

Comparing Student Attitudes to Different Models of the Same Virtual Patient

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Abstract

Aims: Two types of virtual patient designs can be distinguished – a ‘narrative’ structure and a ‘problem-solving’ structure (1). This study assesses attitudes of students with respect to learning communication skills via a virtual patient; and compares acceptability of the two different types of virtual patient designs. **Methods:** Two virtual patients were constructed around the same case, each emphasising a narrative or problem-solving model. Undergraduate medical students used the simulations as part of a communication skills program. A computer-based survey was used to assess attitude. **Results:** There was general acceptance of the use of the computer-based simulated patient. Students who generally performed better at communication skills, were more positive towards the virtual patient. There was no quantitative difference in acceptability between the two designs, but there were clear qualitative differences. **Conclusions:** While students were moderately positive about both simulations, qualitative data indicated that there were clear differences in attitude between the two different designs.

Keywords:

CAL, simulation, communication skills, virtual patient.

Introduction

Virtual patients – where the student role-plays a doctor with a computer-based simulated patient – are an increasingly common tool across a variety of clinical disciplines. They range from the simple web-based to expensive resource-intensive productions, but there are also differences in their fundamental structure. Two major designs have been distinguished previously by the authors (1). These are the ‘problem-solving’ and the ‘narrative’ approach.

The problem-solving approach is found in virtual patient designs concerned with teaching clinical reasoning and diagnosis. Generally the student has to collect a range of uncued information – usually from menus of possible history questions, lab tests and physical examinations – and make decisions based on their findings. A well-known example of this type of design is *DxR*, which exercises

students’ diagnostic reasoning skills (2;3). Another web-based example is *The Interactive Patient* (4). Often the problem-solving design is very cost-effective, as templates are easy to build and maintain, which greatly reduces the cost of creating multiple virtual patients.

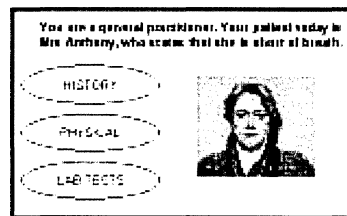


Figure 1 – Example screen: problem-solving design

On the other hand, the narrative approach is often found in virtual patient encounters that are concerned with cause and effect. This includes programs that have an emphasis on decision making, resulting in various outcomes over time. Creating a decision tree can be very time-consuming (5), and in general, ‘narrative’ designs are more expensive to produce because the narrative has to be individually crafted rather than relying on a template.

An example of narrative design is *The Virtual Practicum*, which traces the progression of a woman with HIV over five years through a series of virtual consultations (6). Several web-based examples of a narrative design can be found at www.trauma.org (7). It should be noted that narrative and problem-solving approaches to CAL can be used in tandem (for example McGee et al (8)) but implementations frequently follow one design or the other.

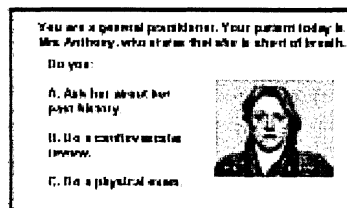


Figure 2 – Example screen: narrative design

In general use of narrative is considered a method of integrating the sense of the human and the affective into medical education (6;9). It can therefore be hypothesised that a narrative approach to the virtual patient will provide an increased sense of value of the patient as a person, with an accompanying affective dimension.

The domain of interest of this particular study is communication skills, a topic where psychosocial and affective dimensions are extremely important, and a narrative approach should provide real benefits. Clinical communication skills have been taught successfully via CAI on a number of occasions. (10;11), and using a virtual patient on at least one occasion (12).

There is empirical evidence for the value of using narrative virtual patients to teach communication skills. A parallel investigation to this study compared students' communication skills after using narrative and problem-solving versions of the same virtual patient, and concluded that the narrative simulations can improve communication skills more than problem-solving simulations (1). In this paper, the same virtual patient will be examined, but in terms of student attitudes. The aim is to elicit an understanding of the relative acceptability of the different virtual patient programs. Do students view the narrative and problem-solving simulations in different ways?

