Virtual world interview skills training for health professionals

Final Report 2014

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List of acronyms used

COSE	Counselling Self-Estimate Inventory
GAP	Graduate Attributes Project
ISES	Interviewing Self-Efficacy Survey
IST	Interview Skills Trainer
MUPS	Medically unexplained physical symptoms
OLT	Australian Government Office for Learning and Teaching

Executive summary

Allied health interview skills training has traditionally been undertaken using in-class role-play exercises or clinical placement experience. Both environments give students experience with client-patient interaction. However, neither environment allows for deeper learning nor reflection on what provides quality health communication across gender, age and culture. The project team developed and evaluated a virtual world interview skills training (IST) software program which allowed students to interview an avatar (virtual client) that interacts with the student verbally and via body language/emotive responses.

The IST was tested using multi-disciplinary undergraduate and postgraduate allied health students (i.e. health sciences, psychology, physiotherapy) at The University of Sydney and University of Canberra. Each scenario was developed using expert ethical/moral scenarios informed by Associate Professor Hugh Selby from The Australian National University (ANU). The six month test period recruited a large number of students (N=482) with the key results of the project being:

- Students' interviewing self-efficacy showed greater improvement following Virtual World IST learning versus traditional interview skills training (i.e. role-play).

- Students reported their perception of greater enjoyment, motivation and learning from role-play experiences compared to using the Virtual World IST. Given this, qualitative analysis of student experience indicated that students would readily engage in using the Virtual World IST again if the technology evolved for greater human realism experience with the Avatar.

- The Virtual World IST is best used as an adjunct to the preferred training modalities for interview skills with clients (i.e. clinical placement, in-class role-playing).

Outcomes and deliverables from the Australian Government Office for Learning and Teaching funded project were considerable given the short timeframe for the project. The project developed the following software: virtual world IST player and four x avatars, their environments and script scenario software. Each was created from scratch, beta-tested and evaluated. The virtual world IST player software, script scenario editor and avatar programs (young boy, middle aged woman, indigenous man, elderly woman) are available from the following URL (http://sydney.edu.au/health-sciences/prometheus-twb/research.shtml). A YouTube clip demonstrating the virtual world IST in action can be found at: https://www.youtube.com/watch?v=gPMaHNAfyMU. Three conferences were attended with papers presented at each (i.e. SciTect2012; HERDSA 2012 and the Australian Catholic University (ACU) 2012: Simulation in Health Showcase). In addition, two peer-reviewed publications have been submitted to *Higher Education Research and Development (HERD) journal* and *Journal of Technology in Human Services* in 2013-14. The continued use of the virtual world IST is planned for use within the Faculty of Health Sciences at University of Canberra and The University of Sydney, respectively, post the completion of this project.

Given that software development is unlikely to be mature in its functionality and application in learning and teaching after only 12 months from concept to piloting, a further testing period and version development of the virtual world IST is highly recommended. The summary of recommendations for the virtual world IST can be summarised into three points: 1) further software development to improve the avatar realism; 2) improvement of the scenario scripter and assessment feedback sections of the teacher interface of the virtual world IST; 3) inter-disciplinary testing of the virtual world IST outside of allied health (e.g. law, policing, engineering, teaching, etc.)

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Chapter 1: Project Background and Aims

1.1. The Health Higher Education Context

There is an expectation that students, particularly health students, graduate with sophisticated communication skills. The National Graduate Attributes Project (GAP) (The University of Sydney, 2011) examined policy statements of graduate attributes from all Australian universities. It identified "communication" as a core outcome for graduates of these institutions (Barrie, 2004). Effective communication is also explicitly named as a graduate attribute of the universities taking part in this project (The University of Sydney, 2012; University of Canberra, 2012; ANU, 2012).

Communication is also a key competency for healthcare practice. NSW Health explicitly identifies *"easy and honest communication"* as a reasonable patient expectation and core skill for practitioners (NSW Health, 2012). Communication, here, is defined as an ability to translate health knowledge for patients and clients, as well as developing rapport for ongoing treatment and consultation.

Effective communication between client and clinician has been shown to affect patient outcomes. Street Jr, Makoul, Arora and Epstein (2009) examined the relationship between client-clinician communication and health outcomes, identifying both direct and indirect paths, through which communication can affect patient outcomes. Street et al. (2009) argue that communication enhances patient access to healthcare (by increasing awareness of services and willingness to participate), and increases patient knowledge, empowerment and ability to manage emotions. According to Street et al. (2009), consequences of more open communication between the patient and practitioner include enhancing the therapeutic alliance, increasing social support and creating patients who are informed to make higher quality decisions. Weiland et al. (2012), also showed that doctor-patient communication with patients exhibiting medically unexplained physical symptoms (MUPS) enhanced satisfaction, daily functioning and healthcare use. This literature review also showed that communication can reduce symptoms and health anxiety in these patients. Thus, health communication, particularly between clients and clinicians are important for effective, patient-centred healthcare.

