

TEACHING IN IMMERSIVE VIRTUAL WORLDS: CONCEPTUAL CHALLENGES AND OPPORTUNITIES

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Abstract

The immersive and social affordances of virtual worlds offer many new opportunities for educators but also challenge established teaching practices in higher education. This study describes the experiences of eight teachers from the fields of Pharmacy and Nursing who have chosen to implement immersive virtual worlds in their courses. Results indicate that the immersive, social nature of the environment challenges teachers' conceptions of teaching and learning, requiring a student-centred approach to design and implementation of activities.

Introduction

Immersive virtual worlds (IVWs) have been utilised in Higher Education (HE) for more than a decade and their use has steadily increased, particularly in disciplines such as medicine (Boulos, Hetherington, & Wheeler, 2007; Gamberini, Barresi, Maier, & Scarpetta, 2008), education (Nussli & Oh, 2014; Storey & Wolf, 2010) and language development (Knutzen & Kennedy, 2012; Wehner, Gump, & Downey, 2011). There is considerable research on the affordances offered by the unique three-dimensional features of IVWs which provide online learning opportunities that are both immersive and collaborative at a time and place convenient to the learner (Inman, Wright, & Hartman, 2010; Wang & Burton, 2013). The existence of technological barriers both for teachers and students is also well documented (Oh & Nussli, 2014; Warburton, 2009) as is the student perspective (Gamberini et al., 2008; Hew & Cheung, 2010). However, there is little published research carried out from the teachers' perspective and in particular teachers' conceptions of teaching and learning in IVWs are rarely considered. This type of research is necessary to facilitate the induction of teachers into teaching and learning with IVWs and has implications for the sustainability of IVWs.

This study aims to fill the gap by exploring teachers' conceptions of teaching and learning in an IVW and the relationship between these and the design of student learning activities. By investigating teacher conceptions of teaching and learning in IVWs, implications for support and training can be considered that have the potential to increase the quality of student learning and teacher experiences in IVWs.

The experiences of eight teachers from the fields of Pharmacy and Nursing who designed and implemented learning activities in an open source IVW, OpenSimulator (<http://opensimulator.org/wiki/>) are described. The study reports on the teachers' conceptions of teaching and learning, their experiences of designing and teaching in an IVW and discusses the pedagogical implications of the potential paradigm shift involved in teaching and learning using educational technology such as an IVW.

Background

It is widely acknowledged that IVWs hold great educational potential in terms of role playing and fostering experiential learning and social interaction (Jarmon, Traphagan,

Mayrath, & Trivedi, 2009; Savin-Baden, 2008). They can facilitate learning in a realistic context with authentic tasks (Dickey, 2005; Lombardi, 2007), enable rich communication and social interaction and allow consideration of phenomena from different perspectives through role playing and simulations (Childress & Braswell, 2006; S. H. Kim, Lee, & Thomas, 2012; Warburton, 2009).

With regard to vocational education, such as Nursing and Pharmacy, IVWs are being increasingly used to support the achievement of both generic and discipline-specific skills, particularly where students are geographically dispersed. Englund and Wester (2015) have previously described the use of an IVW to offer opportunities for experiential learning in an authentic environments (Wenger & Lave, 1991) and Conradi et al. (2009) have examined the use of an IVW to create a safe and immersive environment for paramedic students to rehearse competency and decision making skills without fear of real-world repercussions. Considerable research has been carried out concerning the use and application of IVWs in HE, although much is of a descriptive nature mainly considering the opportunities offered, providing guidelines for implementation, possible technology barriers and student attitudes and perceptions of the environment.

Educational technology (Edtech) such as virtual worlds can offer a wide variety of opportunities for learning, but there is also increasing evidence that the use of IVWs places new demands on teachers in the design of appropriate activities (De Freitas & Veletsianos, 2010; Savin-Baden, 2010) and involves the adoption of new roles grounded in a student-centred approach to teaching and learning (Ketelhut, Nelson, Clarke, & Dede, 2010; Savin-Baden et al., 2010; Wang & Burton, 2013). De Freitas and Veletsianos (2010, p. 5) propose that the social capabilities of virtual worlds can be challenging for teachers when designing and using IVWs and that one of the reasons for this is their conceptualisation of teaching and learning:

In effect, the definition of learning as information regurgitation is giving way to a notion of learning as centring upon ‘immersive learning experiences’ that are inherently social and collaborative. The key challenge for educationalists here is to respond to a significantly more dynamic and complex learning environment and its associated sets of teaching tools.