Methods

Development

The virtual patient was designed to be incorporated into an hour's tutorial as part of an overall clinical and communication skills program for third year pre-clinical students at Monash University. Two virtual patients to teach communication skills were created, both based on the same case but using the two different design approaches. The case chosen was that of Mrs Cohen, an aggressive cynical patient who presents with pains in the chest. These pains are a recurrence of a condition that was investigated fully a year ago but which disappeared after a long holiday.

The narrative design emphasises the temporal experience of the interview. A student using this package selects from three or four options which advance the interview. The virtual patient responds through a video representation. If students make irrelevant, insensitive or repetitious choices then the path through the simulation results in a clearly unhappy patient. If a student makes patient-centred choices that allow the patient to express her views, then the consultation will be successful.

The second design emphasises the problem-solving aspects of the interview. A student using this package is given the initial scenario and then a range of history questions to be asked in any order. These map to the system review questions learnt by students in previous years and are presented alphabetically: cardiovascular, drug history, family history, gastrointestinal, genitourinary, neurological,

past medical history, physical examination, respiratory, social history. After selecting a question – such as 'Do you have any pain in your chest Mrs Cohen?', sub-questions appear. The questions are generic, while the sub-questions relate to the specific history at hand. Students doing this program have to select suitable lines of questioning. Students are then asked to make a preliminary diagnosis before proceeding to a short management section. As with the narrative design, if the students make irrelevant, insensitive or repetitious choices, Mrs Cohen's responses are clearly negative, although in this case, her responses are independent of previous interactions.

In other respects the virtual patients are as similar as possible. Using a model of reflection-in-action (13), both tutorials have equal emphases on reflective thinking, interaction and feedback. In both designs, students reflect on the establishment of rapport in the consultation and how they could have conducted such an interview better. They also receive a question-by-question analysis of their choices.

Student Allocation

The study was conducted over 1998 and 1999. Within a small tutorial group, set in a computer laboratory with headphones, each student was randomly assigned to use a different program. All students were given the opportunity to do the other version of the simulation. The students were not aware of the difference between the two types of tutorials or of the hypothesis under investigation.

Table 1 – Summary of the Instrument Measuring Student Attitudes to the Simulation

- | |
|---|
| <ol style="list-style-type: none"> 1. Doing the simulation improved my understanding of communication skills. 2. I found the simulation difficult to use. 3. I enjoyed the simulation. 4. The choices created by the simulation were restrictive. 5. The computer is an inappropriate medium for learning communication skills. 6. I would use a similar sort of simulation again. 7. The simulation improved my ability to communicate. 8. The simulation didn't provide me with enough information. 9. The simulation improved my ability to take a patient history. 10. I found the simulation situation believable. |
|---|

A ten-item survey was used to assess student attitudes' to the simulation. Similar surveys had been used extensively by the authors in previous evaluations of health-related educational technology (14;15).

The survey is summarised in Table 1. Responses corresponded to a Likert scale of: 'Strongly agree' (1) 'Agree' (2) 'Neither agree or disagree' (3) 'Disagree' (4)

'Strongly disagree' (5). Students were also provided with a 'No comment' option. If the students did not select any of the options the computer recorded the option 'No response', and the survey was marked as incomplete. Ratings for positive items were reversed so that a high score indicated a positive attitude towards the simulation. The sum of the items was used to form an overall score. Under each item of the survey the students were free to write in their own comments. The survey itself was attached to the end of the simulation in computer format.

Statistical Methods

Calculations were performed using SPSS software. Both independent T-test and the Mann Whitney U test were used to assess differences between groups. Reliability analysis used Cronbach's alpha. *P* values of less than 0.05 were reported as statistically significant.

Qualitative Methods

Inductive analysis was used, allowing patterns, themes and categories of analysis to emerge empirically from the data as described by Patton (16).

The Quantitative Evaluation

Quantitative Results

Descriptive Statistics

There were computer logs for 276 separate uses of the simulation, although a number of files were randomly lost due to technical error. 97% of those using the simulation for the first time filled out surveys. (209 students; 106 using narrative and 103 using the problem-solving simulation). Although students repeated the simulations and filled out additional surveys, this data has not been included as opinions of those students who completed the simulation more than once would skew the data.