As part of their education, health students are provided with opportunities to practise and develop communication skills. Often, however, this learning occurs during clinical placement. Here, students are assigned to healthcare practices (both private and public) to receive training by a clinician (clinical educator). The student would be trained in, and assessed on, a number of discipline-specific skills relevant to their stage in the degree program. Professional skills, such as interviewing and client-communication, are also taught. Given this, it should be noted that on clinical placement students are interviewing real patients. For students on their first placement, this may be their first exposure to health interviewing. In this context, mistakes in communication are made on real patients which is clearly not ideal for both the wellbeing of clients, ethics of client duty of care, and best-practice training experience for the student where they, too, may experience discomfort. An additional limitation of this learning context is that communication skills are not explicitly attended to (unless students make a glaring mistake). The focus of clinical education is on discipline specific treatment based skills (Levinson, Lesser, & Epstein, 2010). As such, further opportunities to practice these skills and explicit instruction and feedback are required.

Research has shown that simulated training in clinical skills (including communication skills) provided prior to students attending clinical placement, can enhance student self-efficacy and performance whilst on practicum (Blackford, 2012). At present, this training is delivered through in-class role plays. In these role-plays students alternate between the roles of client, clinician and observer. The use of role-plays in a range of health care fields have been successful in developing skills in active listening, demonstrating empathy, problem-solving,

acquiring knowledge and refinement of interview skills (Barney & Shea, 2007; Joyner & Young, 2006; Nestel & Tierney, 2007; Rao, 2011). However, the diversity of patients suggests that more authentic learning scenarios than role-plays between peers are required. Moreover, there is limited time for students to continue to practice their interviewing skills within and outside the timetabled lecture or tutorial. As such, an alternative and/or adjunct learning experience is required.

Another argument for additional opportunities for students to practise their interviewing and health communication skills is logistically based. With increasingly larger numbers of students (particularly in first year undergraduate degree programs) attending limited numbers of clinical placements, learning opportunities and spaces are required to allow students time to refine and enhance their communication with clients/patients. The authors wish to note that this project aims to extend students' opportunities to learn about communication, ***not*** to replace clinical placement. We acknowledge the importance of clinical placement training and wish to enhance the skills learnt during practicum by providing further practise (for senior students) and preparation (for junior students) opportunities.

Berkhof, van Rijssen, Schellart, Anema and van der Beek (2011) evaluated the effectiveness of different training strategies for health communication skills learning. Consistent with research on experiential learning, the project team found that training programs which incorporated extensive opportunities to practice, receive feedback and were learner-centred, were more effective. Stating that self-motivated, autonomous adults, learn more effectively through experiential techniques such as discussions and problem-solving, compared to having to respond to instructions from others through informative lectures (Benbassat & Baumal, 2009), the current project combined this educational basis with existing national knowledge, regarding autonomous learning for allied health clinical education (CETI, 2011). Given this, there is a need for improved simulated training environments to improve clinician-client communication skills that are repeatable, measurable and relatable across multi-disciplinary health sectors.

In reference to the program priorities of the OLT, the current project met the OLT objectives of extending existing knowledge. This was achieved by the creation and use of virtual world avatars in the learning environment, specifically for allied health communication skills training. The virtual world IST was tested across the disciplines of psychology, physiotherapy and general health science students who choose to undertake graduate studies as an allied health clinician, manager or researcher. The study engaged in multidisciplinary teaching; designs for enhancing teaching capability around clinical skills training; improving teaching resources from an innovative standpoint; and encouraged a more uniform approach to skill acquisition and assessment of those communication skills.

The current project extends knowledge from the development of work undertaken in 2007 for pharmacy students at Monash University (ALTC funded study: Virtual Patients and Critical Thinking, 2009). The Monash study aptly demonstrated the need for this technology in clinical allied health training of pharmacists. However, due to the studies limitations in both the software use (lower quality student immersion in the simulated environment, with minimal human factors in the avatar, e.g. body language was absent), and its singular-disciplinary approach (i.e. pharmacy), the current study has now produced evidence of the efficacy of this approach to interview skills development across allied health disciplines. The project establishes that the virtual world IST is both cost effective, efficacious in repeatable skills training, and is teacher led and designed (eliminates the need for a computer programmer to create the avatar scenarios).

1.2. The Innovation: Virtual World Interviewing

The project aimed to create virtual environments that students can access at their convenience (both regarding time and location), to practise their health interviewing skills. Accessible where a computer is available, the virtual world learning tool does not necessitate teacher presence, which addresses financial issues and concerns about repeated opportunities for practise.

As technology advances, the potential of using computer generated patients for clinical practices is becoming widely recognised (Cook & Triola, 2009). Virtual patients are used in clinical scenarios played out on screen. In these virtual worlds, a student will question or interview a virtual patient by selecting questions provided on screen. Question options are dependent on the training required. For example, scenarios could revolve around requesting information for history taking, or medical consultations for referrals. Similarly, the virtual patient will respond from a bank of pre-determined replies based on the question that was selected. The outcome of the session with the virtual patient lies with the line of questioning the student pursues, however a clear storyline exists for each line of questioning the student selects (Bearman, 2003).

