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Touch it, feel it and experience it: Developing professional IS skills using interview-style experiential simulations

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Touch it, feel it and experience it: Developing professional IS skills using interview-style experiential simulations

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Abstract

The IS education field has made increasing use of computerised experiential simulations, but few attempts have been made to create an authentic learning environment that combines and balances elements of video-based computer simulation with real-life learning activities. This paper explores the design principles used to develop a CD-ROM simulation where learners use interviewing skills to elicit system requirements from simulated employees in an authentic context. The employees are videoed actors who converse with each other and with learners within a dynamic interaction model. The paper also describes how we combined this simulation with other teaching approaches such as in-class discussions, student team work, formal presentations, etc.

Keywords

Experiential simulations, requirements engineering, interview, education, learning, virtual reality

INTRODUCTION

Computerised business simulations have been used for about 40 years to provide students with practical experience with principles relating to business strategy, economics, human resources, etc (Biggs 1990). Students typically: assume the role of decision-makers (often in teams); submit decisions on variables relating to firm operation (or a functional area); view the computer-generated results often based on interdependent decisions of all teams; repeat the decision cycles multiple times; analyse the decisions outcomes; and engage in reflective discussions facilitated by a teacher (Biggs 1990, Feinstein et al. 2002).

IS simulations have a shorter history and have been used to teach, for example, eBusiness-enabled supply chain management principles in which students take on the roles of organisations in supply chains and trade with one another (Cheng et al. 2004, Parker & Swatman 1999, Parker & Swatman 2001), knowledge management (KM) principles as students take on the role of a KM taskforce in an organisation (Leemkuil et al. 2003), and IS development and project management principles as students perform a role in IS management (Martin 2000).

Our experience in using simulations to teach software development dates back to the 1980s (Ciesielski et al. 1988), when at Royal Melbourne Institute of Technology we adopted Horning and Wortman's (1977) 'software hut' model to run large educational projects in software development. A refined 'software hut' project structure (incorporating the later recommendations of Wortman 1987) was deployed at La Trobe University (Cybulski 1991) to guide and monitor large numbers of project groups (35 teams of 6 third-year Software Engineering students). Role playing and role swapping were at the centre of the 'software hut' simulations, to allow student teams to emulate client-developer relationships, inter-team and intra-team communication. The approach also supported various software development tasks, especially the most communication-intensive ones which are characteristic of the early requirements engineering (RE) stages of system development. Requirements engineering incorporates requirements elicitation, analysis, specification and validation (Sommerville & Sawyer 1997). Since these early days, role-playing games have been recognised as an excellent method of teaching students the fundamental skills of requirements engineering, and in particular, client-developer communication in meetings and requirements elicitation interviews (Zowghi & Paryani 2003). Like many other university IT schools, the School of Information Systems at Deakin University also utilises simulations, to include computer simulations, to support its teaching of requirements engineering.

Very few of the simulation examples in the IS field use any elements of virtual reality, such as embedded video, real-life (acted) characters or their mutual awareness in a simulated environment, which are all an integral part of software products developed by the gaming industry. While this industry is often seen as purely focused on entertainment, education researchers are increasingly recognising the lessons we can learn in designing engaging, immersive and effective learning environments which are also enjoyable (eg, see Jackson 2004, Kirkley & Kirkley 2005, Rosenbloom 2003). For example, Jackson (2004) argues that games like SimCity can give players insights into urban planning complexities. The challenge for educators is how to select the relevant advanced simulation approaches (such as those found in electronic games) and to incorporate them into educational simulations in a meaningful way. In addition, the relative infancy of research into IS educational simulations shows that ongoing research is needed to explore how such approaches can be blended into a broader learning framework including classroom discussions and online collaboration, in an effective manner.

