maximise the use of virtual worlds for enhanced learning. The climb has started up the Gartner Slope of Enlightenment. Now is the time to put together what has been learned, forge new tools, solidify best practice, keep calm and get on with it.

References

Andreas, K., Tsiatsos, T., Terzidou, T., & Pomportsis, A. (2010). Fostering collaborative learning in Second Life: Metaphors and affordances. *Computers & Education, 55*(2), 603–615.

Becker Nunes, F., Stieler, S., Bierhalz Voss, G., & Medina, R. D. (2013). *Virtual Worlds and Education: A Case of Study in the Teaching of Computer Networks Using the Sloodle*. Paper presented at the XV Symposium on Virtual and Augmented Reality (SVR).https://doi.org/10.1109/SVR.2013.45

Biggs, J. (1999). *Teaching for Quality Learning at University - What the student does*. Buckingham: Society for Research into Higher Education.

Biggs, J. (2007). *Teaching for Quality Learning at University - What the student does* (3rd ed.). Berkshire, United Kingdom: Society for Research into Higher Education & Open University Press.

Biggs, J., & Tang, C. (2011). Teaching for Quality Learning at University (4th ed.). Berkshire, England: Open University Press.

Cheung, R., & Vogel, D. (2013). Predicting user acceptance of collaborative technologies: An extension of the technology acceptance model for e-learning. *Computers & Education, 63*, 160–175.

Childs, M. (2010). *Learners' Experience of Presence in Virtual Worlds*. University of Warwick, Warwick: UK. Retrieved from http://www.academia.edu/396680/PhD_Thesis_Learners_Experience_of_Presence_In_Virtual_Worlds

Csikszentmihalyi, M. (1990). *Flow : the psychology of optimal experience*. New York: Harper Perennial.

Dalgarno, B., Gregory, S., Carlson, L., Lee, M. J. W., & Tynan, B. (2013). A systematic review and environmental analysis of the use of 3D immersive virtual worlds in Australian and New Zealand higher education institutions: Final report 2013 (pp. 1–226). Armidale, Australia: DEHub: Innovation in Distance Education, University of New England. Available from http://www.dehub.edu.au/downloads/VWSSP_Report_V2_TD_200613_dehub.pdf.

de la Harpe, B., Radloff, A., & Wyber, J. (1999). *What do professional skills mean for different disciplines in a business school? Lessons learned from integrating professional skills across the curriculum.* Paper presented at the 7th ISL Symposium, York, September.

De Lucia, A., Francese, R., Passero, I., & Tortora, G. (2009). Development and evaluation of a virtual campus on Second Life: The case of SecondDMI. *Computers & Education, 52*(1), 220–233.

Dudeney, G., & Ramsay, H. (2009). Overcoming the Entry Barriers to Second Life in Higher Education. In C. Wankel & J. Kingsley (Eds.), *Higher Education in Virtual Worlds: Teaching and Learning in Second Life* (pp. 11–28). Bingley, UK: Emerald Group Publishing.

Educause Learning Initiative. (2006). 7 Things you should know about Virtual Worlds. Retrieved from http://net.educause.edu/ir/library/pdf/ELI7015.pdf

Eladhari, M. P., & Ollila, E. M. (2012). Design for Research Results Experimental Prototyping and Play Testing. Simulation & Gaming, 43(3), 391-412. https://doi.org/10.1177/1046878111434255

El Tantawi, M. M. A., El Kashlan, M. K., & Saeed, Y. M. (2014). Assessment of the Efficacy of Second Life, a Virtual Learning Environment, in Dental Education. *Journal of Dental Education, 77*(12), 1639–1652.

Faiola, A., Netwon, C., Pfaff, M., & Smyslova, O. (2013). Correlating the effects of flow and telepresence in virtual worlds: Enhancing our understanding of user behavior in game-based learning. *Computers in Human Behavior, 29*(3), 1113–1121. https://doi.org/10.1016/j.chb.2012.10.003

Farley, H. (2011a). *Recent developments in virtual worlds and their potential impact on their use in higher education*. In G. Williams, P. Statham, N. Brown, & B. Cleland (Eds.), *Changing Demands, Changing Directions. Proceedings ascilite Hobart 2011* (pp. 381–385). Hobart, Australia: The University of Tasmania and ascilite. Retrieved from http://www.ascilite.org.au/conferences/hobart11/procs/Farley-concise.pdf

Farley, H. (2011b). The University of Queensland's Virtual World Religion Bazaar Project. In C. Wankel (Ed.), *Teaching Arts and Science with the New Social Media* (pp. 211–237). Bingley: Emerald Group Publishing.

Farley, H. (2014). Virtual Worlds in Higher Education: The Challenges, Expectations and Delivery. In M. Gosper & D. Ifenthaler (Eds.), *Curriculum Models for the 21st Century* (pp. 325–349). New York: Springer.

Fosnot, C. T., & Perry, R. S. (2005). Constructivism: a psychological theory of learning. In C. T. Fosnot (Ed.), *Constructivism: Theory, Perspectives, and Practice* (2nd ed.) (pp. 8–38). New York: Teachers College Press.