The use of interactive virtual patients has demonstrated uses in teaching health interviewing and communication, history taking, decision making, therapy and rehabilitation, and medical examinations (Botezatu, Hult, & Fors, 2010). Vogel et al. (2006) conducted a meta-analysis examining computer gaming, interactive simulations and traditional (e.g. role-plays, lectures) methods of teaching interviewing skills. Most effective for learning were approaches that required interaction, specifically games and simulations. Students expressed a significant preference for games which they navigated themselves. This project has been used to inform the development of the virtual world interview skills trainer (IST) used in this project.

1.2.1. The Virtual World

Simmersion Holdings from Canberra, Australia, have created MyCosm® technology which caters for the creation of 3D virtual worlds and environments with rich, real-time, graphics. Through this, Simmersion has developed a virtual world interview skills trainer (IST) for health professionals with funding provided by the Australian Government Office for Learning and Teaching.

As part of this project, four avatars were designed: a young boy, an indigenous man, a middle-aged Caucasian female and an elderly female. They are depicted in Figures 1-4 respectively. The virtual world environment was created from photographs taken in clinic rooms at The University of Sydney, Faculty of Health Science Campus, and University of Canberra, as the project was trialled with students from these institutions.

Figure 1: Screenshot of a young boy

Figure 2: Screenshot of an Indigenous man

Figure 3: Screenshot of a middle aged woman (aka Melinda)

Figure 4: Screenshot of an elderly woman (aka Edith)

Three units of study were identified as suitable for providing the virtual world learning experience. Teachers within these subjects then created a story and accompanying script for the avatar of their choice. For example, The University of Sydney wanted to provide students with an experience of interviewing an older client/patient. They created a script for the avatar of the elderly lady (whom they named “Edith”), that included several question options for students and several responses by the avatar for each question. A screen

capture of the flow chart of this scenario transcript for Edith is included as Figure 5.

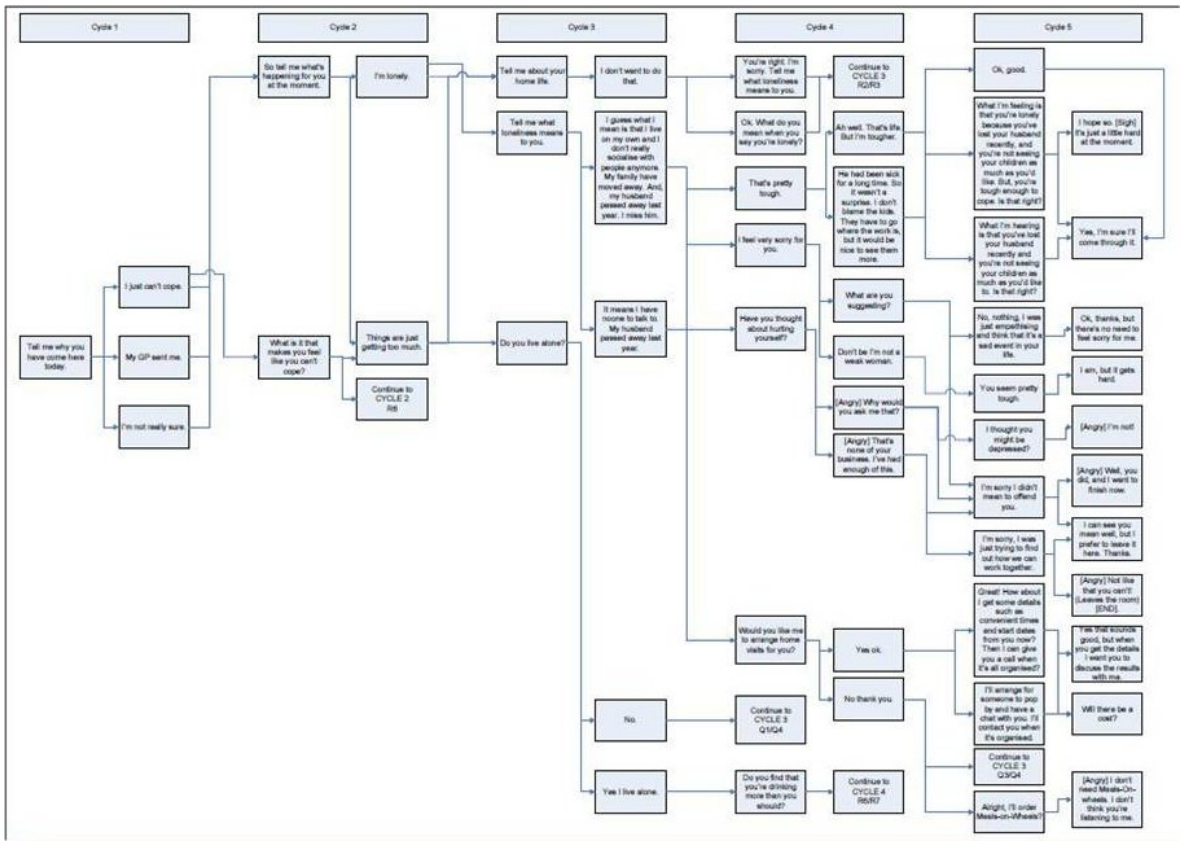

Figure 5: Excerpt of Edith scenario transcript

Students would progress through the interview by choosing a question from a list of options to ask the avatar. Often, there would be no, one, correct response, and many responses may seem plausible. Responses that may seem implausible to teachers were at times deemed appropriate by students. These included touching the avatar when she was crying or instructing the client to *"Google it"* when the client sought information about services in their local area. The findings from evaluating this project will be discussed in Chapter 3; however, it is worth noting that for students engaged with the game, it was not a matter of finding the most straightforward answer. Often, there were several question options that would lead to positive outcomes.

