

A Framework for an Immersive Learning Environment with Telemetries and Simulation

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The use of virtual environments and on-line collaboration tools are rapidly growing. Educators and researchers are working together on designing virtual environments, for not only delivering the content, but also offering virtual facilities to practice newly learned skills, thus improving the effectiveness of the course. Immersive virtual environment designed for this study is tested within the framework of a course on domestic violence for students coming from different backgrounds (nurses, police officers, emergency response professionals, etc). Avatar based immersive virtual environment offers a classroom with multi media access and different simulation environments, such as children aid office, police station, government health office. These simulation environments are used for new learned skills to be practiced within scenarios presented to students and submit their recorded group act to be evaluated. Students can also be digitally followed within the environment for data to be analyzed later to gain better understanding of the common behavior and practices to improve the effectiveness of the course and the virtual environment. The experience shows that our virtual environment is effective not only in providing the educational experience but also in collecting data otherwise not available.

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A FRAMEWORK FOR AN IMMERSIVE LEARNING ENVIRONMENT WITH TELEMETRICS AND SIMULATION

Introduction

Health and social care workers are involved in many difficult crisis situations that require the involvement of more than one professional. The ability to communicate and work collaboratively as a team, with each member providing his or her expertise, is paramount to delivering optimal services to the community. Training in inter-professional collaboration and teamwork, however, has traditionally been difficult to implement. One of the major barriers to teaching the practical skills of collaborating with other professionals is simply logistics. Coordinating face-to-face meeting time for students from different faculties or institutions, each with variable schedules, can be a prohibitively complex task.

Face-to-face interaction is a key component in learning teamwork skills because developing proficiency in teamwork involves more than simply knowing information *about* teamwork (what psychologists refer to as “declarative” knowledge). Rather, effective teamwork training must involve *learning to do* – what psychologists refer to as the development of “procedural” knowledge. Learning-to-do involves experiential, “hands-on” practice, and in the training of health and social care workers, it involves engaging in simulations of crisis situations.

Recently there has been interest among researchers in the role of emerging technologies in such education and training. Researchers have suggested that the emerging technology of avatar-based virtual environments – where users interact as avatars in a three-dimensional (3D) virtual world - offers authentic and rich learning experiences, especially with respect to fostering student collaboration and teamwork (Dickey, 2005; Falloon, 2010; Kenny, Parsons, Gratch, & Rizzo, 2008).

With respect to the training of health and social care workers in particular, avatar-based immersive virtual environments offer two important contributions. First, they have the potential to provide an effective solution to the logistical challenges of inter-professional education. A virtual environment provides a way to gather geographically-dispersed inter-professional learners together, and provides the flexibility of available meeting space twenty-four hours per day seven days per week. Second, avatar-based virtual environments can contribute to meeting learners’ needs for simulation-based training, which is considered crucial in the training of health and social care workers (Bond et al., 2007).

Simulation-based training in general involves the replication of real-life situations as closely as possible to give participants the opportunity to experience challenging situations in a safe and non-threatening context (Schank, 1997). It has been identified as a powerful tool for developing teamwork skills, and has become an increasingly prevalent method for training within health care domains and emergency training (Bond et al., 2007). With respect to the development of teamwork skills, simulation affords several benefits beyond the simple acquisition of declarative knowledge about teamwork. First, simulations provide an engaging learning environment that emulates the tasks encountered on the job. Practicing in an environment that replicates the performance environment increases the likelihood that the trained teamwork skills will be transferred to the job (Driskell & Johnson, 1998). Second, simulation serves as a safe environment for learning without the

risk of patient harm. By removing the potential for high-stakes errors during training, learners can comfortably experiment and familiarize themselves with teamwork skills before applying them in clinical practice where the consequences for errors can be high. When errors do occur, simulations allow for immediate feedback to maximize learning (Rosen et al., 2008).

A challenge in providing simulation-based training in on-line educational environments is the need for realistic interaction among participants and the related need for a technological framework that can adequately simulate face-to-face interaction. Avatar-based immersive virtual environments offer advantages over other current collaboration technologies such as web-conferencing, video-conferencing, and video walls in their superior capacity to emulate face-to-face interactions. Other collaboration technologies present various boundaries that separate individual participants, whereas boundaries do not exist between avatars in the three-dimensional immersive virtual environment (Davis, Murphy, Owens, Khazanchi., & Zigurs, 2009). In addition, communication among avatars in immersive virtual environments allows for the inclusion of both verbal and non-verbal cues that can be controlled by the person behind the avatar (Davis et al., 2009).