Overall the average attitude rating for all students was moderately positive: 33.3 out of a possible 50 (10 highly negative, 30 neutral, 50 very positive). Cronbach's alpha of .80 indicates an acceptable degree of inter-item reliability.

Inferential Statistics

Independent variables that might have influenced the attitudes of students were: design of simulation (problem-solving vs narrative); gender; year of study; and class ranking as measured by performance in a communication skills role-play. There was also a significant difference in attitudes between the top 50% and bottom 50% of the class. If a normal difference is assumed, there was a significant difference in attitudes between those students who used the simulation in 1998 and those who used it in 1999 (Table 3).

Table 3 - Comparing Design, Gender, Year and Rank

		N	Mean	SD	T-test	Mann-Whitney
Virtual patient design	Narrative	85	33.7	5.2	Not sig	Not sig
	Problem-solving	82	32.7	5.2		
Gender	Male	63	34.0	5.3	Not sig	Not sig
	Female	104	32.8	5.1		
Year	1998	84	34.0	3.9	<i>p</i> = .027	Not sig
	1999	83	32.4	6.2		
Rank	Top 50%	80	34.6	4.3	<i>p</i> = .001	<i>p</i> = .010
	Bottom 50%	81	31.9	5.7		

Discussion of Quantitative Results

In general, there was a moderately positive attitude towards the virtual patient. Most students found it enjoyable, believable and would be likely to use it again. They felt that using the simulation improved their understanding of communication skills. On the negative, they found the choices available were restrictive. It is interesting that the students themselves did not distinguish in their attitudes between the two types of simulations. Or if there is a difference in acceptability, it has a small effect size. This was in contrast to the measured improvement in communication skills reported in the parallel study (1). Likewise, gender does not play a strong role in determining attitude, or its effect size is again, small. The cross-year comparison, significant if a normal distribution is assumed, raises the interesting question: can differing year-to-year teaching contexts affect student attitudes to a particular program?

It was not surprising that students who do well in one communication skills exercise are going to be more positive towards another. However, this result does indicate some fidelity with the 'reality' of the virtual patient. That is, if students who do well face-to-face are more likely to be positive about a virtual experience, then it seems reasonable to assume that there are strong similarities between the two teaching exercises.

The survey displays an acceptable degree of inter-item reliability, and the general form has been previously used on a number of occasions (14;15). Of course, there may be some gap between what the survey measures and the attitudes of the students to the resource at hand. Another threat to the validity of the study is the impact of losing survey results. While this within a session this was virtually at random, it did occur in the first three weeks of the study, so the results are skewed against those students.

The Qualitative Evaluation

Students were invited to comment on each of the survey questions as well as being invited to leave any further comments. Many students responded, writing complimentary and critical comments, both specific to the question and adding general opinions. On average 88

responses (37% of students) were recorded per question. What is presented here is a summary of the most popular themes.

Mostly students perceived the computer medium as 'useful' and 'fun'. However, they were very concerned that computers not replace real patient contact, and only be used as an adjunct to other methods. Some students felt it was not a valuable medium as learning communication skills was something that was 'human.'

A large majority of students felt they had learnt or improved their skills through using the simulation. Typical positive comments were: *I learnt to deal with a difficult patient; I learnt a patient-centred approach; I learnt from the feedback given by the program; I improved my understanding of rapport.* More neutral comments included: *the simulation provided me with experience; the simulation didn't necessarily improve communication skills but it was a useful exercise.* Not all students were positive. There was a significant minority of negative responses. Typical comments were: *the program was limited; no new information or skills were introduced; a 'once-off' has learning limitations; I need to try with real patient.*

There were different emphases between the responses to the two different virtual patient designs. Indeed, relatively more of those who had used the narrative program commented on learning about a patient-centred approach, rapport, listening to the patient and the structure of the interview. As one student wrote: '[The narrative simulation] helped me understand the patient as a whole – their feelings, attitudes and needs.'

On the other hand, relatively more of those students who had used the problem-solving program commented on learning about use of language and appropriate questioning. As another student commented: '[I learnt] that sometimes asking a whole systems review is not necessary and can thus antagonise a patient.'