Once the student had selected a question to ask, in The University of Sydney group for example, Edith would respond with one of several verbal (voice recorded) responses that was paired with matching facial expressions and hand gestures. The interview would progress until the story ended. This may have been a positive conclusion, where the student was able to provide Edith with support. Conversely, it may have been a negative conclusion where the student had, in some cases, offended Edith.

Students were given access to this program to practise, and re-practise, as they saw fit. The variety of questions and responses to each question aimed to create a new experience for students each time. The project team anticipated that students would go through to explore different combinations of questions and question styles, rather than engage in multiple attempts to find the "right" way of interviewing. Part of the learning we aimed to foster was that there was no correct way of interviewing. Instead, students should be equipped with a variety of tools and be able to assess situations and use those tools appropriately.

Original conceptualisation of the virtual world IST also included feedback to students. Each time the student selected a question, the avatar would respond and, following this, a textbox would pop up providing the student with feedback on their choice of question at

that stage in the interviewing sequence. This feedback was incorporated into the scripts for each avatar. Students would therefore receive tailored, 'just-in-time', feedback regarding their choices.

It is also important to note that the focus of these stories was not to teach students how to diagnose. Particularly for The University of Sydney students, this would be inappropriate. Their undergraduate degree program (Bachelor of Health Sciences) involves providing a foundation in Health Sciences, but is not a program graduating accredited healthcare professionals. This was an interdisciplinary project addressing the graduate attribute of communication. As such, it focused on providing students with experiences of questioning patients/clients and learning about the communication process.

In line with the focus on sustainability and interdisciplinary, cross-institution application beyond the grant, the virtual world IST was designed with three building blocks: avatar, environment and script. Any logical combination of avatar, environment and script could be used. An example of a sensible combination would be an elderly lady in a rural setting seeking information about community services. Less logical, would be using the Indigenous male avatar in combination with a script about pregnancy. New scripts can be created (written) by any teacher and imported into the program with no extra financial cost. There is also a variety of environments and four avatars to develop stories for.

1.3. Project Aims

The overall aim for this project was to enhance interviewing skills and self-efficacy in Health Sciences students. This project is innovative, drawing upon existing methods of instruction (i.e. experiential, problem-based learning) to create 24/7 environments where students can further practise their communication skills. It has implications for skills refinement in senior students and skills development in large, first year undergraduate courses through blended learning experiences.

The specific project aims were:

a. to create a tool that provides interdisciplinary, interactive and feedback-enhanced learning experiences;

b. to enhance student health interviewing self-efficacy through technology;

c. to engage students in blended learning experiences designed to support practise of health interviewing skills; and

d. to evaluate the effectiveness of a virtual world interviewing skills training tool in enhancing self-efficacy and interviewing skills for Health students.

Chapter 2: Evaluation Approach

2.1. The Project Team

A key objective of this project was to create a teaching tool with the potential for interdisciplinary and cross-institutional application in higher education. To ensure this wider viewpoint, the team consisted of colleagues from The University of Sydney, University of Canberra and The Australian National University (ANU). The disciplines represented include: Health Sciences, Psychology, Physiotherapy and Learning and Teaching (Curriculum Development). The individual contributors are noted below.

At each stage, the team made decisions that would ensure that the virtual world IST could be extended for use in other disciplines (e.g. law) with no additional cost, post project. Consultation, team meetings and collaborative decision-making was an integral part of this process. The result is a program that can be adapted and used at any institution. for any discipline, provided teachers implementing the program create an appropriate script for their curriculum.

Project Team	Dr Andrew Campbell (Project Leader) Prof Andrew Gonczi Prof Michelle Lincoln, A/Prof Steve Cumming A/Prof Lynne Magor-Blatch A/Prof Hugh Selby Dr Navjot Bhullar Dr Amanda George Dr Victoria Neville Dr Melanie Nguyen Ms Toni Green Ms Lisa Oxman
Project Manager	Dr Krestina Amon
Virtual World IST Development Team	Simmersion Holdings Pty Ltd Mr Bob Quodling (Director, CEO) Mr Jeff Cotter (CTO)
Avatar Scriptwriting Team	***Health Sciences*** Dr Krestina Amon Dr Melanie Nguyen Dr Andrew Campbell Dr Victoria Neville A/Prof Steve Cumming Prof Michelle Lincoln ***Physiotherapy*** Dr Victoria Neville Ms Toni Green ***Psychology*** Dr Lisa Oxman A/Prof Lynne Magor-Blatch ***Script and Ethics Content Reviewer*** A/Prof Hugh Selby

2.2. The Students

Students who were trained using the virtual world IST were undergraduate and post-graduate students from The University of Sydney and University of Canberra. The distribution of students is noted below:

Table 1: Distribution of students according to university, discipline and degree program

University	Discipline	Degree Program	Enrolled number
The University of Sydney	Health Sciences	Bachelor of Health Sciences	417
University of Canberra	Psychology	Bachelor of Science in Psychology Masters of Clinical Psychology	44
	Physiotherapy	Bachelor of Physiotherapy	21

Although large numbers of students used the virtual world IST (indicated in Table 1 above), not all students participated in the project. Two hundred and seventy two students completed the baseline survey, 322 students completed a survey following their role play learning and 186 students completed the survey after their virtual world learning. However, only 72 students completed all three surveys. The data presented in this report will be from students who had completed all surveys.