Conceptions of Teaching and Learning

Extensive research has been carried out in the area of conceptions and approaches to teaching (Lam & Kember, 2006; Prosser & Trigwell, 2014; Samuelowicz & Bain, 2001). In the present study, conceptions of teaching and learning are defined as e.g. the teacher’s beliefs about teaching and learning, whereas approaches to teaching and learning are defined as the strategies teachers adopt for their teaching practice (Kember, 1997). Some teachers demonstrate teacher-focused conceptions, viewing teaching as the transmission of information, while others have a more student-focused conception emphasising the promotion of the students’ own learning process. Trigwell and Prosser (1996) identified five qualitatively different conceptions of teaching (A to E) that are structurally related in a hierarchy of inclusiveness, ranging from information transmission to facilitating learning through conceptual change (see Table 1 for a more detailed description of the categories).

Teachers’ conceptions of teaching and learning have significant consequences for how Edtech is used to facilitate learning (Englund, Olofsson, & Price, 2016; C. Kim, Kim, Lee, Spector, & DeMeester, 2013; Song & Looi, 2012). Edtech can be used in a variety

of ways, however teachers most frequently use it to support their particular conception of teaching and learning (Kirkwood & Price, 2012). For example, content-focused teaching is likely to manifest itself in technology use for the presentation of information. Comparatively, a learning-focused use of technology allows students to demonstrate their understanding and encourages communication and collaboration (De Freitas & Veletsianos, 2010; Kirkwood & Price, 2013; Savin-Baden, 2008).

Correspondingly, differing conceptions of teaching and learning will result in differing designs for learning activities when using IVWs. Minocha and Reeves (2010) found that conceptions of teaching and learning and design mutually influence each other in that teachers' conceptions guide the design of learning spaces in IVWs and consequently the type of student learning opportunities.

Building on Trigwell and Prosser's research into conceptions and approaches to teaching (1999; 1996), the five categories developed, A to E, have been used in this study as a theoretical framework for a) the identification of the respondents' conceptions of teaching and b) to examine the relationship between conceptions and design of IVW learning opportunities. Following on from Savin-Baden (2008), these categories are described in Table 1 together with the corresponding categories for the dominant Edtech used and the main focus on learning. Table 1 thus builds on Trigwell and Prosser and Savin-Baden's work to illustrate the relationship between conceptions of teaching with technology and the challenges that may be encountered in designing and implementing learner activities in IVWs.

Table 1 (next page) would seem to indicate that a more student-centred approach is required if IVWs are to be successfully implemented. It is probable that a change in the nature of the teaching environment, from teaching in a closed Virtual Learning Environment (VLE) to teaching in an IVW necessitates a corresponding change in conceptions of teaching and learning towards a more student-centred, communicative approach and corresponding strategies for the design of learning activities.

Method

In order to gain insight into the teachers' conceptions of teaching with technology and their experiences of teaching and learning in IVWs, a qualitative approach to data collection was adopted (Kvale & Brinkmann, 2009).

Context

Umeå University, Sweden, has long experience of distance and online programmes and an open source IVW, OpenSim, is hosted by the Centre for Educational Development (UPL). In collaboration with technicians and educational developers from UPL, teachers from the online Pharmacy programme developed a virtual pharmacy and hospital. The IVW is used in the 7.5 ECTS courses *Pharmacotherapy in the Elderly* and *Clinical Pharmacy*. In the courses, the students are provided with opportunities to practice communication with customers, patients and colleagues and are also assessed on achievement of course learning objectives. These courses have now run for five years.

