Online Simulation: Innovative strategies to promote student engagement in learning and assessment

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There is increasing interest in the use of simulation for the teaching of clinical skills and decision making amongst nursing, medical and allied health professional students. However, with a single human simulator costing as much as $500,000 AUD and many students studying via distance education, it is useful to explore alternative simulation approaches able to be delivered online to large numbers of students. This paper describes the Online Simulation project which uses a combination of video and text to simulate the health care workplace. Nursing students were provided with clinical decision making activities and then, according to their decisions, directed along complex, non-linear learning pathways as the condition of the simulated patient evolved according to the decisions made. The Online Simulation project focuses on nursing assessment and cross-cultural health care and demonstrates the use of effective strategies for student engagement. The Online Simulation project has been evaluated using a multifaceted evaluation framework, based on the work of Agostinho et al. (2005). The results of the evaluation are reported in the context of a broader discussion, related to the general use of online simulation in higher education. The implications of the Online Simulation project extend beyond nursing, as the approach used has the potential to be applied across multiple disciplines and professions.

Keywords: *e-learning, scenario based learning, simulation*

Background

The University of South Australia (UniSA) School of Nursing and Midwifery has over 2,000 undergraduate students located throughout Australia and overseas. These students have diverse backgrounds in terms of age, family structure, nationality, prior education and experience. The UniSA Bachelor of Nursing (BN), like most nursing programs, provides an introduction to client history-taking and assessment in first year, with subsequent years building and extending student knowledge. The traditional approach to teaching history and assessment has been via the use of hospital assessment forms, many of which are replicated in student texts. Undergraduate students use these forms to guide role play assessments of each

other. While this traditional teaching approach is reasonably effective due to its experiential nature, student learning is often limited by the inexperience of the student assessor and the capabilities of the role playing student. Further limitations of the traditional approach relate to the assessment forms themselves and the textual content which provides limited guidance for inexperienced students.

The approach to online simulation described in this paper is based on the work of Kindley (2002). An important aspect of the simulation approach is that learning resources are developed by firstly mirroring the work environment. Learning pathways are then structured to match the decision making that occurs in the workplace.

> Simulation makes possible 'learning by doing' because it focuses on the learner's performance outcomes in a context that mirrors the real work environment ... and takes into account the complexity of possible interactions across key variables. (Kindley, 2002, p3)

Using a combination of video, audio and text, students are provided with scenarios that replicate a real workplace situation and must respond to problem solving activities by selecting from multiple choice options while working online. Students are then presented with an evolving workplace simulation where they encounter different learning pathways according to the choices they make. This illustrates the effective use of technology to promote experiential learning as advocated by Challis et al. (2005). In this way, students are actively engaged in determining their own complex and non-linear learning pathways.

The result is simulation activities that 'allow students to explore and rehearse, in supervised settings, the application of their growing professional understanding, knowledge and skills to workplace contexts'. (Lee 2007, p. 6)

Project Objectives

The major objectives for the Online Simulation project were:

- To provide undergraduate nursing students with practice-based learning opportunities through the presentation of simulated clinical decision making
- To promote student engagement through the development of practice relevant online content linked to student assessment
- To develop learning and teaching resources for diverse student groups
- To assist students to develop knowledge and skills relevant to culturally sensitive and clinically effective health care practice

Method

The Online Simulation project involved the further development of the Individualised Client Assessment (ICA) resource, originally developed for the Open University of Australia and integration of this resource into the undergraduate nursing curriculum. Therefore, the project had two distinct components: resource development and integration.

The ICA, a website concerned with client history and assessment, is divided into ten sections, each addressing a body system. The content in each body system has been developed a little differently to illustrate different approaches to online teaching and learning.

There are six main components of the ICA:
- Text-based prompts for client assessment
- Video clips of expert nurse interviews
- Video clips of patient history and assessment interviews
- Text, video and simulated documentation describing client scenarios
- Decision trees allowing students to select from multiple choice options
- Text and video presentation of client scenarios addressing cultural diversity

These components of the ICA are often integrated. For example, the transcultural respiratory assessment scenario follows the progress of a Muslim woman hospitalised for asthma. According to the treatment and assessment options selected by the student, the progress of the Muslim patient varies, as both cultural and physiological factors influence her recovery.