2.3. Evaluation Design

A cross-over design was used to examine changes in student interviewing self-efficacy, following learning via role-plays and virtual world interactions. Students completed a demographics questionnaire once and the Interviewing Self-Efficacy Survey (ISES) three times during semester. Students completed the first ISES at the beginning of the semester to establish a baseline score. Students were then randomly allocated to either a role-play first (1^{st}), or virtual world training first (1^{st}) condition. After one week, students participated in the alternate task. At the conclusion of each task, students were invited to complete the ISES again.

The ISES was adapted from the Counselling Self-Estimate (COSE) Inventory (Larson et al., 1992). The COSE was developed for use in training, supervision and research towards the development of self-efficacy in counselling among trainees (Daniels & Larson, 2001; Larson et al., 1999; Mantak, Raymond, Patrick, Man-Ping, & Daniel, 2004). The object of this project was to examine ways of supporting the development of interviewing, *not diagnostic*, skills in students. Students were asked to rate the degree they agreed with the item statements on a likert-scale from 1 (strongly disagree) to 6 (strongly agree).

After students had completed the virtual world training, they were also invited to complete the student experience of MyCosm questionnaire. This non-standardised, 16-item, survey asked about students' perceived enjoyment, learning and motivation to learn more about interviewing skills following virtual world learning. Students also answered questions about their experiences with the technology and avatar.

Chapter 3: Project Outcomes

3.1. Principle Findings

The ISES was created to measure students' perceptions about their interviewing abilities, prior to any interview training (baseline), after participating in the in-class role-play activity, and following their experience with the IST. Statistically significant increases in interviewing self-efficacy were found following both the role-play and virtual world IST learning experiences. Further testing showed significantly greater improvements in self-efficacy following the IST training compared to role-play learning.

Although students' interviewing self-efficacy showed greater improvement following virtual world IST learning, students preferred more traditional methods. Students reported significantly greater enjoyment, motivation and learning from role-play experiences compared to virtual world simulated learning. Student preferences are represented in Figures 6 and 7. When asked to rank their order of preference between role-plays with peers, role-play with actors, clinical placement, and the use of the IST to learn interviewing skills, students' first preference was clinical practice (first choice mode = 38.9%). Second was role-plays with peers (second choice mode = 31.9%), followed by the IST (third choice mode = 41.7%), and finally role-play with actors (fourth choice mode = 30.6%), see Figure 7.