Beyond the benefits for learners, interaction in virtual environments also offers researchers data on communication patterns through telemetry that is not readily available in real-life face-to-face training environments. Telemetry involves the collection of data from the virtual environment, such as the location and pattern of interactions among avatars and logs of certain features of encounters. These can be recorded and used for quantitative analysis, allowing researchers to develop a better understanding of the learning process in virtual environments.

Researchers have begun to explore the use of emerging technologies in simulation-based training for single-user applications, but there is a lack of research for multi-user environments. For example, Sticha, Roy, and Olsen (2006) report on a prototype training system involving a “Virtual Standardized Patient” designed to train the medical community to recognize and manage victims of bio-terrorism. This kind of simulation replicates the functionality of live standardized patients, but unlike real-world simulations, it allows for repetitive training, requires only limited resources, can be easily distributed, and provides immediate feedback to the user. It represents the use of experiential learning methods instead of traditional didactic approaches, and anecdotal evidence suggests that this type of simulation training is highly engaging and that the use of interactive role-play simulations improves training effectiveness (Sticha et al., 2006). Anolli, Vescovo, Agliati, Mantovani, and Zurloni (2006) also report on a type of single-user virtual simulation for medical training. They describe the use of 3D simulations where a physician and patient interact in a virtual environment to help the physician train their communicative and emotional skills.

The research into single-user simulation training in an avatar-based virtual environment, described above, suggests the potential of the immersive virtual environment for engaging learners in experiential learning. Multi-user virtual environments, however, offer the possibility of the same engaging simulation-based training but for multiple geographically-dispersed learners. Perhaps the most famous multiple-user immersive platform is “Second Life” (www.secondlife.com), which is a 3D virtual world that has been widely used for

social, educational, and commercial purposes. Other examples include “Active Worlds” (www.activeworlds.com), Twinity (www.twinity.com) and IMVU (www.imvu.com). Boulos, Hetherington, and Wheeler (2007) suggest potential uses for 3D worlds such as Second Life with respect to health and medical education based on the idea that 3D virtual environments provide an immersive and realistic experience that combines communication, training, and entertainment, in addition to providing access to a variety of types of data about the educational experiences of users.

Based on the potential benefits of multi-user 3D virtual environments for facilitating simulation-based training for health and social care workers, we generated a virtual environment designed to provide a platform for a course on inter-professional collaboration for health and social care workers. Below we describe the platform itself as well as the evaluation of the learning experience provided by the users.

Methods

The virtual environment and the course content that make up this study represent a pilot project that was designed as a development and testing phase for a 6-week long course in inter-professional collaboration at Algonquin College in Ottawa, Canada. The pilot project was a two-day workshop that took place in the spring of 2009, the objective of which was to improve the communication skills and inter-professional competence of participants. In this section, we describe the participants involved, the technical aspects of the virtual environment, and the measures we used to assess participants’ experiences of the workshop.

Participants

Sixty graduates were recruited from several different programs of study at Algonquin College in Ottawa, Canada to work as consultants on this project. They included recent graduates from Police Foundations, Nursing, Child and Youth Worker, and Paramedic programs. Graduates from these particular programs were chosen because they are likely to be exposed to domestic violence in their working environments, and a domestic violence scenario was to be the main simulation experience of the workshop. Participants were recent graduates of their respective programs who had not yet started working. They were each paid 300\$ as consultants in the 2-day, 16 hour workshop. Approximately 300 recent graduates were approached to be consultant, and were accepted on a first-come first-serve basis. All consultants were approached by a professor independent from the research project to determine if they would be interested in participating in the research project. Ethics approval was obtained through the Algonquin College Research Ethics Board. All 60 consultants agreed to participate in the study and informed consent was obtained. Of the sixty participants, 63% were female ($n = 38$) and 37% were male ($n = 22$). The age of participants, for those who reported age ($n = 48$) was as follows: 18-20 years ($n = 9$), 21-25 years ($n = 23$), 26-30 years ($n = 10$) and 31 years and above ($n = 6$).