To address these gaps in IS education research, this paper reports on our experiences designing and using a simulation environment called Deakin Live Simulator (or LiveSim) - an interactive multimedia environment which supports the development of interview-style experiential simulations and which incorporates selected virtual reality and game design elements, such as real-life acted characters which learners can interview. Deakin LiveSim has been used to produce five simulations, with the first simulation piloted being the First Australian Bank Automatic Teller Machines (FAB ATM). The main objective of FAB ATM is for students to specify system requirements for the new line of FAB's ATMs. Students are initially introduced to the FAB ATM project in class, and then research and brainstorm the general issues of ATM use via online discussion groups and chat rooms. Subsequently, students use the FAB ATM simulation (on CD-ROM) to interview simulated bank employees who report on FAB's business and technology, and state numerous requirements for the new ATMs (software and hardware). While immersed in the simulation, students identify and analyse redundancies, conflicts and omissions in the collected requirements, and they eventually reconcile, formalise, validate and specify these requirements. Students then participate in a final reflection (or debriefing) session in class.

Having experienced the process of designing and deploying a complex simulation environment and then using it to deliver a number of educational simulations, we would like to share our experiences with other technologists and educators, using FAB ATM as the primary example. This paper therefore answers the following question:

What design considerations guided the development of an interview-style experiential simulation?

We believe that the paper provides valuable insights into (1) the elements of virtual reality and computer games which are applicable for improving experiential simulation designs so they are richer, more dynamic and authentic; and (2) some of the ways in which experiential simulations can be blended with other learning opportunities and approaches such as in-class discussions, learner-directed research and online communication – especially in units involving diverse cohorts of students with differing backgrounds and locations of study.

The paper firstly provides an overview of simulations based on the literature to explain why we employed an interview-style experiential simulation. We then describe major design issues we considered when developing the FAB ATM simulation. We provide a brief theoretical discussion, focusing on why experiential simulations are suitable for educators who are willing to embrace a constructivist epistemology. The paper further describes how students use the FAB ATM simulation (and its virtual reality elements) to learn the principles of requirements elicitation, and provides examples of the typical views from students who used FAB ATM in early 2006.

FAB ATM: AN INTERVIEW-STYLE EXPERIENTIAL SIMULATION

The academic and technical literature uses various, often inconsistent, definitions of simulations and games (Feinstein et al. 2002, Gredler 1996). Rather than enter the debate, we use Gredler's (1996) taxonomy because it provides a detailed multidisciplinary categorisation of simulations and games in an educational context. This taxonomy also enabled us to clarify the appropriate terms to describe FAB ATM - a simulation which was developed to support our teaching of requirements engineering.

Gredler (1996) firstly distinguishes between educational games and simulations. Games involve the primary objective of winning; typified by linear sequences of events where players (or teams) advance (or not) depending on their response to a stimulus (often content-based questions); and rules describing how players advance as well as any constraints, privileges and penalties. Simulations by contrast involve participants taking on social or professional roles and performing associated tasks which result in privileges and/or consequences; participants making decisions over periods of time in light of problems, issues or events which emerge as a consequence of previous decisions; and simulating dynamic and authentic relationships among simulation objects which change over time. Our intention when designing FAB ATM was for participants to take on the role of a business analyst, engage in an authentic interviewing process and make decisions about the collected system requirements. We therefore believed that FAB ATM was best described as a simulation rather than a game.

Secondly, simulations can be further categorised, according to Gredler (1996), as either experiential or symbolic. Experiential simulations are like dynamic case studies where participants are on "the inside" and involve: learners being an essential element of the simulation by performing tasks associated with their role and controlling decision-making; scenarios unfolding in part due to the actions of learners; multiple pathways through the simulated reality in response to learner decisions; and consequences for learner actions in terms of other participants' actions or in the problem context itself. Symbolic simulations, by contrast, are typically computer representations of a function, behaviour, process or equipment where learners manipulate variables in these models and are therefore not a functional part of the simulation itself. Learners are not assigned a role in which they have an invested interest in the outcome, but rather perform professional tasks relating to scientific discovery, explanations, predictions, etc. We wanted students to have a realistic, authentic experience of a business environment while using FAB ATM so that different requirements analysis outcomes could emerge depending on student decisions such as which questions to ask, who to interview, etc. For this reason, we believed FAB ATM was best described as an experiential simulation.