Ghaye, T., & Lillyman, S. (2000). *Reflection: Principles and practice for healthcare professionals*. London: Mark Allen Publishing

Gibbs, G. (1999). Improving Teaching, Learning and Assessment. *Journal of Geography in Higher Education, 23*(2), 147–155. https://doi.org/10.1080/03098269985425

Girvan, C., & Savage, T. (2010). Identifying an appropriate pedagogy for virtual worlds: A Communal Constructivism case study. *Computers & Education, 55*(1), 342–349. https://doi.org/10.1016/j.compedu.2010.01.020

Goh, S., & Yoon, T. (2011). *If You Build It Will They Come? An Empirical Investigation of Facilitators and Inhibitors of Hedonic Virtual World Acceptance*. Paper presented at the System Sciences (HICSS), 2011 44th Hawaii International Conference. https://doi.org/10.1109/HICSS.2011.233

Gregory, S., Dalgarno, B., Campbell, M., Reiners, T., Knox, V., & Masters, Y. (2011). Changing directions through VirtualPREX: engaging pre-service teachers in virtual professional experience. In G. Williams, P. Statham, N. Brown, & B. Cleland (Eds.), *Changing Demands, Changing Directions. Proceedings ascilite Hobart 2011* (pp. 491–501). Hobart, Australia: The University of Tasmania and ascilite.http://www.leishman-associates.com.au/ascilite2011/downloads/papers/GregoryS-full.pdf

Gregory, S., Scutter, S., Jacka, L., McDonald, M., Farley, H., & Newman, C. (in press). Barriers and enablers to the use of virtual worlds in higher education: An exploration of educator perceptions, attitudes and experiences. *Educational Technology & Society*.

Griffiths, A. (2014, June 11). HUDs as Immersive Devices. *F/Xual Education Services.* Retrieved from http://fxualeducation.wordpress.com/2014/06/11/huds_and_immersion/

Herrington, J., Reeves, T., & Oliver, R. (2010). *A guide to authentic e-learning*. New York and London: Routledge. https://doi.org/10.4324/9780203864265

James Au, W. (2014, June 20). BREAKING: Linden Lab Confirms It's Building New Virtual World "Far Beyond What is Possible with Second Life." *New World Notes*. Retrieved from http://nwn.blogs.com/nwn/2014/06/linden-lab-building-second-life-2.html

Jarmon, L., Traphagan, T., Mayrath, M., & Trivedi, A. (2009). Virtual world teaching, experiential learning, and assessment: An interdisciplinary communication course in Second Life. *Computers & Education, 53*(1), 169–182. https://doi.org/10.1016/j.compedu.2009.01.010

Jerry, P., Tavares-Jones, N., & Gregory, S. (Eds.). (2013). *Riding the Hype Cycle: The Resurgence of Virtual Worlds*. Oxford, United Kingdom: Inter-Disciplinary Press. Retrieved from https://www.interdisciplinarypress.net/online-store/ebooks/digital-humanities/riding-the-hype-cycle-the-resurgence-of-virtual-worlds

Johnson, L., Adams Becker, S., Estrada, V., Freeman, A. (2014). NMC Horizon Report: 2014 Higher Education Edition. Austin, Texas: The New Media Consortium.

Jonassen, D. H. (2001). Constructivist learning environments on the web: Engaging students in meaningful learning Retrieved from http://www.coe.missouri.edu/~jonassen/

Lave, J., & Wenger, E. (1991). *Situated Learning: Legitimate Peripheral Participation*. Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9780511815355

Laurillard, D. (2002). *Rethinking University Teaching: a conversational framework for the effective use of learning technology* (2nd ed.). London: Routledge Falmer. https://doi.org/10.4324/9780203304846

Lowendahl, J-M. (2013). Hype Cycle for Education, 2013. Gartner. Retrieved from http://www.frankiejackson.net/uploads/2/1/1/6/21168820/hype_cycle_for_education_201_251104.pdf

Luse, A., Mennecke, B., & Triplett, J. (2013). The changing nature of user attitudes toward virtual world technology: A longitudinal study. *Computers in Human Behavior, 29*(3), 1122–1132.

Marlowe, B. A., & Page, M. L. (2005). *Creating and sustaining the constructivist classroom*. Thousand Oaks, California: Corwin Press.

Mateas, M. (2005). Build it to understand it: Ludology meets narratology in game design space. *In Proceedings of DiGRA 2005 Conference* (pp. 299-310). Vancouver, Canada: University of Vancouver.

McDonald, M., Ryan, T., Sim, J., James, J., Maude, P., Scutter, S. & Wood, D. (2012). Multidiscipline role-play in a 3D virtual learning environment: Experiences with a large cohort of healthcare students. In M. Brown, M. Hartnett & T. Stewart (Eds.), *Future Challenges – Sustainable Futures. Proceedings ascilite Wellington 2012*. Wellington, New Zealand: Massey University and ascilite. http://ascilite.org.au/conferences/wellington12/2012/images/custom/mcdonald,_marcus_-_multidiscipline.pdf

Menzel, N., Willson, L. H., & Doolen, J. (2014). Effectiveness of a Poverty Simulation in Second Life®: Changing Nursing Student Attitudes toward Poor People. *International Journal of Nursing Education Scholarship, 11*(1), 1548–1592. https://doi.org/10.1515/ijnes-2013-0076

Mezirow, J. (1990). How critical reflection triggers transformative learning. In J. Mezirow & Associates (Eds.), *Fostering Critical Reflection in Adulthood* (pp. 1–20): Jossey Bass.