In 2012 the online District Nursing programme also developed a virtual emergency room in collaborations with UPL for clinical assessment and emergency care as part of the course *Care in rural areas*, 7.5 ECTS. The purpose of the activity was to train and examine nursing students in the clinical evaluation and treatment of an acutely ill patient. Team communication and the students' abilities to evaluate the patient's condition and communicate effectively with colleagues are assessed in the IVW. This

course has now been offered for three years and the virtual emergency room will be expanded 2017 to include undergraduate students.

Table 1 *Conceptions of teaching with educational technology*

Conception of teaching	Conception of teaching with technology	Dominant Edtech	Learning focus
A: Teacher-focused activity with the intention of transferring information to the students. The focus is on transmitting discipline-based facts and skills. No prior knowledge by students is assumed or that students need to be active in the learning process.	Activity is teacher-focused where technology is used to transmit information about the discipline. No interaction with students is anticipated. Demonstration and delivery of discipline-based facts and skills using technology as a supplementary tool.	Closed and contained VLEs	Achievement of task
B: Teacher-focused activities with the intention of helping students acquire the main concepts. Students don't need to be active in the learning process and their understanding of the subject matter is built through working within the predetermined teacher and/or content framework structures.	The teacher uses technology to help students acquire the concepts of the syllabus. Students' understanding of the subject matter is facilitated through working with predetermined content materials delivered via institutional technology channels and VLEs.	Closed and contained VLEs	Development of capabilities
C: Interaction between the teacher and students aimed at helping students acquire concepts and understand their relationships. Students' knowledge is gained through active engagement in the teaching-learning process and interaction between teacher and student.	The teacher engages in dialog with students in the learning process using communication technologies. Students are introduced to activities such as digital simulations and animations.	VLE with use of communicative technologies e.g. discussions boards and some social software.	Developing understanding of the content
D: A conceptual approach that focuses on students developing their own conceptions of the subject matter. Here the teacher adopts a student-focused strategy. The focus of activity is on elaborating and extending students' understanding.	The teacher uses technology for collaboration and communication with students and between students. Technologies enabling online project work and group discussions used. Problem-based approaches may be implemented where students can create their own digital resources.	Open source VLE, communicative technologies. Tools for online group work eg, Google docs. Some use of IVWs	Synthesis across boundaries
E: The teacher adopts a student-focused strategy with the intention of helping students to both develop and change their conceptions of phenomena. The focus of student activity is on students' restructuring and changing their current world view by interacting with subject material in a way that challenges their currently held conceptions.	Curriculum and learning resources are created jointly by teacher and students. Open educational resources and social media are used in the learning process. Communication, creation and delivery of digital resources is collaborative. The use of technology is aimed at helping students prepare themselves for their future roles and professions.	Open source VLE, social software and immersive virtual worlds	Critical thought and analysis

Respondents

Data was collected through semi-structured interviews with four teachers from the Pharmacy programme, spring 2015, and four teachers from the Nursing programme spring 2016, to elicit their conceptions of teaching and learning in an IVW and their strategies for the design of activities. Convenience sampling was used to identify respondents actively involved in using IVWs in their teaching. The respondents received a participant information sheet concerning the purpose of the study prior to participation and gave their written consent for the data gathered to be used in this study. Table 2 illustrates the data set used: subject discipline, teaching experience of respondents and IVW learning activities designed by the respondents.

Table 2
Data set used in study

Subject discipline (level, mode)	IVW learning activity	Teaching staff
Pharmacy (postgraduate and undergraduate, online)	Communication skills, assessment of course learning objectives	4 teachers, all female, experienced in online teaching with technology, little experience of face-to-face teaching, no previous experience of IVWs
District Nursing (postgraduate, online)	Teamwork, communication skills, assessment of course learning objectives	4 teachers, 1 male, 3 female, all experienced in online teaching with technology and face-to-face teaching, no previous experience of IVWs.

Interviews were approximately one hour in length and were conducted at a time and place convenient to the respondent. The respondents' contributions were anonymised and stored according to research ethics regulations (Swedish Ethical Review Board, 2004). Qualitative software (NVIVO® ver.10) was used to record, store and organise the data.

Analysis

Thematic analysis was used to analyse interview data (Braun & Clarke, 2006). The interview transcripts were read iteratively by the researcher to gain an overall sense of the data. The interview data was then read again and coded in terms of emergent themes. In addition, the five categories of conceptions of teaching (Trigwell, et al., 1994) were used as a framework for the identification of the respondents' conceptions of teaching with technology and in IVWs. These categories are described in Table 1.