Gredler (1996) notes that some developers try to combine games and experiential simulations (called simulation games). She argues this is contradictory because: the real world (which experiential simulations emulate, such as a business environment) does not usually involve a "winner" with other businesses going bankrupt (Teach 1990); the players tend to treat simulation games either professionally or purely as non-serious games (Jones 1987) which detracts from the learning opportunities for the serious learners; and the players who are not winning sometimes sabotage the game by performing tasks unrealistically, such as making no orders (Teach 1990). For this reason, we did not consider the simulation game approach to be appropriate for designing FAB ATM.

Finally, there are a range of experiential simulations which can be employed (Gredler 1996): data management simulations (including business simulations, which were described previously); diagnostic simulations which are used in medical education and involve diagnosing problems and deciding on actions as the nature of the problem emerges; crisis management simulations which include political-crisis and combat simulations and involve unexpected events and learners resolving them quickly; and social-process simulations (or role-playing simulations - see Feinstein et al. 2002) where the focus is on the interactions between and behaviours of learners, and involves learners taking on a role and communicating with other role-players within a problem context. With FAB ATM we wanted learners to engage in interviews with simulated employees to increase the authenticity of the learning environment. FAB ATM therefore did not fit the categories outlined by Gredler (1996) because it did not involve (respectively) manipulating quantifiable firm operation variables, diagnosing medical problems, responding to a crisis, or role-playing among learners.

FAB ATM is best described as an interview-style experiential simulation in which students take on the role of a business analyst and decide: what questions to ask (which elicit system requirements) of simulated stakeholders; who to interview; in what order; and in what combination (e.g. individually or together). The variables in the simulation relate to the consequences of these decisions in terms of what requirements are elicited and, in some cases, even how stakeholders answer the questions (eg, when interviewed one-on-one or in a group session). This way, learners can repeatedly enter the simulation, which in turn generates multiple outcomes and possible pathways. Learners can therefore gain relevant control over the elicitation process and be able to influence the elements which are important to the curriculum and the learning, without being overwhelmed with unmanageable complexity or responsibility.

The next section provides an overview of how experiential simulations can support the objectives of educators with a constructivist epistemology, and the theory of experiential learning which underpins this approach.

THEORIES UNDERPINNING EXPERIENTIAL SIMULATIONS

A vital ingredient of any educational simulation is its learning design. While it is beyond the scope of this paper to delve into the epistemological and theoretical origins and debates around learning and experiential simulations in particular (interested readers should see Duffy & Cunningham 1996, Lainema 2003a, Lainema 2003b), we would like however to provide an overview of the constructivist epistemology and experiential learning theory, which have influenced our approach to FAB ATM design, and which provide the impetus for the establishment of design principles to support experiential simulations.

The constructivist epistemological view of learning underpinned our design of FAB ATM. Constructivism holds that there are many meanings and perspectives (not just those of the instructor) and ways to structure our understanding of reality (Lainema 2003a). Learning is seen as occurring when individuals interact in (experience) reality and construct knowledge (rather than acquire it) separately from instruction (Duffy & Jonassen 1992, Lainema 2003a). Based on this epistemology, instruction does not involve disseminating knowledge, but rather involves supporting learners in their construction of knowledge (Duffy & Cunningham 1996) and development of knowledge construction skills (Duffy & Jonassen 1992); recognising the value and importance of prior knowledge (Lainema 2003b); and incorporating learning tasks into realistic contexts to facilitate richer mental models and multiple perspectives (Lainema 2003a). It must be emphasised, however, that constructivists do not view *any and all* constructions by learners as valid. Instead Duffy and Cunningham (1996) explain that constructivists judge a learner's constructions in terms of the viability, workability and acceptability of actions and constructions compared to potential alternatives.

Constructivism therefore has a number of implications for designing learning environments and tasks. Table 1 summarises these implied design principles and shows why experiential simulations such as FAB ATM can be used by educators with a constructivist epistemology.