Content related to the neurological system provides a different approach where students are provided with prompts such as assessing client orientation to time, place and person. This is then complemented by video clip content, where an expert nurse describes crucial areas for attention when conducting neurological assessment. In this section, students are provided with linear navigation options to ensure that essential preliminary content is not missed. Students then encounter a client scenario where they need to distinguish between alcohol intoxication and head injury. They are provided with assessment data in the form of simulated medical records and video clips of the client being interviewed by a nurse. Students then make decisions based on their assessment and progress down a learning pathway according to the decisions they make. If incorrect decisions are made, students encounter video content illustrating the client's deteriorating condition and have to make even more serious clinical decisions. This allows students to learn about clinical errors in an environment that mirrors the workplace situation, where errors of serious consequence can occur and is particularly valuable when the simulation allows the participant to "live" the situation without undue harm (Kindley, 2002, p3). For example, some types of pupil change are an indicator of major neurological deterioration and failure to detect and act on such changes can result in patient death. Consequently, this provides strong justification for the use of simulation based teaching activities addressing this and other areas of clinical practice where critical errors can occur.

Student engagement and assessment

While the description of the ICA provides an outline of what students will encounter when using the website, there are further strategies used to promote student engagement. First year students using the ICA were provided with initial navigation and orientation instructions, after which they then engaged in an assessment-linked learning activity. Each student was required to:
- Work through interactive learning resources, including decision trees
- Develop their own history and assessment form
- Conduct a client assessment using the form they have developed
- Write a critical reflective paper describing the strengths and weakness of their client assessment

Student use of the ICA resource was therefore linked to an experiential learning assessment activity that realistically mirrored what actually occurs in the workplace. This learning activity was further enhanced by having students develop their own assessment form and also, reflect upon the processes carried out.

While this assessment linked learning activity provided an effective way to integrate the ICA resource within the first year undergraduate curriculum, the integration process was not straightforward. When teaching staff suggested the ICA resource was too advanced for first year level, this lead to the development of separate first and second year versions of the resource. The evaluation discussed in this paper relates to the first year version of the ICA resource.

Evaluation process

Evaluation of the Online Simulation project was conducted using a modified version of the scenario-based learning evaluation framework described by Agostinho et al. (2005) based on the work of Bain (1999) and Phillips et al. (2000). The framework investigates student perceptions of scenario-based learning and the specific learning design, student perceptions of the learning experience, effectiveness of online delivery, the extent to which learning outcomes were achieved and the scope for improvements. To obtain this information, Agostinho et al. (2005) utilised a range of data collection methods, including student interviews, questionnaires, email, chat, discussion transcripts, student artefacts and externally conducted teacher evaluation.

The evaluation of the Online Simulation project modified some of these data collection approaches to include the use of:

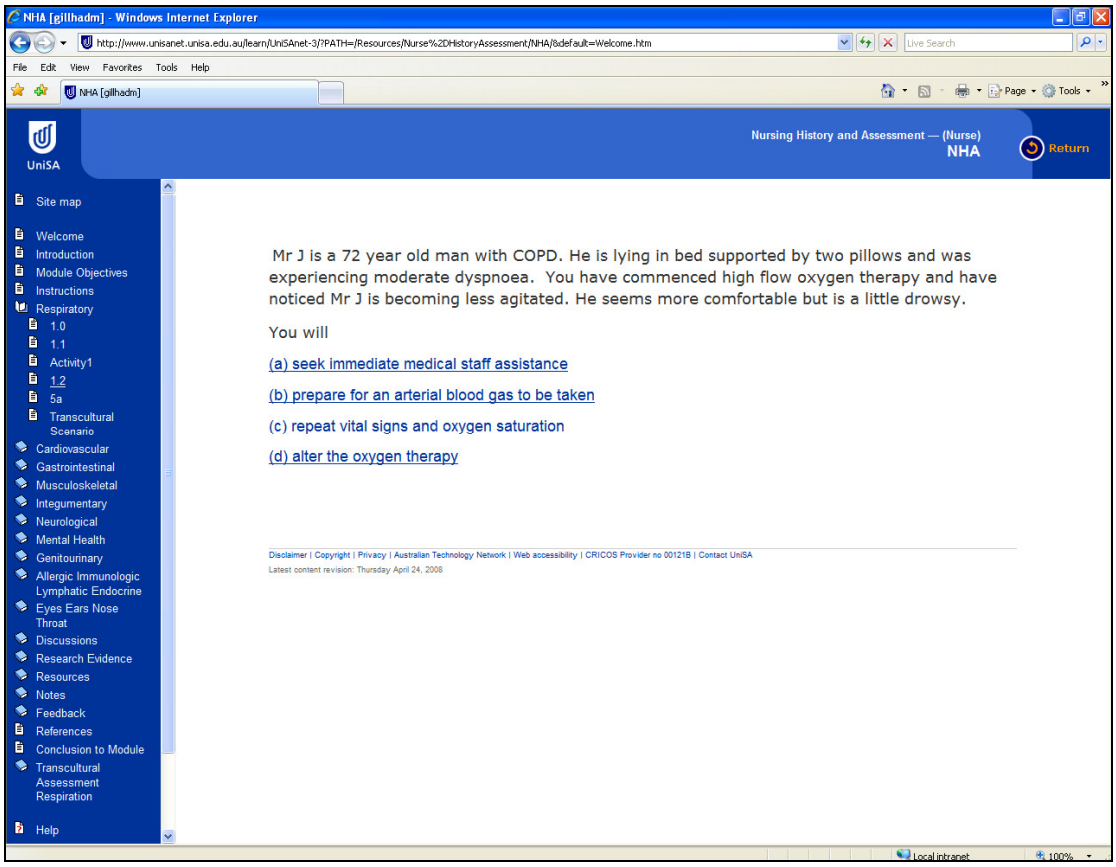
- An online student evaluation questionnaire
- Online discussion transcripts
- Student focus group feedback