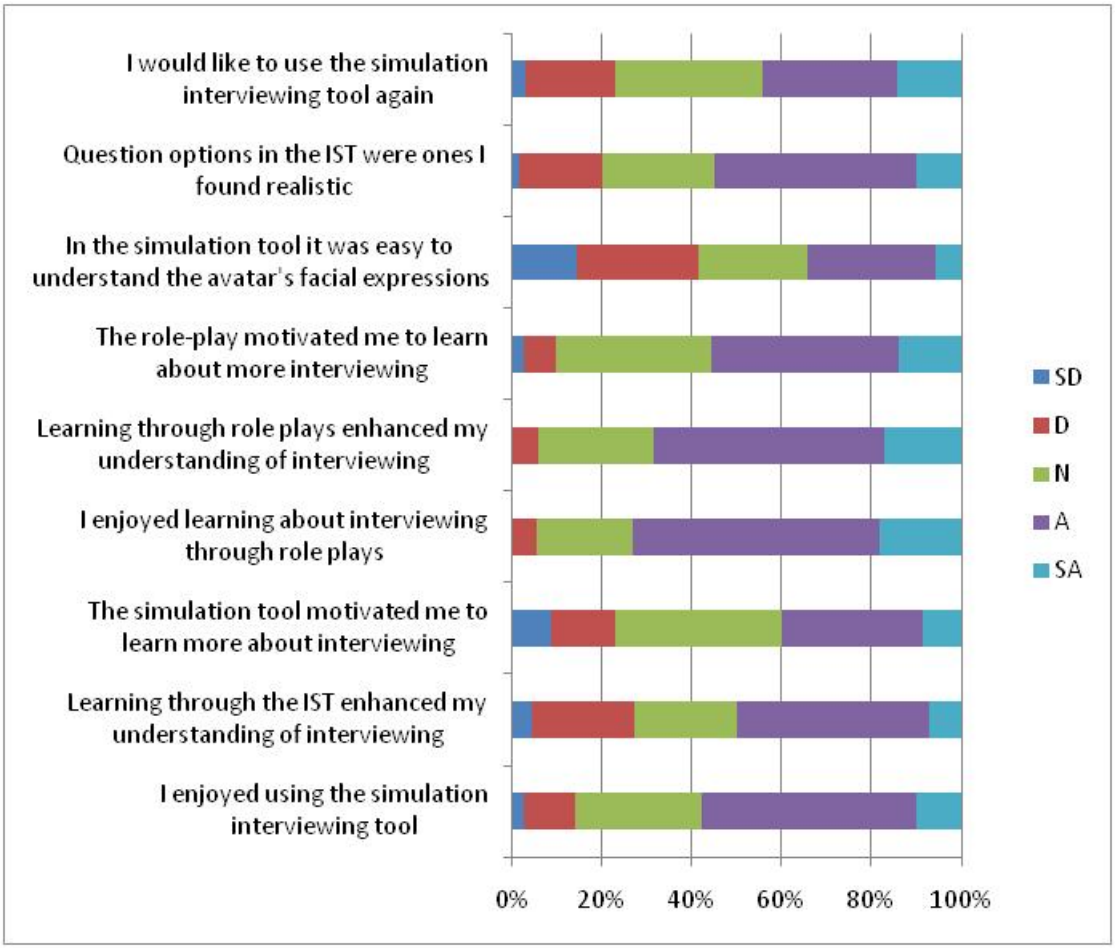

Figure 6: User preferences for Virtual World IST and alternative learning approaches for interview skills training

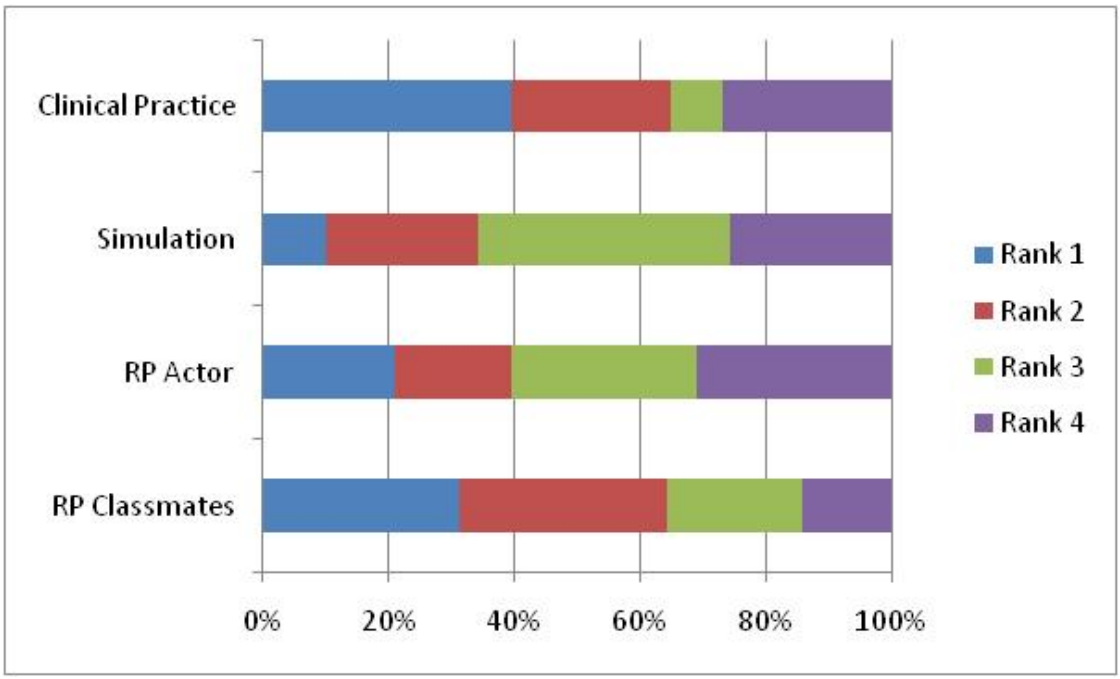

Figure 7: Student rankings of preferred learning methods

A potential explanation for this discrepancy is the technical difficulties experienced by students (51.4%). The issues consisted of:

- difficulties accessing the file from the University server (problems with university security screening at The University of Sydney and University of Canberra);
- server issues on the campus computers;
- log-in issues on the campus computers; and
- the program being unable to run on some personal computers due to system requirements (e.g. older PCs or any MacBook was unable to support the program).

Frustration at challenges to accessing the program could have affected student satisfaction ratings, even though the virtual world IST program itself ran with little problems once accessed. Consistent with this argument, when asked for suggestions on improving the simulation tool, a common suggestion was accessibility – make the program easy to download and run from a server.

Other suggestions included improving the programs graphics for avatars and environment settings, particularly around facial expression to create more realism; give the user more question options to choose from to allow for a lengthier interview session, and/or the ability to type in their own questions.

Qualitative data was collected to further understand student responses to the virtual world environment and avatar. There was mixed feedback regarding how realistic the "client" seemed.