FAB ATM was designed and used based on the principles in Table 1. For example, the requirements engineering problem-solving activity is driven by and in the control of learners to the extent that they must select what questions to ask from a pre-defined list and decide who to interview, in what order, etc. FAB ATM also presents students with an authentic corporate environment (see Figure 1), featuring a familiar décor and background noise, where a series of one-on-one or group interviews typically takes place. FAB ATM also simulates the authentic complexities of requirements analysis, because the simulated employees respond to student questions by volunteering useful or useless information, tabling important documents, occasionally misunderstanding questions and making mistakes, contradicting or agreeing with each other when in group situation (see Figure 1), or deciding to terminate an interview when they feel they are not listened to, or when the time is up. FAB ATM also creates irritating, though very real, distractions (such as phone calls and interruptions). In addition, the FAB ATM simulation is designed to overwhelm students with 'factual' information, and challenge them with unfolding events and time constraints.

Constructivism learning environment design principle	**Experiential simulations**
Complex, not overly defined and authentic contexts just like in the real world (Bednar et al. 1992, Gerjets & Hesse 2004, Jonassen et al. 1999, Savery & Duffy 1996).	Models an aspect of the real world using variables with authentic relationships among them, resulting in multiple realistic pathways (Gredler 1996).
Learning tasks involve problem-solving (Duffy & Cunningham 1996, Savery & Duffy 1996).	Learners solve problems within the simulation based on their assigned roles (Gredler 1996).
Active learner-driven engagement with knowledge (Gerjets & Hesse 2004, Lainema & Makkonen 2003, Segrave & Holt 2003).	Learners perform tasks, make decisions, seek new information which is needed, etc. The problem emerges based on learner actions (Gredler 1996).
Social interaction among learners (Duffy & Cunningham 1996, Gerjets & Hesse 2004, Savery & Duffy 1996).	Learners can work in teams (Gredler 1996) and engage in debriefing sessions involving reflective discussions about experiences (Parker 1997).
Learners own the problem and understand/accept learning objectives (Savery & Duffy 1996).	Introductory sessions brief learners about the simulation (Parker 1997) and provide motivation.
Learners control the problem-solving process (Savery & Duffy 1996).	Players make decisions and the problem emerges based on learner actions (Gredler 1996).
Challenge the learners' thinking so they develop viable problem solutions which are tested against alternative views and contexts (Savery & Duffy 1996).	Simulations challenge learner thinking with open-ended scenarios (Gredler 1996). Discussions in teams/debriefing can explore views, solutions, etc.
Learner reflection on content learned and the learning process itself (Savery & Duffy 1996).	Learners engage in post-simulation debriefing involving reflective discussions (Parker 1997).

Table 1: Comparing experiential simulations with constructivism learning environment design principles

Students also have opportunities for social interaction to discuss their learning, experiences and the knowledge they are constructing, including online, during class and in teams. For instance, after using the FAB ATM simulation, student teams reconcile their notes and observations, and conduct post-interview analysis and reporting. Before lodging the final specification document, the teams validate their findings in a formal presentation (face-to-face or by video-conference, synchronous or asynchronous) and receive feedback from a bank employee (this time a real person – the facilitator). Post-simulation debriefing sessions are run so that students can confront their imagination, preconceptions and ideas with the facilitator and fellow students.

Educators have also justified the use of (experiential) educational simulations using experiential learning theory. This theory emerged from the work by Kolb (1984) in the 1970s (based on the work of Dewey 1910, Lewin 1951) and posits that the most powerful learning occurs when learners have direct experience (that is, taking action and reflecting on the outcomes) rather than through instruction alone (Lainema 2003a). While experiential and adult learning theorists have differing views on how learning occurs, they tend to agree that effective learning (especially in a business context) is a cyclic process which involves (not necessarily in this order): reflecting on one's experiences; abstracting or generalising from these experiences; testing the implications of the newly developed concepts in new situations; reflecting on these new concrete experiences; and learning by doing (see Lainema 2003a, Parker 1997).