Materials

The two-day workshop involved the collection of data through a variety of methods, including participant course evaluations, telemetry, recordings of simulations performed by learners both in real and virtual environments, and individual and group interviews. The focus of this paper is limited to presenting brief telemetric data as well as summarizing participant course evaluations. Before describing these methods of data collection, we provide an overview of the virtual environment developed for this project.

The virtual environment. The virtual environment was created to provide learners with simulation-based learning opportunities as well as virtual locations where avatars could meet in a group to listen to lectures or engage in group collaboration exercises. The general structure of our virtual environment is shown in Figure 1.

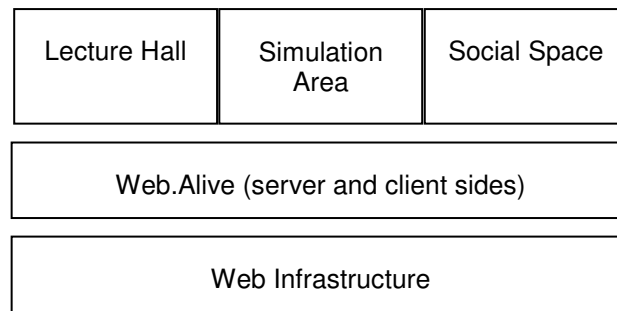


Fig. 1. General Structure of the Virtual Educational Environment

Visually, the virtual environment appears to the user as a campus with a series of buildings that avatars can enter, each connected by pathways amid open, grass-covered lawns. Users move their avatars through the virtual environment using basic keyboard commands and can perform an additional series of basic physical movements (e.g., shaking hands) using an on-screen menu. Each user sees the virtual environment from the perspective of being behind their avatar. Figures 2 and 3 are screen shots that display different views and features of the virtual environment. Figure 2 shows the interior of the lecture hall where avatars can meet to listen to a virtual lecture, delivered by an avatar lecturer. Figure 3 shows an outdoor view including three different item-types, labelled as follows: 1) a bungalow used for crisis simulations involving multiple learners; 2) one of a number of office suites placed throughout the environment that represent the different organizations of the professionals involved (e.g., nursing, police, paramedics, child and youth workers) and which house virtual collaboration space; and 3) a screen that provides a surface for the sharing of slides and documents and functions as a synchronized web collaboration surface.



Fig. 2 Lecture Hall with During the Break, Particepants Having Discussions



Fig. 3. A Screen Capture of the Virtual Environment

The different “areas” of the virtual environment can be controlled to define which avatars have access to specific locations within the virtual environment. This allows for private meetings and restricted access to certain locations.

While the learners in the virtual environment are considered “players”, the system also supports “non-player” characters such as a crying child who is a victim in a simulation scenario. The non-player character can be controlled by scripts and events. Figure 4 shows an example of a “non-player” character (a crying child) in a simulation area. Figure 5 shows examples of simulation scenes.



Fig. 4 Crying Child non-Player Agent



Fig. 5 Example Scenes from the Simulations

The presentation of content by instructors in this virtual environment is done through surfaces (screens, as described above) that can show videos, images, presentation files (supporting Powerpoint and PDF), and real-time web pages. This allows instructors and other participants to easily access content and update it in real time while in the virtual environment.

With respect to audio, users controlling avatars each wear a headset that allows audio communication with any other avatar in the virtual environment. The system allows 3D

spatial audio. This means that users can hear each other based on proximity to one another in the virtual environment. The sound level can also be set as independent of distance as needed (e.g., for speakers in the lecture hall). Users can know who can hear them through indicators on their display and can control certain audio features such as temporary mute of their own headset. Avatars communicate with each other verbally and can hear all other avatars in proximity to them, but also have the option of sending a text message to other avatars.

With respect to the technological platform, the virtual environment was created using the platform Web.Alive™. The content of the virtual environment is a set of 3D assets generated using standard software tools and environmental controls such as events, triggers, scripts, and volumes. These are defined using the Web.Alive™ editor, which also serves as the tool to put together all of the assets. Web.Alive™ is based on the Unreal Engine by Epic Games (www.unrealtechnology.com) and supports a variety of different asset types. Figure 6 shows a graphical representation of the system architecture.

