Facilitating the ability of graduates to articulate their employability skills through the use of a 3D virtual learning environment

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'Readiness' for employment is having the appropriate knowledge and practical skills for a particular job, as well as possession of the 'right' attributes for that job. A recent report on the recruiting preferences of Australian graduate employers (AAGE, 2011) revealed that the three most desired attributes in graduates are communication, team work and problem solving. This paper reports on the first stage of a three stage study exploring the potential of a 3D virtual learning environment (3DVLE) to aid graduates identify and articulate these 'employability skills' (Precision Consulting 2007). Using a qualitative approach, the purpose this stage was to seek primary stakeholder (students and university staff) feedback and input into the early design of three proposed learning scenarios in a 3DVLE. Student acceptance of the 3DVLE was positive, staff acceptance less so. Both students and staff provided valuable input into improving the look and use of the proposed scenarios.

Key words: 3D virtual learning environment, employability skills, virtual world research.

Introduction

The internet revolution witnessed over the past two decades has precipitated significant cultural change in how organisations, businesses, production processes, governments, news media, communities and individuals communicate, interact and operate (Benkler, 2006; Rheingold, 1993). These new practices, combined with the increasing ease of use new software and technologies, provide the opportunity for individuals to be more participatory in and critical of things that affect them (Benkler, 2006) such as the activities of government, their interaction with the world of work, the economy and the environment. The changing demands of the

participatory culture in a networked information economy (Benkler, 2006; Wood et al, 2011) highlight the critical role that higher education needs to play in not only positioning graduates for integration into a knowledge community (Hodge & Collins, 2010), but also in facilitating learners' employability skills. At the same time, we also need to leverage off the digital literacy of our changing student demographic.

Key to successful job acquisition is the ability of the applicant to demonstrate to the recruiter one's possession of the appropriate knowledge, skills and attributes for a given position (Allen Consulting Group, 2010). For the graduate, knowledge and skills are easily identified and conveyed (predominantly in written form via a cover letter and rėsumė and academic transcript) as these are generally part of the curriculum and are overtly assessed. The applicant's possession of appropriate attributes for the position, however, is equally if not more important than knowledge and skills (Yorke, 2006). These are not as easily identifiable, nor elucidated as these 'employability skills' (Precision Consulting, 2007) appear in general to be neither formally taught, nor assessed in Australian higher education institutions (Bridgstock, 2009; Kavanagh & Drennan, 2008; Smith *et al*, 2009). This is in sharp contrast to active employability skills education and assessment in the United Kingdom (Shepherd, Braham & Elston, 2010), or indeed in Australian vocational tertiary institutions (see Denton, 2005 as an example).

Many educators are turning to 3DVLEs in response to the needs of the changing student demographic and the related demands for increased flexibility and more engaging collaborative activities facilitated through simulated learning environments (Wood, 2009). Such environments have been found to be an effective medium for a range of activities including presentations, discussions, role plays and simulations, historical re-enactments, games design, dramatic performances, creative arts and business modelling (Wood, 2010). Not surprisingly, therefore, 3DVLEs are increasingly utilised in higher education institutions as part of their pedagogical approach to knowledge and skill acquisition (Armstrong & Franklin, 2008; Gregory *et al*, 2010; Kirriemuir, 2010).

Importance of the study

'Readiness' for employment is not just about having the appropriate knowledge and practical skills associated with a particular job; it also includes possession and internalisation of the 'right' attributes and attitude(s) for that job. It is not unusual for graduates to think that employers are chiefly seeking candidates who have an ability to carry out tasks associated with a position and possession of knowledge underpinning those tasks. However, it is argued that the most important skills employers require of candidates is the possession of relevant attributes associated with the job (Maiden & Kerr, 2006; Ostrom, 2007; Scott and Fuller, 2009; Yorke, 2006). These attributes include sound written and verbal communication skills, the ability to work in teams and solve problems, and initiative. Enterprises call these the 'employability skills', the careers industry terms them the 'soft skills', and centres of higher education (HE) infers them under a variety of banners including 'graduate qualities' (UniSA, 2010) and 'graduate attributes' (Barrie, 2006).