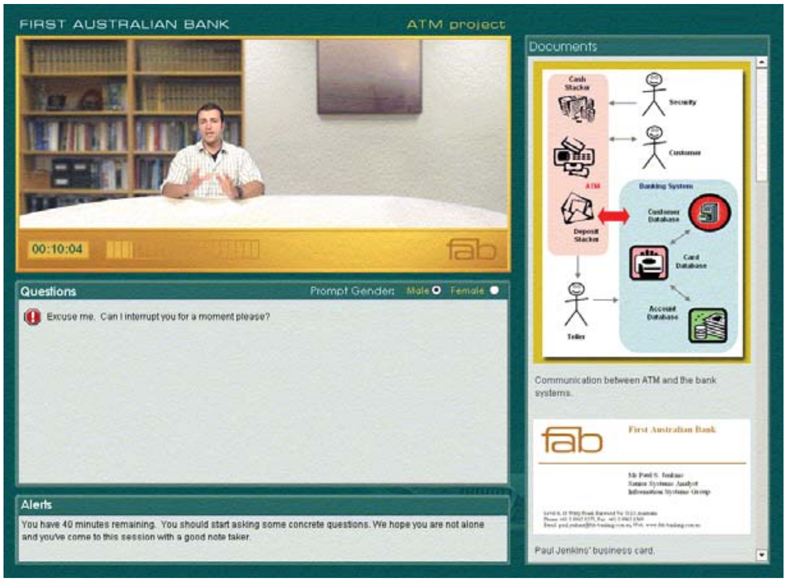

Figure 1: Sample FAB ATM screen

Although the premise of experiential learning is that it occurs in the workplace (Dewey 1910, Kolb 1984), it can also occur outside the workplace using such educational approaches as case studies, business simulations and outdoor management development (Hoberman & Mailick 1992).

Experiential simulations such as FAB ATM are therefore an approach emerging from this experiential learning theory because they: model in an authentic manner the real world (eg, the workplace setting); involve learners adopting a role within this setting (as they would in the workplace); encourage learners to perform tasks and testing ideas in a new (simulated) situation resulting in new experiences; and involve educators facilitating learner reflections on these experiences (see, for example, Chee 2002, Feinstein et al. 2002, Thavikulwat 2004).

In the next section we examine the design principles emerging from virtual reality and from the software gaming industry which we believe are relevant and appropriate for enhancing experiential simulations, and how these were employed during the design of FAB ATM with the aim of improving student learning outcomes.

FAB ATM: INCORPORATING VIRTUAL REALITY AND GAMING PRINCIPLES

A philosophy guiding all our Deakin LiveSim educational simulations is to apply a rigorously ‘circumscribed reality’. We define such simulations as those which attach only key aspects of authenticity to its objects and environment (Segrave 2003). They may sacrifice some degree of reality and yet they never cross the threshold of acceptability to the learner. To heighten the perception of user immersion in our simulations we use high fidelity images, sound and videos. Our simulations tend to be highly interactive and real time. To facilitate learning tasks, the employed media forms and interactions are designed to be very simple for the average student user; nevertheless, the simulations often present some serious challenges by creating complexity in the mind of a learner. To assure continuum of virtual experience, the simulations are just one part of a larger learning framework with some activities occurring in the real (e.g. in the classroom) and others in the virtual world (e.g. the FAB ATM simulation, online chat rooms, etc), as explained previously.

As the gaming experiences of young computer users grow, so too grows their expectation of the computer software functionality, behaviour and its user interfaces (Kirkley & Kirkley 2005). Simulation designers must actively probe and assess the level of user experience and incorporate these evolving user expectations in their product (Rosenbloom 2003). And yet, to create a compelling experience for players, simulations do not necessarily need to be complex in their technology and design - it is often sufficient for the simulation behaviour “to be believable and designed to support the desired experience” (Swartout & Lent 2003, p 39). What convincing games do (and experiential simulations should) provide, however, is the opportunity for players to explore and experience simulated reality from numerous vantage points, to repeatedly revisit their (positive) experience, to apply their senses directly to the simulated events, and to explore the simulated reality according to their personal interests and preferences (Jain 2003).

