Imperial College London

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Game-based Learning for Virtual Patients in Second Life

Medical education faces difficult challenges in the 21st century. Increasing pressure upon doctors to deliver service targets, the European Working Time Directive and changes in the way in which we deliver healthcare, coupled with higher numbers of students entering medical education, have increased the demands on academics, resulting in less time for teaching (Olson LG et al. 2005).

Opportunities for building learning activities around real patients have decreased. Therefore, various forms of representative simulation have become an increasingly common alternative. Virtual patients has been one of the representative simulations developed to support the delivery of clinical teaching (Begg et al. 2005).

Game-based learning has been considered as a new way of delivering clinical teaching more suited to the new generation of 'digital natives' – 'native speakers' of the digital language of computers, video games, mobile phones, and the Internet (Prensky 2006).

Online Multi-User Virtual Environments (MUVE) offer rich interactive 3D collaborative spaces where users can meet and interact. One example of such an environment is Second Life (http://www.secondlife.com).

The Faculty of Medicine at Imperial College London has developed a Virtual Hospital in Second Life, that aims to design game-based learning activities for the delivery of virtual patients that can drive experiential, diagnostic, and role-play learning activities supporting patients' diagnosis, investigation and treatment.

Imperial College London – Second Life

The four-dimensional framework described by De Freitas and Martin (2006), plus the learning types described by Helmer (2007), as well as the different aspects of emergent narrative described by Murray (1997) have provided the basis for the design of these game-based learning activities for virtual patients under two different categories: context and learner specification, and narrative and modes of representation.

The MedBiquitous Virtual Patient (MVP) standard has been used to define a reusable architectural model for the delivery of virtual patients.

PHASE I

Phase I of this project focused on the delivery of one virtual patient in the area of Respiratory Medicine following the game-based learning model developed and implemented in Second Life.

The game-based learning activities for one virtual patient focused upon the management of pneumothorax. The module was also available as part of a respiratory emergencies e-module embedded in the year three medical undergraduate curriculum. Initial data about gaming competence was obtained from 118 full-time undergraduate medical students of average age (22 years).

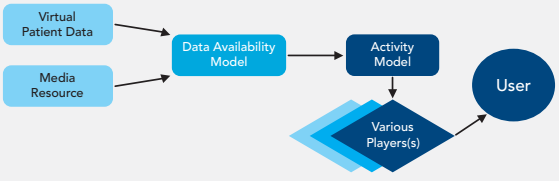
A stratified sample (n=42) was selected according to gender and high and low gamer categories. One group (n=23) was given access to the game-based learning activities in Second Life and the second group (n=19) was given access to the same content but delivered as an interactive e-module.

After use of the modules, students in both groups completed a questionnaire which involved 21 statements related to affective components, perceived control, perceived usefulness and behavioural components which they scored on a five point Likert Scale.

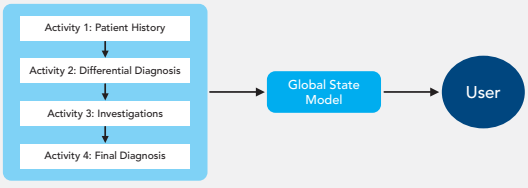
The feedback received has informed the development of Phase II which incorporates a multi-patient approach.

During this phase an architectural model was developed based on MedBiquitous Virtual Patient (MVP) standard.

MedBiquitous is a consortium focused on the development of XML standards for healthcare education and training. It has been developing a data standard for the exchange and reuse of virtual patients, which is defined as the MedBiquitous Virtual Patient (MVP) standard (Ellaway et al 2006).



Delivery structure for game-based learning activities in Second Life (figure adapted from Ellaway et al 2006, used with permission)



Activities developed for the delivery of virtual patients following a game-based learning approach referenced through a single global state model (figure adapted from Ellaway et al 2006, used with permission)

The structure outlined in Figure 2 is co-ordinated by a GSM and rendering mechanism. Figure 3 shows the different activities developed for the delivery of virtual patients following a game-based learning approach in Second Life, which are referenced through a single GSM.

PHASE II

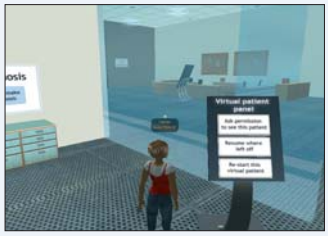
Phase II introduces a multi-patient approach. Five virtual patients suffering from different respiratory problems: Asthma, Lung Cancer, COPD, Pneumonia and Pneumothorax have been implemented. The same narrative and Activity Model is applied for all these patients including different modes of representation. The learner is asked to make decisions based on current information and acquires new information as a result of different decisions.

Virtual Patient in Second Life

More general feedback and guidance for cyclical content have been introduced in this phase. The Imperial College London badge has been introduced as an option for learners to wear. The badge provides feedback from the system. Feedback will be delivered to the learners if they have not carried out any activity for the last five minutes informing the students about the patient they last treated and the last activity carried out on that patient.

Imperial College London badge – Reception area

'Demanded feedback' for cyclical content have also been introduced by the patient's area. By selecting the 'Resume where left off' sign, learners receive feedback on where they were left last time they accessed the patient.



'Demanded feedback' – Resume where left off sign

More control over each activity has also been implemented. Signs titled 'Re-start this virtual patient', are available near the patients allowing the learner to reset the virtual patient activity in case they want to start all over again.

A web world environment has been implemented consisting of a three-tier architecture based on J2EE's Model View Controller (MVC) design

'Demanded feedback' – Resume where left off sign

pattern - tier 1: web-server; tier 2: application server; and tier 3: database. This model accommodates the delivery of a one-to-many relationship between the user/student and several virtual patients.

A user friendly web interface provides access to the tracking information stored in the database. A variety of reports can be easily produced by user or virtual patient selected.

METHODS

This investigation involved 42 undergraduate medical students (21 years old). The gender distribution of the respondents was 42.85% female (n = 18) and 57.14% male (n = 24).

One group (n = 23) was given access to the game-based learning activity for a virtual patient on respiratory medicine developed in Second Life following the framework described in this poster. The second group (n = 19) was given access to the same content, covering the same virtual patient but delivered as an interactive e-module. The survey 'My feelings when playing games', developed by Bonnanno and Kommers (2008), was applied. The survey comprises 21 statements. Six statements relate to the affective component, five are about perceived usefulness, six about perceived control and four about behavioural components. All statements describe behaviours while using games. The statements were adapted depending on the groups: 'My feelings when learning in Second Life' and 'My feelings when learning via e-modules'. Situations with positive feelings, as well as situations with negative feelings such as fear, lack of control, and hesitation have been addressed. A five-point Likert scale was used.

The scores for the separate statements were coded in Stata version 10, using reverse scoring for unfavourable statements. These findings will be highlighted in the poster.

RESULTS

There is no evidence of a difference in general attitude for second life (P=0.66) or the e-module (P=0.86) between gender.

There is some evidence of an association between gaming competence and gender for Second Life (P = 0.03), whereas there is no evidence of an association between gaming competence and gender for e-module (P = 1.00).

CONCLUSION

The survey 'attitude to learning in Second Life and via e-module' is a useful instrument from a pedagogical perspective because it addresses attitudinal components. The survey findings have helped to identify key elements that should be looked at more carefully during the design of game-based learning for virtual patients in Second Life.

General findings have driven the implementation of a series of changes in the original design, aiming to support learners under the different categories identified in the survey (affective component, perceived control, perceived usefulness and behavioural component).

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