Whatever the terminology used, it is evident from the literature that HE careers services units promote them, employers expect graduates to possess them and universities use them in their marketing. However, whether or not students have gained the attributes as a result of their studies, many graduates appear to minimise the importance of job related attributes (AAGE 2010), let alone promote them to employers. As a result, graduates may well be underachieving when it comes to providing employers with evidence of their suitability for a particular position during the job search process. This can lead to: a) dissatisfaction of employers with the quality of job applicants; b) a greater time gap between graduation and employment for students, and: c) poorer employment outcomes for universities.

As with all similar graduate career related units in Australian HE institutions (Smith et al, 2009; Yorke, 2006), the University of South Australia's (UniSA) Career Services unit provides students with a wide variety of career management skills education, employment market information and practical job search and application resources to better position students for the world of work. The job application resources available to students include web based written materials, weekly resume writing workshops, one-on-one career guidance and in-curriculum lectures on job application techniques. However, unlike some other Australian HE career service units (Stokes-Thompson, 2009), UniSA's Career Services is yet to embrace the wide range of technologies now available, and more specifically, 3DVLE and social networking platforms such as Wikis, blogs and Facebook, in the delivery of its services. This is set to change.

In the last two years UniSA has transitioned to *Moodle* as its learning management system platform. The adoption of *Moodle* now enables teaching staff greater flexibility and a variety of tools for incorporating different pedagogical approaches and the diverse suite of synchronous and asynchronous Web 2.0 based communications platforms (Benkler 2006) such as blogs, wikis, eportfolios, vidcasts and RSS feeds. The Career Services unit is keen to exploit this opportunity to expand its range of career information and teaching aids delivery much like a number of other Australian university career services units have done in recent times (Stokes-Thompson, 2009). Of particular interest is the potential of the 3DVLE (Gamage, Tretiakov & Crump 2009; Kluge & Riley, 2008), with the support of the Web 2.0 technologies, in assisting graduates to recognise and articulate their employability skills.

Approach - development of a series of 3DVLE based learning scenarios

Stages

The value of use of the 3DVLE in HE learning for offering a wide range of unique, timely, purposeful, mistake-forgiving, student centred scenarios for interaction and learning, which are not possible in the real world (Savi-Baden, et al 2010) is now well recognised. Development of employability related attributes in the 3DVLE environment at the HE level (for example, communication skills: (Sweigart et al 2010); team skills (Maxwell, 2007; Minocha & Morse, 2010; Rudra et al, 2011); problem solving (Tanti & Kennedy-Clark, 2010) is not new. However, in many of these documented applications, graduate attribute development appears to be secondary if not incidental to other learning for which the activity was designed. There is an apparent lack of curricula that address the underlying principles which constitute effective communication, constructive team work or successful problem solving. For example: What are the finer nuances of verbal and non verbal communication? What are the various roles people take on during team meetings and what contribution can or does each member make towards goal achievement and team maintenance? What are the recognised steps in problem solving and how can each person involved positively contribute to each of those stages?

Proposed Learning Scenarios

Towards the end of 2010 the Australian Association of Graduate Employers (AAGE) commissioned a survey of member organisations to determine, among other things, those attributes they deemed most needed in graduates to make them employable. The final report (AAGE, 2011) showed that the three most valued attributes, in order of importance, were communication, team work and problem solving skills. This section reports the first stage of a study undertaken at UniSA in which scenarios addressing these identified attributes were developed within a 3DVLE; each of which has been designed to highlight and assist students in recognising and articulating their communication, team work and problem solving skills.