In educational software games, players are emotionally (Jones 2004) and experientially (Segrave 2003) immersed in the simulated environment to the extent of developing the sense of his or her presence and acting in the game, which in turn can lead to what is sometimes referred to as ‘collateral learning’ of new concepts, by ‘doing’ or 'being', thus learning without any conscious or formal instruction (Zyda 2005). We recognise this phenomenon as an important aspect of software games which can effectively be used to enhance experiential simulations. More specifically, our incorporation of virtual reality and gaming principles into FAB ATM resulted in students not merely acting out their interviewing roles in the simulation, but also visibly turning into interviewers and becoming IS business analysts who were practising their professional skills. For this reason, we believe that when learners take on the immersive role in interview-style experiential simulations which are enhanced with appropriate and relevant virtual reality and gaming principles, it allows them to engage in the professional practice without leaving the safety of the educational environment.

One element of software gaming design we believed was important to incorporate into FAB ATM related to the simulated characters and their behaviours. In FAB ATM, the simulated characters display behaviour that demonstrates awareness of their virtual environment, of other characters beside them, of what has been asked of them and what has been said in their presence. In view of these objectives, FAB ATM adopts the principles of cognitive interfacing (Funge 2000), which allows simulated characters to react to their virtual world, often emotionally, to agree or disagree with their co-interviewees and real interviewers, to become bored when left disengaged, and to act surprised in response to unanticipated events. At the same time, FAB ATM users exercise a fair degree of control over the simulated events and if necessary are guided by subtle changes to the simulation focus (Baudisch et al. 2003). In such simulations, which are cognitively-aware and subtly-controlled, the simulation must maintain the status of play and of characters, change states in reaction to events triggered by learners and their simulated colleagues, and appear to acquire knowledge of the past events. This is why FAB ATM utilises the state-based model (Harel & Politi 1998) embedded in Deakin LiveSim, which allows the simulated interviews to naturally move from state to state in response to students' questions, to monitor mental states of the interviewed characters, and to represent the state of students' knowledge in the process (detailed description of the state-based model of LiveSim behaviour is beyond the scope of this paper). This contrasts with the standard 'programmed' behaviour of many educational simulations and games.

Another aspect of virtual reality and gaming design we considered was the fidelity of the simulated characters. We believe that the simulated characters needed to have a natural appearance, individuality, functional fidelity, autonomy of reaction and good synchronisation with the simulated environment (Badler et al. 1999). Realistically animated characters, displaying such characteristics, are often used in movie production (e.g. Matrix or Superman) and in experiential games (Macedonia 2002). Outside the movie industry, animated virtual humans have also been used in games and in simulations, such as the simulation of complex physical systems (Badler et al. 2002) and in management training (Aldrich 2004). However, animation of virtual humans is very complex, technologically demanding (at this stage) and, for many organisations aspiring to develop such technology (such as educational institutions), prohibitively expensive. Constructing an experiential simulation around real-life human characters, which are acted by professional actors and then dynamically synthesised into the simulation, provides at this point in time a more realistic and cheaper solution. Such an approach has been used very effectively in FAB ATM, and in the past has also been utilised in numerous other educational simulations, such as 'Virtual Patient Project' (www.typemovie.com) and 'youinfrontoftheclass' (www.jijvoordeklas.nl).

It should be further noted that in contrast to the 'true' virtual reality simulations which provide fully immersive systems (such as those provided by VRML and X3D, and text-interactive simulations like MOOs and MUDs), our FAB ATM (and its Deakin LiveSim simulator) uses more cost-effective, not fully-immersive, solutions using normal input devices and a monitor. In essence, FAB ATM uses modest and yet experientially believable methods of casting simulated characters, projecting their state-based behaviour, and constructing the environment in which the characters act, communicate and interact with the students. In this sense, we have applied only selected elements of virtual reality and software gaming which can be used to enhance experiential simulations, with students' "imagination" allowing them to feel they were real interviewers in an authentic context. In the next section we provide an overview of how we employed FAB ATM with requirements engineering students.

EXPERIENCES USING AN INTERVIEW-STYLE RE SIMULATION

Deakin University students undertaking a graduate course in requirements engineering (MSC754) are of mixed backgrounds, including master students (some with their first degree in IT and some with degrees in Business) and Honours students specialising in Information Systems as part of an Honours degree in commerce or doing accelerated Honours as part of an IS degree. The modality of the course enrolment is also varied - we have a large group of on-campus students, many off-campus students (some inter-state and overseas) and a number of students from remote campuses taking the subject fully online. While there is only a small number of students (50-70), students' expectations of the course, its teachers and teaching standards are very high. Some of the students are working professionals and already have gained experience in IS development, client communication and consulting activities. Some students have been involved in the requirements engineering process itself.