The student evaluation questionnaire included the use of the UniSA Course Evaluation Instrument (CEI). This anonymous online questionnaire was used to collect overall evaluation data for the first year nursing course in which the ICA was embedded. A single open-ended question related to the ICA was included in the questionnaire. In addition, a class of external students participated in an online discussion activity which prompted comments about the use of the ICA resource. Finally, further evaluation data was collected in the form of focus group feedback.

Results

Results: Development of the resource

The ICA resource was first developed by Gillham et al. (2008) to provide students with instruction and information in the form of text prompts and video covering the assessment of ten body systems. Features of the ICA include the presentation of client scenarios using video and text. Students are required to make decisions on client assessment and treatment and according to their decisions, move down complex learning pathways as the client's condition evolves. The following screen shot illustrates a scenario-based clinical decision making point within the ICA resource.



ICA screenshot

A recent addition to the ICA has been the inclusion of a transcultural respiratory scenario. This scenario combines content related to respiratory assessment and cross cultural communication. This provides contextual representation of issues related to cultural diversity and illustrates the way in which good communication practices across cultures can contribute to improvements in physical and emotional well being.
The transcultural respiratory scenario includes text illustrating the thoughts of a Muslim patient as she receives instructions for discharge from hospital. This is used to illustrate the ease with which medical instructions may be misunderstood and the way in which this content is understood and viewed from within a different cultural context. The final section of this scenario consists of a follow up interview of the Muslim patient identifying positive and negative experiences during the simulated hospitalisation.
Further areas of particular interest within the ICA are the inclusion of hospital forms to simulate the paper-based information environment and the use of subtitles to illustrate the thoughts of an expert nurse as she conducts a client interview. In this case, several sentences of complex thought are described in the subtitles, even though the expert nurse is apparently only asking the client one or two simple questions.

A final additional component of the Online Simulation project has been the development of an online template to guide the production of tree-structured scenario-based content. This consists of a template for lecturing staff that includes introductory content to the guide video and text development presented in the format of an online shell, into which content can be loaded.

Results: Evaluation

Online student evaluation questionnaire

Feedback was obtained from the UniSA, Course Evaluation Instrument (an online student evaluation questionnaire). This questionnaire was made available to a total of 380 students, with 120 completing the questionnaire and therefore, a response rate of 31.5%. Of the 120 students who completed the questionnaire, 67 responded to the open-ended question related to the ICA. Evaluation results were quite varied but strongly positive overall. Students were asked the following: "Please comment on the nursing history and assessment website that was linked to your assignment 3 activity."

There were numerous very positive comments such as:

- *Extremely interesting and useful. It will be something I will continue to refer back to*
- *Good website and will no doubt be a valuable tool for me for a long time....*
- *Thought this was a fabulous site with a lot of relevant information*
- *It was good and interesting*
- *I thought it was great! It provided so much relevant information*

Some students had difficulty accessing videos:

- *This is quite a good website, although I had some trouble watching the videos*
- *I thought it was really well set out, but I had trouble with video links*
- *Great source of reference, bit slow to upload on my computer at home, which made it a little frustrating*

Some students did not use the website at all:

- *Did not look at it, did not have time*

Other students questioned the method of integration and level of the content:

- *Overwhelming! We were told that no physical assessment was required for Assessment 3, however the website was very detailed and seemed to be way more than what was required*

- *While I thought it was an excellent website, I felt it was almost another whole subject in its self. Many of the links took one to very extensive websites and I found it very time consuming, as well as keeping up with the lectures and other weekly work load. Again, for me I do not have good internet access, so I had to spend a lot more time coming into the campus to try and use a computer here*

- *Fairly interesting, found the videos a bit boring to watch one after another sort of thing, because it took so long, but it wasn't too bad. Could maybe be worked in to the course a bit more though because it was a big lot of information that was only for assignment 3 right at the end of the course. It maybe could be pretty useful in other parts of the course??*

Online discussion transcripts

External class discussion comments posted to the online discussion generally provided detailed positive feedback.