Mezirow, J. (1997). Transformative learning: Theory to practice. *New directions for adult and continuing education, 1997*(74), 5–12. https://doi.org/10.1002/ace.7401

Mezirow, J. (2009). An overview on transformative learning. In K. Illeris (Ed.), *Contemporary Theories of Learning: Learning Theorists... In Their Own Words* (pp. 90–105). Milton Park, Abingdon, Oxon: Routledge.

Nehring, W. & Lashley, F. (2010). High-Fidelity Patient Simulation in Nursing Education. London, Jones & Barlett

Newman, C., Farley, H., Gregory, S., Jacka, L., Scutter, S., & McDonald, M. (2013). Virtual Worlds for learning: done and dusted? In H. Carter, M. Gosper and J. Hedberg (Eds.), *Electric Dreams. Proceedings ascilite 2013 Sydney*. (pp. 622–626). Retrieved from: http://www.ascilite.org.au/conferences/sydney13/program/papers/Newman.pdf

Newitz, A. (2014, June 24). Is Second Life About to Become a Ghost World? We come from the future. Retrieved from http://io9.com/is-second-life-about-to-become-a-ghost-world-1594324051

Schon, D. A. (1983). *The Reflective Practitioner: How Professionals Think in Action*. Aldershot Hants, England: Avebury.

Schon, D. A. (1987). *Educating the Reflective Practitioner*. San Francisco: Jossey-Bass.

Schultze, U. (2010). Embodiment and presence in virtual worlds: a review. *Journal of Information Technology, 25*(4), 434–449. https://doi.org/10.1057/jit.2010.25

Selwyn, N. (2009). The digital native: myth and reality. Aslib Proceedings: New Information Perspectives, 61(4), 364–379. https://doi.org/10.1108/00012530910973776

Steinert, M., & Leifer, L. (2010, July). Scrutinizing Gartner's hype cycle approach. In *Technology Management for Global Economic Growth (PICMET)*, 2010 Proceedings of PICMET'10: (pp. 1–13). IEEE.

Titchen, A., & Higgs, J. (2001). A dynamic framework for the enhancement of health professional practice in an uncertain world: the practice-knowledge interface. In J. Higgs & A. Titchen (Eds.), *Practice Knowledge & Expertise* (pp. 215–225). Oxford: Butterworth Heinemann.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User Acceptance of Information Technology: Toward a Unified View. *MIS Quarterly, 27*(3), 425–478.

Wadley, G. R., & Ducheneaut, N. (2009). The 'out-of-avatar experience': object-focused collaboration in Second Life. In I. Wagner, H. Tellioğlu, E. Balka, C. Simone & L. Ciolfi (Eds.), *ECSCW 2009: Proceedings of the 11th European Conference on Computer Supported Cooperative Work* (pp. 323–342). London: Springer-Verlag. https://doi.org/10.1007/978-1-84882-854-4_19

Warden, C. A., Stanworth, J.O., Ren, J.B. & Warden, A.R.(2013). "Synchronous learning best practices: An action research study." *Computers & Education 63(*0): 197–207.

Wasko, M., Teigland, R., Leidner, D., & Jarvenpaa, S. (2011). Stepping into the Internet: New Ventures in Virtual Worlds. *MIS Quarterly, 35*(3), 645–652. https://doi.org/10.2307/23042801

Wiecha, J., Heyden, R., Sternthal, E., & Merialdi, M. (2010). Learning in a virtual world: experience with using second life for medical education. *J Med Internet Res, 12*(1). https://doi.org/10.2196/jmir.1337

Wu, W. H., Chiou, W. B., Kao, H. Y., Alex Hu, C. H., & Huang, S. H. (2012). Re-exploring game-assisted learning research: The perspective of learning theoretical bases. *Computers & Education*, *59*(4), 1153–1161.

Yoon, T. E. and J. F. George (2013). "Why aren't organizations adopting virtual worlds?" *Computers in Human Behavior, 29*(3): 772–790. https://doi.org/10.1016/j.chb.2012.12.003

Please cite as: McDonald, M., Gregory, S., Farley, H., Harlim, J., Sim, J., & Newman, C. (2014). Coming of the third wave: a move toward best practice, user defined tools and mainstream integration for virtual worlds in education. In B. Hegarty, J. McDonald, & S.-K. Loke (Eds.), *Rhetoric and Reality: Critical perspectives on educational technology. Proceedings ascilite Dunedin 2014* (pp. 161-170). https://doi.org/10.14742/apubs.2014.1073

Note: All published papers are refereed, having undergone a double-blind peer-review process.

The author(s) assign a Creative Commons by attribution licence enabling others to distribute, remix, tweak, and build upon their work, even commercially, as long as credit is given to the author(s) for the original creation.