Over a period of 12 months a virtual careers centre was designed and built within an existing virtual UniSA campus on the *OpenSim* platform *Reaction Grid*. In areas leading off the main career centre atrium, builds of an office and two meetings rooms have commenced. As the final layout and other elements of the scenarios are dependent upon student, teaching staff and employer input, the builds are still progressing. Once the development of the scenarios has been completed, individual students will be able to:

1. Undertake an interview for a position in an employment area of their choice and thereby practice their written and verbal communication skills, and their ability to articulate a range of other graduate skills.
2. Join in a team meeting and in doing so, learn to identify and value different roles people adopt in a team (Belbin, 2010) and take on one or more of those roles (*al la* de Bono's (1999) 'thinking hats') during repeated playing (see Figure 1, which shows the proposed scenario platform and indicates the various roles players may adopt).
3. Participate in a problem solving discussion where the various stages of problem solving are elucidated.

The stages associated with the development of the scenarios are:

Stage 1 – determine the appropriateness of utilising the 3DVLE as a pedagogical approach and seeking initial input into the development of the three scenarios using input from students and university staff.

Stage 2 – develop the three scenarios utilising input from employers, educators and students as to look, feel, process and activity within each scenario.

Stage 3 – pilot the three scenarios in order to fine tune their effectiveness using students.

Stage 4 – test the three scenarios against other methods of identifying and articulating employability attributes in order to determine their pedagogical and learning effectiveness.

This paper reports on the Stage One of the overall investigation.

Figure 1: Screen shot mock up of proposed 'Team Meeting' scenario in the 3DVLE, indicating team roles (Belbin, 2010) that student avatars will be able to experience.
(Image adapted from http://dianaf.posterous.com/?tag=mpk16sl)

Methodology

In this first stage, the researcher aimed to explore with no preconceived expectations, ideas or opinions, the appropriateness and potential effectiveness of using the 3DVLE in highlighting and promoting employability attributes. Therefore, a Grounded Theory (Glasser & Straus, 1967) approach to the research was taken with the view that the final design and implementation of the three scenarios were to be informed by input from the primary stakeholders – students who will interact with the scenarios and staff involved in the direct education of students who may eventually incorporate the scenarios into course curriculum.

Employing qualitative research methodology (Corbin & Strauss, 2008), student and university staff opinions were sought on the appropriateness of using the 3DVLE in the delivery of career related services and, more especially, its use in highlighting and promoting employability attributes of communication, team and problem solving skills. This stage of the investigation was aimed at gaining early input into scenario development. This was achieved predominantly through the use of a short questionnaire, which sought responses to a series of open open-ended questions (Gamage, et al, 2009). However, as this may only provide feedback on the look and feel of the 3DVLE, feedback was also sought from university staff using a semi structured focus group approach in order to gain insight into how the scenarios could be refined to enhance their potential as learning tools.

Method

Ethics approval was gained from the University's Human Research Ethics Committee (UniSA HREC) and all participants (students and staff) were advised of the voluntary nature of the anonymous feedback and their rights to withdraw at any time. After showing and outlining the preliminary scenarios to student and staff participants, feedback in the form of an open ended questionnaire was sought. The written questionnaire contained four questions.

Feedback questionnaire questions:

1. How appropriate is it to use the 3DVLE for the delivery of career information to higher education students?
2. What are some of the features or ideas that you like most about the 3DVLE immersive virtual careers centre proposal?
3. What are some of the features or ideas that you do not like about the 3DVLE immersive virtual centre proposal?
4. What suggestions (additions, alterations, subtractions) do you have which would improve the 3DVLE immersive virtual careers centre proposal?

Student participants

Feedback was sought from two groups of students.

The first group comprised a class of 60 first year Computer and Information Science (CIS) students who were gathered to hear a 90 minute presentation by the researcher on the careers related topic 'self marketing'. With the permission of the Course Coordinator and the students, the researcher used the final 20 minutes of the session to demonstrate an early form of the proposed 3DVLE under construction. Using a computer linked to the lecture theatre's audio visual system, the image of the 3DVLE was projected onto a large screen. Over a period of 10 minutes the class of students was 'walked' through a simulation of the career centre atrium (Figure.2), the proposed content and available resources within the virtual careers centre outlined and adjacent rooms and the three scenarios explained. Reiterating the voluntary nature of any feedback to be provided, and being reminded of the ability to withdraw at any time, students were asked to complete the short feedback questionnaire.