Students emphasised the way in which the ICA appealed to their learning style:

> *It is good to hear from a nurse. This personalises the information for me. I go intellectually floppy when reading procedure after procedure, so observing body language and tone of voice is a memory trigger.*

> *I have found the website very valuable like [student name] in the fact that it is great to hear the information and see someone, rather than just reading text after text. I have found this 10 times better and really helpful when it comes to my understanding and the way I learn. I need written, visual and hands on! I am also finding it really helpful in starting to develop my questions for Assignment 3.*
>
> *After looking at the link and watching the videos, I realise that many of the important aspects regarding respiratory assessment are visual, such as observing posture and examining sputum. In my 'before', I had made no mention of auditory clues such as wheezing or gasping or the type of cough a patient may be presenting and had not considered cool extremities due to poor circulation.*

Other students, while finding the ICA useful, also highlighted the need for more explanation of terms used within the ICA:

> *I found the website very useful in stating many ailments I hadn't heard of or didn't relate to respiratory or cardiac disorders before. It reminded me how important it is to keep looking, listening and observing the client whilst asking questions at the same time. Many of the terms referred to didn't make sense to me so I need to look up their meanings. I thought it might be useful to be able to click on each symptom, diagnostic test etc. for an immediate explanation.*

Student focus group feedback

A small group of 5 first year students attended the focus group. Two points were identified as areas for improvement:

- Video access was difficult from some home computers: it was suggested that a DVD should be provided
- The terminology required more explanation

The following key points were also identified:

- Text content was straightforward, with multiple choice questions and helpful answers
- The video of the registered nurse was of good quality and easy to understand
- The inclusion of everyday hospital language was valuable
- The video and multiple choice combination was very effective
- Cross-cultural content providing the patient perspective was valuable
- The content was easy to remember, as it provides the health care context
- Examples of poor practice were identified as valuable learning exercises
- Students regarded the video as a realistic alternative to conventional procedural videos
- Students indicated that the ICA was an extensive resource well worth working through
- The use of subtitles to illustrate expert and/or patient thinking was unanimously identified as an excellent feature

Discussion

The online simulation project has explored the use of online simulation for the teaching of nursing history and assessment. The ICA resource illustrates workplace simulation by integrating scenario-based learning into complex decision trees able to mirror the workplace

setting. This approach has been particularly effective for highlighting the effect of clinical errors in a safe and non-threatening learning environment. Students using the ICA have reported very favourably on the realistic nature of the workplace simulation and the combination of interactive video and multiple choice questions. However, students have also suggested more explanation of terminology and the provision of DVD access in addition to web access for the ICA resource. It is clear that despite the use of streaming servers to improve video access, many students had difficulty with access. While strategies to promote student engagement used within the project have been relatively successful, there is scope for improvement in this area. Some students were overwhelmed by the quantity and depth of content. The ICA is a large learning resource and therefore, it may be beneficial to consider restructuring the ICA into a number of smaller learning objects, each addressing a specific body system. However, the best approach will be to allow teaching staff using the ICA to decide whether to continue the current method of integration or move to a smaller learning object structure.

Limitations

The collection of varied evaluation data has provided a comprehensive view of the Online Simulation project. This evaluation was carried out as a part of normal teaching evaluation. This illustrates the way in which information routinely collected while teaching online can be used to enhance the depth of evaluation feedback.

It should be noted that while the approach of Agostinho et al. (2005) informed the evaluation process, practical issues such as time and resource constraints limited this to routine teaching evaluation. Therefore, the reported evaluation comments can only be considered as student and staff opinion about the ICA resource, often potentially influenced by the presence of developers and low response rates.

However, the overwhelmingly positive feedback suggests that the Online Simulation approach should be extended, both through further development of the ICA and also by creating new resources. Furthermore, well designed, formal evaluation that extends beyond routine teaching evaluation should be carried out to accurately assess the value of the ICA.

While the ICA has been successfully integrated into the undergraduate curriculum, there is considerable scope to improve this resource, by including more detailed content addressing all body systems and increasing the emphasis on psychosocial aspects of assessment. The inclusion of video content of interviews of a range of clinical specialists would also improve the ICA resource.

Conclusion

The ICA is an innovative and engaging learning resource for the teaching of nursing history and assessment. The approach used in the Online Simulation project can be easily expanded across the health sciences, adding the capacity for interdisciplinary learning, as students from different disciplines use online discussion for collective, collaborative problem solving. In addition, the Online Simulation approach could also be used to simulate workplaces and disciplines beyond the health sciences.

The Online Simulation project has developed an effective and interactive simulation of the health care workplace. The ICA has been successfully integrated into undergraduate nursing courses and received positive student evaluation. While the Online Simulation project has

demonstrated the use of innovations such as decision trees combined with video and the use of subtitles to illustrate complex thought, much more could be done to further develop these areas. There is considerable scope to improve the ICA resource itself and also to apply the Online Simulation framework to online teaching and learning generally.

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