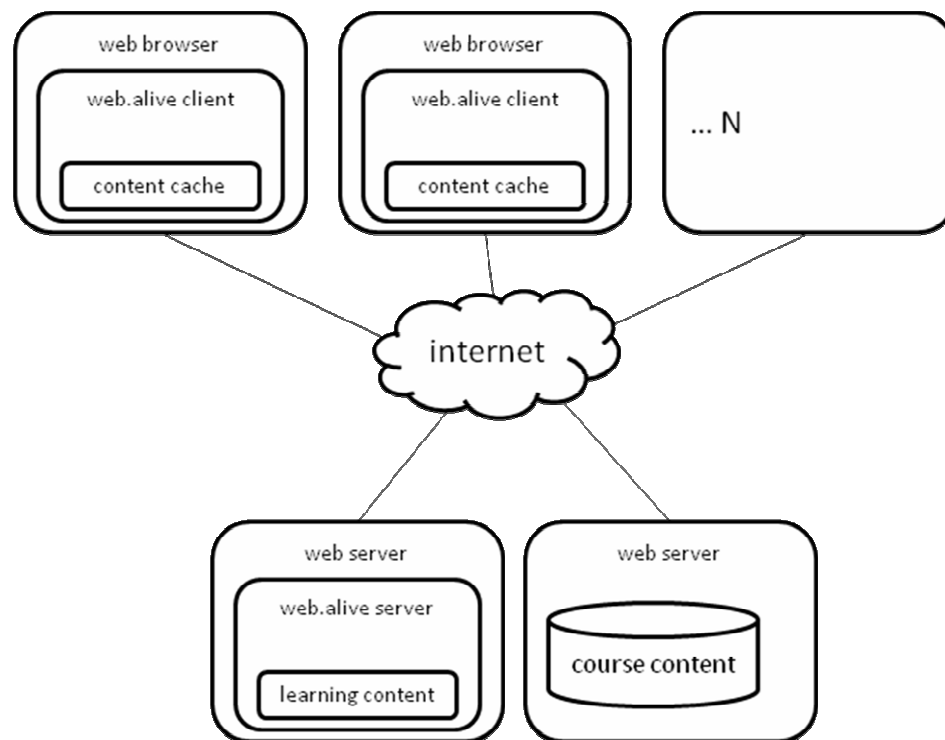


Fig. 6. System Architecture

Telemetry. Telemetric data was collected from the virtual environment during the pilot workshop and we describe its features here as an illustration of its potential for contributing to our knowledge about learning in a virtual environment. Two levels of data were collected: data collected at the level of the server, and data collected at the level of the individual users. In order to respect the privacy of users, the data collected on the server is limited to data which is typically collected over the World Wide Web such as source

Internet Protocol (IP) address, user supplied name, and action performed. At the level of the individual user, data collected includes detailed logs of encounters among avatars that occur within the virtual environment, such as the time each user spent participating in interaction with other avatars, and the time each user spent in each location. The logs are collected for both server and individual user data in a format consistent with the standard World Wide Web Consortium (W3C) logging format. The virtual environment was designed with specific features to facilitate telemetric data collection. For example, the system automatically recorded data on when avatars entered or exited a specific area within the virtual environment (e.g., user entered classroom #2). The virtual environment also contained “stare triggers”, which initiate a log when a user places their cursor over an object (such as a slide presentation) for more than three seconds.

Participant Course Evaluations. At the end of the workshop, participants were asked to complete a course evaluation survey. In this paper we focus on the six items from this survey that relate to the experience of the virtual environment. They included likert-style rating scales as well as open-ended questions. The two likert-scale items, rated on a 5-point scale, where 1 = poor and 5 = excellent, were as follows: “How would you rate the virtual-reality component of the course”; and “How would you rate the ease of navigating within the virtual environment of this course?” The four open-ended questions included the following: “Please describe what you liked about the virtual reality component of this course”; “Please describe what could be improved in the virtual reality component of this course”; Please describe what you liked about navigating within the virtual reality environment of this course”; and “Please describe what could be improved to ease navigation within the virtual reality environment of this course”.