62.5% of students responded that it did not feel very natural. Responses included:

- *"Her behaviours and expressions did not seem natural, but the content of the conversation did".*

- *"Not overly natural. But it served its purpose and still helped with learning interviewing skills. This is a great training tool to use in the process of building skills to be able to eventually work with real clients. Less nerve racking, but still simulates what can happen in clinical setting".*

In contrast to the above, students felt the quality of the visual display did not distract them from interviewing their avatar. Some points made by the students included:

- *"It was more that it was a novel experience. I didn't find it distracting per se, however I did not expect it to feel "real" either".*

- *"I felt the avatar was overly realistic, her movements were very convincing and believable this made the interview a lot more effective I believe."*

- *"The graphics in the visual display could be improved, however, the client's responses were engaging."*

In summary, the principle findings suggest that although the virtual world IST has demonstrated improvements in students' interviewing self-efficacy, further refinements to the software would enhance its appeal to, and engagement with, allied health students.

The project achieved improving competency in clinical interview skills within several disciplines (psychology, physiotherapy, and general allied health professionals) that work in community health services. The project also developed skills competency through engagement with virtual world software. Specifically, the project outcomes included:

1. identification of what professional interview skills in health aim to achieve and the problems faced when teaching and learning these skills;
2. creating virtual world interviewing scenarios for allied health professionals that cover the areas of mental health, pain management, Indigenous health and healthy ageing; a program that developed skills in history taking, active and passive listening techniques, effective needs planning and building rapport with clients;
3. a virtual world environment that is realistic, immersive and capable of varying levels of complexity within the health scenarios;
4. a database capable of tracking progression in interview skills for individual students; and
5. dissemination via high impact tertiary education and research journals and several conference presentations, as well as a publically accessible website for download of all software material produced by this project:

   http://sydney.edu.au/health-sciences/prometheus-twb/research.shtml

3.2. The Virtual World IST Product

The virtual world IST product was developed with funding from the Australian Government Office for Learning and Teaching with the ultimate goals that the software and virtual training environment could be interdisciplinary in adaptability; interactive for the user; dynamic and easy to use for the teacher in regards to scripting interview training scenarios; and enable feedback on the learning experience during or at completion of the learning scenario engaged in. The project succeeded in achieving these objectives and produced an innovative learning system that met each of the aforementioned goals. It should be noted though, that due to project time constraints, the ability to provide continuous 'in-scenario' feedback was not trialled, but can be adapted in proposed later improvements for the software (see Chapter 4).

With the development of the virtual world IST product, which encompasses the software to 'play and run' a scenario, inclusive of a script creator, the MyCosm powered product is also effectively able to be purchased by any learning institute for use from Simmersion Pty Ltd. (http://www.simmersionholdings.com/) The Avatar 'characters' and scenario editor described in this report are the property rights of the Australian Government Office for Learning and Teaching. The materials developed for this project can be shared via the URL http://sydney.edu.au/health-sciences/prometheus-twb/research.shtml. The creation of new avatars (other than the four available via the above URL) for specific institute or organisational needs, should be requested for creation and purchase from Simmersion Pty Ltd, from which point the avatar becomes the property of the purchasing institute and can be utilised for any scenario the teacher wishes to script indefinitely.

Environment backgrounds for avatars can be created by individual higher education institutes using off-the-shelf 3D photographic hardware and software, and uploaded through the scenario player. Alternatively, Simmersion Pty Ltd can prepare new environments in addition to those available from this project (e.g. G.P's surgery, counselling room, community services room in rural Australia, etc).

Voice recordings for avatar scripted scenarios can be recorded by the teacher who writes the interview scenarios, as was done for the current project. These recordings are then lip-synced to the text through the scenario player. This creates a good deal of realism for engagement with the avatar, but can also be 'switched off' if the teacher chooses to run a 'text-bubble' based scenario that only shows the avatars body language without voice response.

Lastly, the products key element of giving the avatars emotional capacity, both in facial and body movement, can be scaled to 'intense' or 'mild' emotional responses by the teacher via the script editor. Currently, only limted emotional responses exist for the avatars (e.g. happy, sad, angry, etc), but complex emotions can be designed and purchased from Simmersion Pty Ltd.

Chapter 4 will address the proposed improvements for the virtual world IST product, as well as further testing possibilities. In summary, the virtual world IST software is currently functional and can be trialled in the education sector via downloading the necessary software from http://sydney.edu.au/health-sciences/prometheus-twb/research.shtml

3.3. Dissemination

Given that the project was completed in just under 1 year (February 2012- December 2012), developing the software from scratch (including: 4 x avatar design, script scenario software, environment creation, and operational programming for the player to be downloaded from a remote server or executed from a CD; beta-testing, script scenario writing and 3 x educational environment testing periods), dissemination has been predominantly completed via national conferences. Further dissemination is planned in 2013-14 post-project, inclusive of publication in peer reviewed journals.