The second group of students comprised three individual students, each of whom had attended a one-on-one career support session with a Career Adviser colleague. One student was studying pharmacy, one nursing and the other was studying education. At the end of their respective sessions, each student was asked by the Careers Adviser whether they would be willing to provide feedback on 3DVLE development project. Upon gaining agreement, each student was introduced to the researcher. Using a personal computer (PC), attached to a 56cm (on the diagonal) screen for the purpose, the researcher to 'walked' each student separately through the simulation of the career centre atrium, proposed resources and adjacent 'scenario' rooms for about ten minutes. The researcher also described the purpose and provided a broad overview of each of the scenarios. Students were then asked to complete the short feedback questionnaire.

Staff participants

Staff opinions and suggestions regarding the development of the scenarios were collected via notes taken by the researcher during a semi structured focus group session and the completion of the same open ended questionnaire completed by the students. Four university staff from the University's Learning and Teaching Unit (comprising two teaching staff and two professional staff all of whom provide learning advice and training to students) were approached take part in the research. The researcher explained that their participation involved viewing the proposed 3DVLE and listening to the scenario outlines and that they would then be invited to provide feedback on any shortcomings and/or suggested improvements via a focus group and completion of the short feedback questionnaire.

As with the students, the staff group was walked through the 3DVLE careers atrium, the proposed content and available resources within the virtual careers centre outlined and a general overview of the purpose of the scenarios explained. At the conclusion of the presentation the staff were asked to discuss as a focus group their impressions, suitability, etc. of the 3DVLE and scenarios. The discussion took approximately 30 minutes. The staff participants were then asked to complete the same questionnaire given to the students in order to formally capture their opinions on the suitability of using the 3DVLE, on what was proposed, as well as their impressions and suggestions for improvement. The open-ended nature of the questionnaire also provided staff with the opportunity to provide any other information which may have been stifled during the focus group session (Gamage et al, 2009).

Figure 2: Screen shot of the design and layout of UniSA's proposed careers atrium and career related resources in the 3DVLE

Results

Questionnaire

Question 1- How appropriate is it to use the 3D virtual learning environment for the delivery of career information to higher education students?

Students – CIS Class

Feedback was received from 60% (36 out of 60) of the students in the class.

Feedback on the appropriateness of using the 3DVLE for employability skill development was positive with 10 students (28%) indicating it was 'most appropriate' and 23 (64%) indicating that it was 'appropriate'. The remaining 3 (8%) indicated that they were 'not sure'. The three students undertaking studies in pharmacy, nursing or education (from now on termed 'independent' students) indicated that 3DVLE use was either 'appropriate' (1 student) or 'most appropriate' (2 Students).

Twenty (55.6%) of the computer science students respondents also provided comments to question 1. A large proportion of the free response comments were positive, emphasising the proposed interactivity, suitability for today's learners, ease of information accessibility and retention, as well as its novelty. Negative comments included lack of detail and need for refinement with respect to look and level of sophistication. The three independent students reiterated these comments.

Staff

One of the university staff participants stated that the use of the 3DVLE was 'most appropriate', while the remaining three staff members indicated that they were 'not sure'.

Three of the four staff participants provided comments, one finding the concept "very interesting and potentially very useful technology", one saw it as "an important means of engaging with students who are familiar with this technology" and the third suggesting the "need to measure start and end knowledge to get an answer" to the suitability question.

Question 2 – What are some of the features or ideas that you like most about the 3DLE immersive virtual careers centre proposal?

Students

Thirty two (89%) of the 36 computer science students responded to this question, as did all three of the independent students. Features that were liked included: the ability to have a practice at interviews, the ability to

personalise (i.e. choose the interview outfit) of one's avatar, that it was online and thereby saved time and effort, and that it was fun and provided immediate feedback.

Staff

All four staff liked the idea of access to readily downloadable resources, that the role plays were a better way of learning and that they were engaging, fun and novel.

Question 3 – What are some of the features or ideas that you do not like about the 3D immersive virtual centre proposal?