In general, the students found the simulations easy to use and enjoyable but restrictive. The overall qualitative assessment of both programs was that the virtual patients were easy to use, but there were frustrating limitations, and the students felt unable to express themselves. Typical positive comments were: *I found the simulation easy to use; general choices were good/available; good to have visuals of the patients' response and to hear the patient's voice; the simulation was real/realistic/believable; it was interesting to deal with a difficult patient; the simulation was fun; the simulation was useful.* Positive comments from those who used the narrative simulation emphasised reflection on process, while responses from those who used the problem-solving design stressed the lack of time constraints within the consultation.

However, many students also felt restricted by the program. Typical negative comments were: *I felt limited by the questions/options; the simulation limited self-expression.* Students who used the narrative simulation emphasised: *I was unable to go backwards within the simulation;*

answering a few questions determined the whole path of the interview; some options contained things that I wanted to say but also things that I didn't want to say. Students who used the problem-solving simulation emphasised: *the simulation takes getting used to; the simulation is artificial; there was no sense of flow; the simulation required introductory questions; there was inappropriate wording of desired content; I couldn't explain/reassure patient with sensitivity, through 'filler' comments or facilitation.*

In general, students pinpointed very different difficulties with the two different versions. Concerns relating the narrative simulation tended to be related to getting 'forced' down a path through choice of unwanted options. On the other hand, within the problem-solving simulation, students identified issues of inappropriate phrasing and a disjointed or artificial sense of the interview, which was partially attributed to lack of introductory or facilitating statements.

Findings

The quantitative measures showed that there was a positive attitude towards the virtual patient. Most students found the simulation enjoyable, believable and would be likely to use it again; they also indicated that using the simulation improved their understanding of communication skills. On the negative, they found the choices available were restrictive. However, students who performed better in a similar face-to-face role-play were more likely to be positive about the simulation.

One of the common problems, identified both quantitatively and qualitatively was that student encountered was the limitations the simulation placed on their dealings with the patient. They felt a lack of self-expression very strongly. Liaw et al's (12) formative evaluation of a virtual patient used for communication skills, also noted this sense of limitation. This may be an inherent problem with the medium. Additionally, student responses indicate that the sense of limitation may have been exacerbated in the *Heart of the Problem* by the nature of the case – a difficult aggressive patient. In general Mrs Cohen's situation and personality, appeared to have a sizeable impact on the learning experience. It seems fair to say that various people related to the content, design and medium of the simulations in particular and personal ways.

With respect to the use of the computer, students were very anxious to ensure that they had experience of the 'real'. Simulations were given the role of an adjunct. However students described two major advantages of the computer-based simulation as the opportunity for specific feedback and lack of pressure or time constraints.

The students assessed both versions of the simulation as being equally acceptable. The qualitative assessment, however, indicates clear differences in attitude and experience, without indicating any particular preference. These results may be explained in several ways. Firstly, the medium, pedagogic design principles and case-content may

have influenced student attitudes far more than the simulation design. Secondly, students may have perceived different but equal advantages to both simulations. Thirdly, there could be a natural variation in students' learning preferences, so that within a population, equal preferences for one simulation or the other will be present. Overall there was a general feeling that the problem-solving simulation mapped well to the structured form of history-taking learnt previously, while this was not the case with the narrative simulation.

Conclusions

The majority of students were positive, although not wildly enthusiastic, towards the simulations. This result echoes Liaw et al's evaluation study (12) and may well represent the balance between the limitations and the advantages of using virtual patients to teach communication skills.

Although general levels of acceptability were the same for both simulations as measured quantitatively, analysis of comments indicates qualitative differences in the benefits and limitations of the different versions. Students do view the simulation in different ways, although this does not result in a strong preference for either simulation. Of particular interest is the different emphasis on the type of learning experiences. Analysis of student responses suggested that the narrative simulation was more encouraging of a reflective process and a patient-centred approach; while the problem-solving simulation was perceived as providing benefits with respect to use of appropriate language. It should be noted that these advantages were not exclusive to either simulation. It can be argued that appropriate use of language is secondary to an overall patient-centred approach and that the narrative simulation may encourage a more holistic view of the consultation, relative to the problem-solving simulation.

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