Procedure

Participants who consented to participate attended one of two two-day workshops that were conducted in a standardized, blended-methods format. The format included real and virtual simulations of a crisis situation involving domestic violence, learning activities in the virtual environment, and face-to-face group debriefings about the simulations and learning activities. Thirty participants attended each 16-hour workshop. The details of the sequence and content of the workshop are presented in Appendix A.

Results and Discussion

Telemetric data

Telemetric data was collected as a part of the pilot project using Web.Alive™’s logging system and set of data analysis tools. Two types of data analysis that are possible using telemetric data are presented in Figure 6. In particular, we were able to observe the influence of time spent in conversation with other avatars on active duration within the virtual environment. The graphed findings suggest that the more users were actively participating in conversations within the virtual environment, the longer they stayed in the environment. This finding indicates the importance for instructors to find ways to encourage users to participate in conversations and interact with other avatars during

learning sessions. We were also able to generate “heat maps” that indicate where avatars tended to congregate within the virtual environment.

The telemetric data collected provides the potential for further and more extensive quantitative analysis focused on learning in the virtual environment. Such quantitative analysis of features of learning in an immersive virtual environment may help to increase the overall effectiveness of education in both virtual and real-life classrooms in the future.

Participant Course Evaluations

Responses from participants’ responses to the open-ended questions on the course evaluation were reviewed and major themes were identified. These themes are outlined below. Themes and responses are presented in greater detail in Appendix B.

Comfort, Safety, and Teamwork. Participant responses indicated comfort with using a virtual environment for simulation. Participants commented on being more comfortable and safer in virtual environment simulations than in real world simulations. They reported that it was an advantage to be able to participate in an emergency simulation while being in a comfortable and familiar physical environment. These feelings of comfort and safety allowed participants to be more engaged in the simulations in the virtual environment. For some the virtual environment shielded them from the anxiety of participation and simulations. For example, one participant wrote the following: “It was easy to get started, to be more involved, without being shy, especially with people I don’t know and safe in virtual environment. Being in a game like environment with the protection of distance.”

Communication. In general, participants made positive comments regarding the domestic violence simulation in the virtual environment. Some participants noted that the virtual environment forced a focus on verbal communication and as a result helped them to improve their communication skills. For example, one participant wrote the following: “... it takes people out of their comfort zone by removing the ability to touch a patient and rely totally on verbal communication skills.”

Although the forced focus on verbal communication was helpful, participants also expressed having difficulty with the absence of the physical aspects of their roles, and with the absence of non-verbal information such as facial expressions of other participants during the simulation.

The Virtual Environment. In general, the experience of being in the virtual environment was reported to be fun and playful. Almost half of the participants ($n = 27$) commented on these aspects of the virtual environment. Participants appeared to accept the technology and many took the time to customize their avatars before immersing in the virtual environment. They reported enjoying the ability to customize their uniforms.

Although participants generally found it easy to navigate in the virtual environment, an introductory session was needed for both participants and course instructors to familiarize them with the basic aspects of controlling their avatars. Participants suggested that technical improvements could be made to the virtual environment through improving the repertoire of animations and the clarity of voice communications.

Quantitative results. For the survey item that asked participants to rate the virtual reality component of the workshop, the mean was 3.42 ($SD = .95$) on a scale of 1 to 5 where 1 is poor and 5 is excellent. For the item that asked about the ease of navigating within the virtual environment, the mean was 3.70 ($SD = .99$). These results indicate that the majority of participants rated the virtual environment and its ease of use as good or better. The breakdown of responses per response category is presented in Table 1.

| | Poor | Fair | Good | Very Good | Excellent |
|--|------|------|------|-----------|-----------|
| How would you rate the virtual reality component of this course? | 3% | 4% | 23% | 23% | 6% |
| How would you rate the ease of navigating within the virtual reality environment of this course? | 1% | 3% | 24% | 16% | 16% |

Table 1. Participant responses to virtual reality component of the workshop

Conclusion

In this paper we presented the structure and implementation of an avatar-based immersive virtual environment designed to facilitate the teaching and acquisition of inter-professional competence and communication skills for health and social care workers. The environment that we developed allows for simulation of crisis situations that can be role-played by multiple geographically-dispersed users who interact as avatars. It also allows for a variety of learning activities, including lectures and media presentations, as well as group exercises, all of which occur in the virtual environment. In addition, this virtual learning environment allows for the collection of telemetric data. Telemetric data represents a potentially rich source of information for quantitative analysis related to features of the learning experience.