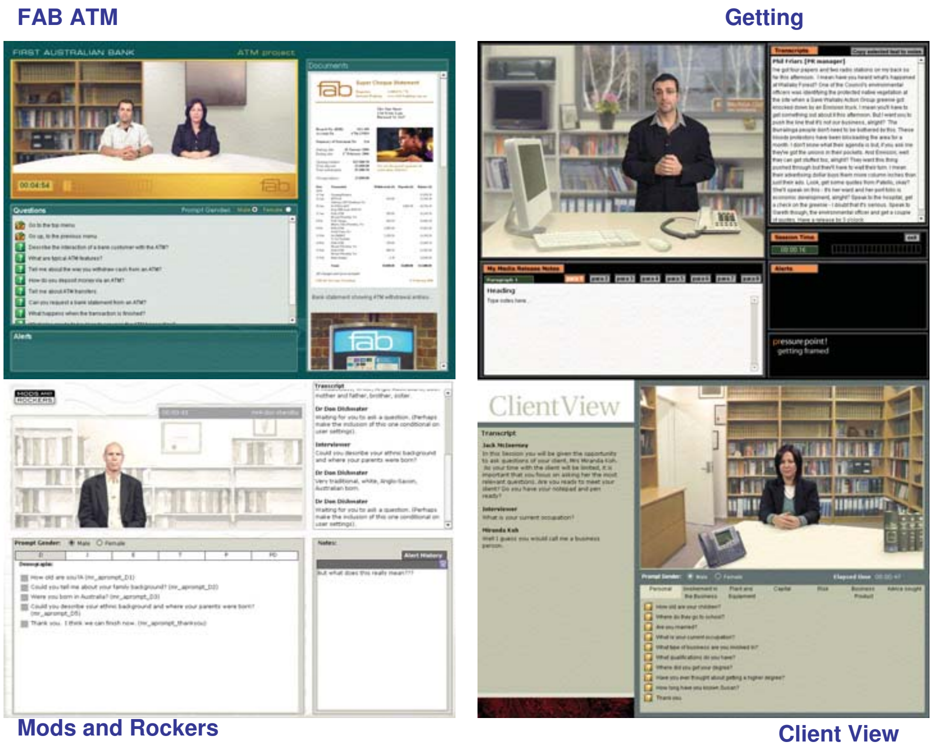

Figure 2: Samples of Deakin LiveSim simulations

In all this variability and richness of student profiles, we are also required to comply with the university policy for comparability of assessment, which states that all student cohorts need to undertake the same projects and be assessed in exactly the same way.

Considering the need for teaching communication and interviewing skills to requirements engineering students (as discussed in the introduction), the benefits of employing experiential simulations in delivering such teaching, and the students' varied backgrounds and experiences, over a period of six years we experimented with various types of interviewing games, role playing and experiential simulations. For example, in the early years of teaching requirements engineering at Deakin, outside professional clients made their time available to students, then - as student numbers grew larger - the IS teaching staff performed the role of interviewees for the students, later - when budgetary constraints cut down the number of staff involved - a single lecturer played the role of multiple 'remote' clients communicating with students via email (and generating 20,000 words of emails in response to student requirements elicitation questions). Eventually, FAB ATM was developed to assist in this labour intensive process and to relieve our overloaded teaching staff! In doing so, we arrived at the solution, commonly known as 'blended learning', which features a mix of real-life activities, intensive online communication and a CD-ROM based experiential simulation (i.e. FAB ATM). As we have explained previously, we have found that FAB ATM can be used effectively in conjunction with a variety of teaching approaches including: student team work (i.e. teams devise interview plans, conduct the interviews using FAB ATM, reconcile notes/observations, etc); self-directed research of the problem domain (e.g. ATM use issues) using online discussions and chat rooms; formal presentations to validate their requirements specification (face-to-face or by video-conference, synchronous or asynchronous); and participate in post-simulation debriefing sessions to discuss their alternative views, approaches, etc. In essence, the way in which experiential simulations such as FAB ATM can be "blended" with other learning approaches can be quite varied, with the simulation providing the impetus for research, discussions, team work, etc.