Findings

The findings illustrate a number of themes contributing to the respondents' conceptions of IVWs as an environment for teaching and their design of learning activities. These themes include:

- Conceptions of teaching and learning in IVWs
- Rational for using an IVW
- Attitudes to Edtech
- Design of activities
- Disciplinary fit

Conceptions of teaching and learning in IVWs. With reference to Trigwell and Prosser's (1996) categories of teaching conceptions, Table 1, the majority of respondents (6 teachers) in this study were placed in category D, using technology for collaboration and communication with students and encouraging problem-solving among students. One teacher, who had taken begun teaching in the IVW as a substitute teacher, was categorised as C with a more teacher-focused approach and one as E, employing collaborative production of resources and helping students prepare themselves for their future roles and professions.

I think it's important for students to collaborate, to discuss and create knowledge for themselves. I get the students to work together. I prioritize group work in my courses. I rarely give lectures, more seminars. I most often use a kind of problem based learning but I give them tools, so I think for me it was no problem to work the same way but in an IVW. (Teacher A, Pharmacy)

Especially where activities in OpenSim are concerned, my role is very different. It's more a partnership between the students and myself to create knowledge and understanding to strengthen them in their future role as pharmacists. (Teacher B, Pharmacy)

So I see it as my task as a teacher is to try to find educational solutions so that they get support and a framework for their learning. I do not see my role as a teacher that I should deliver knowledge to them, but I show them where the knowledge is and they have the opportunity learn. I give them the tools to assimilate the knowledge. So I feel I have more of a supervisory, consultative role perhaps. Teacher D, Nursing)

Rational for using IVW. Not surprisingly, since both the Nursing and the Pharmacy programmes are delivered online, the main reason stated for teaching using an IVW was to facilitate interaction and communication for geographically dispersed students.

Mainly to practice communication, but in a realistic situation like the emergency room in OpenSim. When the students enter the room, they become the district nurses and trainee nurses, they really take on their roles. Then there's the fact that the students can't come to campus. The course is online since it's intended for nurses who live and work in sparsely populated areas. The students needed to train teamwork in an environment that would seem like a rural health centre. We also needed to assess them online, so that was why we chose it. (Teacher A, Nursing)

Many of the respondents also discussed facilitation of inter-professional communication, teamwork and opportunities for authentic, experiential learning as being important in the choice of learning environment.

I think communication is a very important part of becoming pharmacists; therefore our students need to practice oral communication with customers and colleagues. I also feel that they become more professional. They don't just act like a pharmacist; they become the pharmacist in the virtual world. So I think that's good both for the students and for the teaching goals. (Teacher C, Pharmacy)

Attitudes to Edtech and IVWs. The teachers engaged in the design and implementation of the virtual activities were positive to the experience and commented that it had

inspired them to develop their ideas and explore the possibilities offered by IVWs further.

I probably had pretty high expectations that using an IVW would be good, I had seen H's course, so I thought it would probably be pretty good to use it in mine too. It seemed like a good way to hold patient rounds and discussions with doctors without the students having to come to campus. I saw that it had potential. (Teacher B, Pharmacy)

Although it was considered time-consuming initially to gain the skill and expertise necessary to navigate and teach in OpenSim, the affordances offered by the IVW, especially for distance students, were seen as outweighing the obstacles.

On the negative side, I felt that there was very much technology involved. [...] So it was very stressful because there were so many things that could go wrong technically and it took time to learn the system. But purely educationally I thought it felt really fun and challenging. (Teacher D, Pharmacy)

Design of activities. The design of activities in the IVW is in congruence with the respondents' conceptions of teaching and learning, focusing on communication and interactivity and they are well-integrated with the course as a whole:

I actually feel that the IVW is an integral part of the course, especially since one of the expected outcomes of the course is to be able to communicate their knowledge to laymen and professionals. I think [the IVW activity] is completely in line with that, it enhances the course more than anything. Teacher B Pharmacy)