Results from workshop evaluations indicate that this virtual environment was experienced by the vast majority of participants as enjoyable and engaging, and was rated as generally being easy to navigate.

The technology of avatar-based immersive virtual environments offers a potentially effective solution to some of the key the challenges and demands of inter-professional education for health and social care workers. In particular, avatar-based virtual environments provide solutions to logistical challenges of coordinating inter-professional teamwork education and in addition meet the need for face-to-face simulation-based training for health and social care professionals. Our research team intends on following up this pilot project with an investigation of the effectiveness of our avatar-based learning environment as applied to a longer, six-week course on inter-professional collaboration. Further study of such virtual environments will be necessary to determine the optimal course structure and delivery, but the tremendous potential for multi-user simulation-based training in a virtual environment is clear.

References

- Anolli, L., Vescovo, A., Agliati, A., Mantovani, F., & Zurloni, V. (2006). Simulation-based training of communication and emotional competence for the improvement of physician-patient relationship. *Annual Review of Cybertherapy and Telemedicine, 4*, 79-86.
- Bond, W. F., Lammers, R. L., Spillane, L. L., Smith-Coggins, R., Fernandez, R., Reznek, M. A., et al. (2007). The use of simulation in emergency medicine: A research agenda. *Academic Emergency Medicine, 14*, 353-363.
- Boulos, M., Hetherington, L., & Wheeler, S. (2007). Second Life: An overview of the potential of 3-D worlds in medical and health education. *Health Information and Libraries Journal, 24*, 233-245.
- Davis, A., Murphy, J., Owens, D., Khazanchi, D., & Zigurs, I. (2009). Avatars, people, and virtual worlds: Foundations for research in metaverses. *Journal of the Association of Information Systems, 10*, 90-117.
- Dickey, M. D. (2005). Three-dimensional virtual worlds and distance learning: Two case studies of Active Worlds as a medium for distance education. *British Journal of Educational Technology, 36*, 439-451.
- Driskell, J. E., & Johnston, J. H. (1998). Stress exposure training. In J. A. Cannon-Bowers & E. Salas (Eds.), *Making decisions under stress* (pp. 191-217). Washington DC: American Psychological Association.
- Falloon, G. (2010). Using avatars and virtual environments in learning: What do they have to offer? *British Journal of Educational Technology, 41*, 108-122.
- Kenny, P., Parsons, T., Gratch, J., & Rizzo, A. (2008). Virtual humans for assisted health care. Published in the Proceedings of the 1st International Conference on Pervasive Technologies Related to Assistive Environments (PETRA).
- Rosen, M. A., Salas, E., Wu, T. S., Silvestri, S., Lazzara, E. H., Lyons, R., et al. (2008). An event-based approach to simulation-based teamwork training for emergency medicine residents. *Academic Emergency Medicine, 15*, 1190-1198.
- Schank, R. C. (1997). *Virtual learning: A revolutionary approach to building a highly skilled workforce*. New York: McGraw Hill.
- Sticha, Roy, M. J., & Olsen, D. E. (2006). Virtual standardized patients for training health professionals on chemical and biological agent exposures. *Annual Review of Cybertherapy and Telemedicine, 4*, 19-24.

Appendix A

Content and sequence of two-day workshop on inter-professional collaboration

| | |
|--------------|---|
| Day 1 | Real world domestic violence crisis simulation conducted in five small groups (n = 6) with representation from each of the different programs |
| | Real world large group debriefing |
| | Learning to navigate in the virtual environment |
| | Real world debriefing on the experience of the virtual environment |
| | Virtual environment learning activities related to interprofessional competence |
| | Real world group debriefing about the virtual environment learning activities |
| Day 2 | Video shown of a domestic violence scenario |
| | Group debriefing about the video |
| | Video shown of experienced professionals from each of the four professional groups commenting on the scenario |
| | Repetition of domestic violence crisis simulation in small groups (observer-rated), this time in the virtual environment |
| | Debriefing in small groups in virtual environment |
| | Debriefing in large group in real world |
| | Repetition of the same simulation of domestic violence crisis simulation in real world in small groups |
| | Face-to-face large group debriefing |
| | Administration of post-workshop measures |