Development of Deakin LiveSim (an interactive multimedia environment to support interview-style experiential simulations) was undertaken primarily to minimise the complexity of building individual simulations and to maximise reuse of technologies used in their support. Since its inception in early 2005, Deakin LiveSim has been used to develop five educational simulations; four of which have been deployed in disciplines other than the initial IS-related pilot. Such simulations facilitate training of public relations practitioners; interviewing consulting psychologists; conducting interviews with clients seeking legal advice; and finally, forensic interviewing of children. All five simulations apply different educational objectives; have distinct functionality, varied look and feel (see Figure 2); and they present students with unique challenges and opportunities to experientially practice their chosen profession. Two of these simulations (including FAB ATM) have already been used in practice as part of the 2006 curriculum; the remaining ones are to be used late 2006 / early 2007.

At the end of each project phase students are asked to reflect on their learning experiences, their difficulties and the strategies which they employed to overcome these difficulties. To avoid an overbearing focus on the technology used in the project, students are not asked any specific questions about the Deakin LiveSim environment. Nonetheless, many of our requirements engineering students reflected on their experiences with the Deakin LiveSim technology and the FAB ATM simulation in particular. While the objective of this paper has been to report on the design considerations guiding the development and use of FAB ATM at Deakin, we will briefly present some preliminary student feedback below. Future research will involve more detailed investigation of the learning outcomes of students who have taken part in Deakin LiveSim simulations.

The following statements were typical student responses:

- "Overall, this assignment has been a change from any other assignment, in terms of interacting with clients in a computer simulated environment."
- "The interview CD is really a very good idea, which offered us a virtual interview environment via multiple media technology."
- "The interview stimulation program did offer us a chance to be a part of interview, to touch it, to feel it and to experience it."
- "The actual interview simulation session was very informative and convenient allowing some flexibility in the actual interview technique."

At the same time, some students voiced concerns with some aspects of the simulation:

- "The interview transcripts were actually hard to produce, given the speed at which the interviewees talked at, and the limited knowledge we had on the subject."
- "Some questions were too generic and did not add value to the interview."
- "Interviewing was a bit hard as the CD didn't answer most of the questions that we came up with during brainstorming."
- "The most difficult part was consolidating the interview transcripts."
- "I also found the interview tool limiting, in that it did not really allow us to display any of our skills in interviewing."

Interestingly, as evident from the above comments, the greatest difficulty that students found was not in the use of the simulator but rather with problems associated with the real-life tasks of collecting and analysing interview data. This is the very essence of the experiential simulation of circumscribed reality.

CONCLUSIONS AND FUTURE RESEARCH

This paper has shown that interview-style experiential simulations are a suitable approach for educators who view learning from a constructivist epistemology. The paper has also demonstrated the application of selected aspects of virtual reality and software gaming, resulting in a circumscribed version of important aspects of reality which give students the freedom to imagine they are in an authentic learning context. We have also provided insights into the ways in which experiential simulations can be incorporated into a broader educational framework. More specifically, we have shown that such simulations can be used as the impetus and motivation for students to engage in team work, online discussions, independent research, presentations, in-class debriefing sessions and social interaction. The permutations of learning approaches which can be combined with experiential simulations is limited only be the imagination of IS educators.

There are a range of future research possibilities emerging from our preliminary work. Firstly, we plan to conduct more detailed qualitative research into students' reactions to and learning outcomes from their participation in educational programmes which incorporate interview-style experiential simulations. Secondly, we recognise that such computer-based experiential simulations are criticised for their elevated development cost, their narrow and discipline specific context, and demand for teachers' and students' technical skills. For this reason, our ongoing research will involve further refinements to the Deakin LiveSim simulator, storyboard development and the other production tasks associated with building interview-style experiential simulations for IS and other disciplines. It is hoped that this work will result in an interactive multimedia environment which will support the development of cost-effective, efficient and modifiable experiential simulations.

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