The respondents were also well aware of the affordances of the environment:

The virtual room is suited to an exercise we have where the students have to take care of a patient who comes to the emergency health centre and has a problem. The students need to practice systematic thinking, teamwork and even giving an oral structured report and it works well in the IVW. Exercises such as these are successful, but it shouldn't be something that you could just as easily do in a net-meeting. You have to think what function this virtual health centre can fill to help the students learn. (Teacher C, Nursing)

Disciplinary fit. The respondents' use of IVWs for educational purposes is very much in line with the disciplinary conceptions of teaching and learning of the institutions (Wimpenny, Savin-Baden, Mawer, Steils, & Tombs, 2012). This was true particularly where the Nursing programme is concerned.

But in nursing, we're so used to thinking in terms of problem solving, experiential learning, communication and teamwork, so I think it's something that fits great. (Teacher B, Nursing)

Findings also suggest that teacher confidence and competence in using IVWs within the disciplines were central to practical application and understanding. It appears to be of prime importance when designing IVW learning to not only know 'how to do it' technically, but under which circumstances and with whom, and how these can affect the way that particular subject matter is learnt.

So for me, the activities I teach in OpenSim match very well with how we teach within the nursing program because we focus on being systematic, communication

and teamwork and such. It's the same way of thinking about teaching, the same mindset. (Teacher D, Nursing)

Discussion

The majority of teachers involved in the study were experienced online educators, with student-focused conceptions of teaching and learning, well-prepared to adopt the role of facilitator and mediator. For these teachers, the pedagogical impetus to create communicative virtual learning experiences for their students was greater than the technological barriers encountered. Other teachers however, may need support to explore their conceptions of teaching and learning and the affordances of immersive virtual worlds to be able to move away from traditional classroom learning and design activities not with an emphasis on 'learning about' but which focus on 'learning by being' (De Freitas & Veletsianos, 2010).

This has clear implications for the sustainability of IVWs embedded in educational activities such as the Pharmacy and District Nursing programmes. As the initial innovators move on to other assignments new teachers will need to be initiated into not only the technical aspects of teaching and learning in IVWs but also the pedagogical requirements of teaching in an immersive virtual environment. Long-term teacher professional development may be needed to support conceptual change and facilitate a shift to more student-focused teaching and learning where necessary (Ketelhut et al., 2010; Kirkwood & Price, 2012).

In terms of design, teachers need to understand the opportunities for new teaching practices offered by IVWs and a teaching environment that permits and encourages creativity and experimentation is essential. There is a need to identify and capitalise on what IVWs are most suited for, activities that can only be effectively carried out in IVWs, and to develop more student-centred ways of teaching rather than replicating traditional classroom teaching (Savin-Baden et al., 2010).

Teachers' conceptions of teaching are also shaped by their disciplines, and teaching practices reflect the conceptions and culture of the discipline (Shulman, 2005). Further, design decisions are influenced by these underpinning disciplinary conceptions and the activities created frequently echo disciplinary values. Translating the disciplinary traditions and conceptions individuals bring into IVWs can be complex. However for teachers working on the District Nursing and Pharmacy programmes the use of IVWs for interactive, communicative and collaborative work was completely in line with the disciplinary culture and practices of their professions.

Conclusion

The objective of this study was to explore teachers' conceptions of teaching and learning in an IVW world and the relationship between these, the design of learning activities in IVWs and their conceptions of teaching and learning with technology.

Findings indicate that in IVWs the teachers' position is that of a facilitator which necessitates a shift away from the traditional role of teacher as lecturer and purveyor of knowledge to a more student-centred, facilitative role. The main challenges faced by teachers are closely linked to the particularities of the immersive virtual environment, which is social, communicative, interactive, and can require a change in teachers' conceptions of teaching and learning. If the affordances offered by IVWs are to be realised when implementing IVWs, there is a need to be aware of the conceptions of teaching and learning of the teachers and designers when planning student activities.

Limitations. The sample size of the study is relatively small, consisting of eight respondents from two medical disciplines, limiting the degree of external validity and reliability of the results. This study could be elaborated in the future to include a greater number of participants from several disciplines to increase generalizability.

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