Appendix B

Summary of Themes and Responses to Open-Ended Questions on Participant Course Evaluations

| Themes | Responses | |
|------------------------------|---|--|
| Safety | <p>Like a game to try different things without being judged</p> <p>Like a mask so I will feel safe to be there</p> <p>Have increased comfort level in discussions</p> <p>“It was easy to get started, be more involved, without being shy, especially with people I don’t know.”</p> | |
| Time to Think | | |
| Practice Communication | <p>Need more communication options and personal interaction</p> <p>Able to practice communication skills without being rushed</p> <p>Communicating verbally was the only way to accomplish goals (6) *</p> <p>Like the opportunity to have verbal discussions as opposed to verbal chat</p> <p>“...it takes people out of their comfort zone by removing the ability to touch a patient and rely totally on verbal communication skills.”</p> <p>Focus on verbal communication (6)</p> <p>“Hard to build therapeutic relationship with the patient.”</p> <p>Peer discussions</p> | |
| Delivery Mode, Teaching Mode | <p>Fun, change of pace (5), something different (5), engaging (2), interesting new approach (5), innovative (3), interactive (2)</p> <p>Can do from home (3)</p> <p>Need to see people’s faces</p> <p>Need more time to practice with avatar</p> <p>Good instructions for using VR</p> <p>Interactive (2)</p> <p>Ease of creating scenarios without being there</p> <p>Like videos</p> <p>Liked simulations in VR (2), “a lot of potential for practicing scene management in emergency care”</p> <p>Hard to simulate everything in real life</p> <p>Like to make own character</p> <p>Need to have goals when being oriented to the environment-get bored</p> <p>Able to accomplish something by following the instructions in order to navigate the virtual world</p> | |

| | | |
|--------------------------------|--|--|
| | <p>Need technical support for problems (ex. Stuck in water)</p> <p>Need longer orientation/tutorial (2)</p> <p>Face to face is most important. VR is a supplement to F to F (2)</p> <p>Important to meet participants in VR, f to f first to establish a relationship</p> <p>Can be in different locations and still communicate</p> <p>Like avatars</p> <p>New technology is always interesting</p> <p>All equipment should be provided to students so there are no extra expenses</p> <p>Looks real, you can talk and move and text</p> <p>“It seems like this should have been a component in school a long time ago”</p> | |
| <p>Technical Modifications</p> | <p>Need joystick option (2)</p> <p>Need to ease navigation, programmable keys for those who are not right handed, need left handed option (3)</p> <p>Need arrow key option (3)</p> <p>Need mouse click to enter buildings</p> <p>Easy to move around (6)</p> <p>Need to work on controls (ex. Move out of kneeling position, each profession to have its own actions) (3)</p> <p>More actions/functions for avatars (6) (like sims 2-pc game, need vital signs, physical aspects)</p> <p>Larger more detailed world</p> <p>Sluggish controls at times (4)</p> <p>Wider doors</p> <p>Improve technical aspects (12)</p> <p>Make the mouse visible so you know where the pointer is</p> <p>Lag time between person talking (2)</p> <p>Need to be easier to access videos</p> <p>Hard to hear at times</p> <p>Need to be installed on the computer before it is used (2)</p> <p>Better camera rotation</p> <p>Buggy, difficult to do in a public setting</p> <p>Better map of the world (3)</p> <p>Shorter load times</p> <p>Customizing the avatar is good (2)</p> <p>Like being able to walk, run, and jump</p> | |

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| | <p>Have instructions on the top of the screen</p> <p>Instructions were clear and explicit</p> <p>Private chats (speaking)</p> <p>Teachers need more “power” in VR and to speak to everyone without a mic and be able to take away speaking from other students or give student “power”to speak</p> <p>It was in a circle, hard to get lost</p> <p>Audio, fixing speech volumes</p> <p>Like the feel of another world</p> <p>Interaction in real time setting</p> | |
| Teamwork | <p>“...allowed me to relax, and be part of a team while observing other team members.”</p> <p>I like having more team collaboration</p> | |
| <p>(*) Numbers indicates # of the participants giving the same response.</p> | | |