Students

Twenty (56%) of the computer science students respondent to this question and commented on the need to improve the 'laggy' animation of the avatar, that the graphics were "archaic" or "lame" and that the look or detail needed to be improved. Only two of the independent students responded to this question, one commenting that the environment needed more features and the second commenting that the use of the technology "could be restrictive, in the sense when talking face to face new ideas are prompted as opposed to computer only saying what its been told to" .

Staff

All four (100%) staff participants responded to this question and addressed concerns such as: the need for its use to be accompanied by more traditional methods of learning and that the leaning needs to be scaffolded; that not all students would be interested in using immersive technology; and that It could widen the gap between the technology "haves" and "have nots".

Question 4 – What suggestions (additions, alterations, subtractions) do you have which would improve the 3D immersive virtual careers centre proposal?

Students

Twenty three **(**64%) computer science students and all three independent students responded to this question. Suggestions included the need for more people in the environment and interaction between those people, to make sure the site is accessible from "cheaper lower-end computers" as well as reiterating the need for better colour, graphics and animation.

Staff

All staff responded, suggesting "gaming" or reward elements as a way of providing improved student uptake and engagement, ensure that the site is easy to navigate, the need to perhaps consult a games developer and youth who play online games, and that it be supportive of participation.

Focus Group - open feedback responses

Response to the 3DVLE and proposed use was positive. Much of the discussion revolved around questions and comments such as: the plans for its uptake as students were unlikely to engage in additional activities that were extra -curricular?; the need for academic input into formal assessment of scenario responses; the length of time taken in scenario interaction; that the scenarios should be game-like and 'in-game' feedback on progress and support provided; the linearity and levelling up within each scenario.

Feedback Summary

Students' comments were generally positive. Several students indicated that the interactivity of the environment would improve their learning. Students indicated that it was easier to 'remember' the information because they were more actively involved. However one student commented that although the platform had a 'novelty' factor it would not be 'immersive' for an extended period of time.

The staff focus group consisted of only four staff. Comments indicated that the staff were unfamiliar with the environment and had mixed views about how effective it would be. Staff further suggested that evidence in

terms of learning outcomes would be necessary before implementation.

Staff indicated that the role play in the virtual world would make the experience less difficult, so that students could build up their confidence. The availability of the practice environment for distance students and its novelty were identified as positive aspects, as was the 'fun' component of the exercise. The engagement in the activity was also identified as being an important attribute.

Staff had differing perspectives on features that they did not like about the potential 3D centre. Comments included that some students may not engage in the environment to the same extent as others, but that if the technology was easily navigable then this would be easier. Another comment was that the use of such technology increased the gap between the 'haves' and the 'have nots'. One respondent indicated that the open ended, reflective experience provided 'scaffolding' for future student learning.

Staff suggested that the game-like environment of the virtual centre needed to be improved in order to ensure student engagement and participation. A suggestion was made to consult with game-writers and with young people who play online games to determine appropriate methods of providing incentives to "play" the games. The importance of 'fun' was identified, as well as ensuring that the environment could be navigated intuitively. Staff focus group participants were quite consistent in the view that students would not use the resource unless it was more like a game, with rewards or feedback provided on how they were progressing.

Discussion

There are five broad ways in which virtual worlds may be used as a learning tool. These include rote learning, exploration, visualisation, simulation and for exploring or experiencing not possible in real life situations (Daden, 2010). The current study is the first of three stages exploring the dynamic use of the 3DVLE as a simulation learning tool. A tool which will provide three real world work related situations in which the user is the sole participant and actively controls their own avatar as part of their own learning. This is dramatic change from the way UniSA's Career Services section delivers or promotes student acquisition of the employability skills.