Table 2: Dissemination activities

Dissemination Type	Event or Journal	Location	Brief Description	Number of Participants	Impact Factor	Date
YouTube Video	Free Access	Internet	Video of the Virtual World IST being used. Access to video is at: https://www.youtube.com/watch?v=gPMaHNAfyMU	58 views as of 24th Jan 2013	N/A	9 May 2012
Conference Presentation	SimTecT 2012	Adelaide	SimTecT is the annual Asia Pacific Simulation Technology and Training Conference and Exhibition held by Simulation Australia since its inception in 1996. It has grown to become Australasia's premier simulation conference for industry, government and academia.	450+	N/A	18-21 June 2012
Conference Presentation	HERDSA	Hobart	The Higher Education Research and Development Society of Australasia Incorporated (HERDSA) promotes the development of policy and practice in	500+	N/A	2-5 July 2012

			higher education.			
Conference Presentation	ACU Health Sciences: Simulation in Health Education Showcase	North Sydney ACU Campus	NSW Showcase series to promote dissemination of knowledge simulated teaching techniques in allied health.	100+	N/A	29 Nov 2012
Publication	Higher Education Research and Development	Australia & New Zealand	*HERD* is a leading journal in the field of higher education. In 2010, HERD was recognised as an A-ranked journal in the Australian Research Council Journal Rankings.	N/A	0.901	In Prep
Publication	Journal of Technology in Human Services	USA/ Global	Regarded as an expert journal in the development of technology for any services related to aiding health, engineering and technology innovation	N/A	1.591	In Prep

The continued use of the virtual world IST is planned for use within the Faculty of Health Sciences at both University of Canberra and The University of Sydney, respectively, post the completion of this project. All software developed from this project, as well as instructions on how to run the programs are available for download from:

http://sydney.edu.au/health-sciences/prometheus-twb/research.shtml

Chapter 4: Recommendations and Reflections

Recommendations

This project was generously funded by the Australian Government Office for Learning and Teaching for a 12 month period of design, development, beta-testing and pedagogical research to improve interview skills training in allied health students in higher education. Over the projects short duration, all milestones were met, with a number of logical progression paths identified. As such, the below recommendations build on the initial project in order to advance both the software, enhance the student learning experience, and improve administration of the tool from the teachers standpoint:

1. Improve the virtual world IST Avatars to:
   - display more diverse and complex emotions; and
   - provide a greater range of body language movements
2. Improve the onscreen environments for the interview setting to create greater realism. This can be done by:
   - having background noise associated with the setting (e.g. hospital noise);
   - allow objects to be interacted with (e.g. chair, table, examination table) by the avatar; and
   - provide atmospheric animation independent of the avatar (e.g. environmental movement, such as traffic flowing by a window near a street).
3. Improve the script scenario editor for input by the teacher. Specifically:
   - refine the script editor to be easier to use; and
   - to incorporate a database of pre-scripted avatar responses/questions/anecdotes to be chosen by a teacher rather than custom written.
4. Create an open-source feedback for the virtual world IST to incorporate user feedback globally for further version improvements.
5. A database for interview skills tracking for individual students, where over time their repeat efforts can be plotted to demonstrate improvement, or need for improvement, such as through a Learning Management System (e.g. Blackboard or WebCT).
6. Cross platform usability (i.e. not just PC, but Mac and possible mobile computing applications.
7. Inclusive of interviewer interaction with the avatar (e.g. virtual touch or object passing).
8. In-scenario feedback evaluated in future research.
9. Cross-disciplinary research outside of allied health (e.g. law, policing, engineering, teaching, etc).
10. Cross-purpose use and evaluation of the virtual world IST (e.g. use for online counselling for client and clinician to test viability of counselling through virtual worlds).
11. Increased dissemination of the virtual world IST via global conferences related to simulation in higher education learning and teaching.

Reflections

When reflecting on the factors that were critical to the success of this project, the most important one was excellence in communication skills and blended modalities of communication. With the project spread inter-state between 3 universities; e-mail, Skype, phone and face-to-face meetings were crucial in order to keep the project on track for its very short and ambitious timeline.

The second most important factor to the success of the project was the employment of a dynamic research associate/manager who had extensive project management experience and academic research experience. Having a central liaison person to all team members, which involved mass communication to some 20+ stakeholders across all 3 institutes, was a mammoth task that could only be undertaken by a seasoned and highly qualified researcher in their own right. Timelines were met and challenges tackled at the time they occurred to ensure avoiding delays for software testing and field testing for the main focus of the project.

Thirdly, having team members responsible for key areas of the project, and not deviating from their tasks, was essential to meeting the tight assessment timelines of the software and not interfering with regular student study in their chosen degree programs.

Lastly, before the project commenced, it was of high importance that the project leader investigated, met with and understood the technology development and the achievable time-frame, costs and resources required of the higher education institutes before seeking funding for innovation development in learning and teaching. Pre-research into technology/software development, from concept, creation, to beta-test, is essential for the successful use of time and resources in any funded study that focuses on software innovations in learning and teaching.

The greatest challenges, other than a tight timeline guiding the team to key milestones and achievements, were the internal ICT policies and operational styles of each higher education institute. Each university had differing protection policies for servers, computer lab use and student or academic access to software that was not university developed and managed. The biggest project management learning outcome in regards to running the virtual world IST on university servers and lab computers, was to be familiar with firewall restraints and testing policies of computer lab installed software, before assuming that externally produced software will be able to be loaded in time for semester classes, and as such, successfully tested to the university ICT standards.

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