Overall the feedback on the proposed use of the 3DVLE was positive with students showing more acceptance of the technology than the staff participants. Questionnaire feedback from the staff in this study was somewhat different to that gained from research by Gamage, Tretiakov and Crump (2009) where "quite positive" feedback was exhibited by educators. This reversal may reflect two major differences between the sets of educators in our studies. The size of Gamage, Tretiakov and Crump's cohort was 22 compared to this study's 4, and the Gamage et al group was made up of 50% 3DVLE users and 50% non users. None of our focus group members had used the 3DVLE. Both student and staff feedback, however, emphasised the motivational aspects (fun, interactive, game-like) of using the proposed approach. This finding is consistent with results obtained in research by Tanti and Kennedy-Clark (2010) and Sweigart, et al (2010). In addition, Tanti and Kennedy-Clarks' research highlighted the need for students to interact and collaborate when using virtual technology in order to "gain more than just 'fast knowledge'" (Tanti and Kennedy-Clark, 2010, p. 966), this is similarly reflected in students' feedback comments.

Conclusions

Constructivism theory provides the framework for simulation-game pedagogical approach to safe, experiential learning (Starĉiĉ, 2008). However, for maximum learning to be gained, potential users need to be "engaged within the whole process of development and testing the product" (Starĉiĉ, 2008, p. 787). Feedback from both students (peer interaction) and staff (in-game support and feedback, scaffolding) point to a more dialectical constructivism approach (Dalgarno, 2002). This and other feedback has proven to be invaluable in the initial development stages of the proposed use of the 3DVLE in providing students with an authentic, practical, enjoyable and innovative way of gaining and developing work related attributes designed to supplement traditional approaches used by HE UniSA's Career Services section. The research has also helped refine approaches to students, university staff and eventually employers when seeking their input into the next stages of development and refinement of this specific 3DVLE.

The findings from this preliminary research have broader implications for other HE institutions interested in strengthening the development of student graduate attributes. Firstly, the apparent level of acceptance by today's

student body in the use of the 3DVLE as a pedagogical approach. Students, especially those who have digital game playing experience, readily see the potential for involvement and enjoyment while learning. Secondly, students' willingness to be involved in the early phase of 3DVLE development. Their suggestions for improvement, however, do raise challenges in prioritising their suggestions against what is realistic from an educational and fiscal point of view. Thirdly, one may have to select academic involvement carefully. Those with little to no experience in using 3DVLE technologies may be less enthusiastic in the early stages of development than others who have been using 3DVLEs in their teaching and learning for some time. It may be useful to undertake trials with more experienced academics during the initial stages of the project to help build an evidence base that can then be used to encourage less experienced academics to participate in subsequent trials.

In addition to furthering the current research plans, the findings from this study have the potential of generating other lines of inquiry. One such area for investigation might be the exploration of differences in scenario design suggestions between student cohorts. The cohort in this study was students undertaking their first undergraduate year of study. How would their suggestions differ from students further along in their studies? If so, what are the differences and how should the design accommodate this diversity? The findings from such inquiry may lead to a significant change in scenario design.

Several limitations of this study are apparent. The short questionnaire did not seek demographic information (such as age, gender, experience using of 3DVLEs) of participants. Such information would have provided answers to a number of important questions and thereby provided clearer guidelines for the eventual look, feel and educational effectiveness of the scenarios. For example, did student responses represent their respective generation? Did student responses reflect gender preference for playing computer games or accessing virtual worlds? Answering these may have provided insight into why students responded as they did and guided the need or otherwise for seeking feedback/input from student and staff groups as yet unrepresented.

Other limitations revolve around the staff participants. Would have it been better if the questionnaire had been given to the group before the focus group session? Would they have responded differently if it was completed before rather than after? The size of the group was small, only one group was surveyed and only one area of the university was represented, potentially skewing feedback results. It is likely that a larger group have provided more discussion and therefore prompted varied feedback and suggestions.

This paper reports on the first stage of research that explores the potential of a 3DVLE in aiding higher education students to identify and articulate the range of employability skills. Results of this initial study have been valuable despite its limitations and can only lead to the development of improved studies and more effective use of 3DVLE technology for educational purposes. If the 3DVLE as proposed ultimately proves to be of value, it will be an additional tool in a range of learning and teaching approaches from which students can select to meet their changing learning needs, wants and expectations.

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