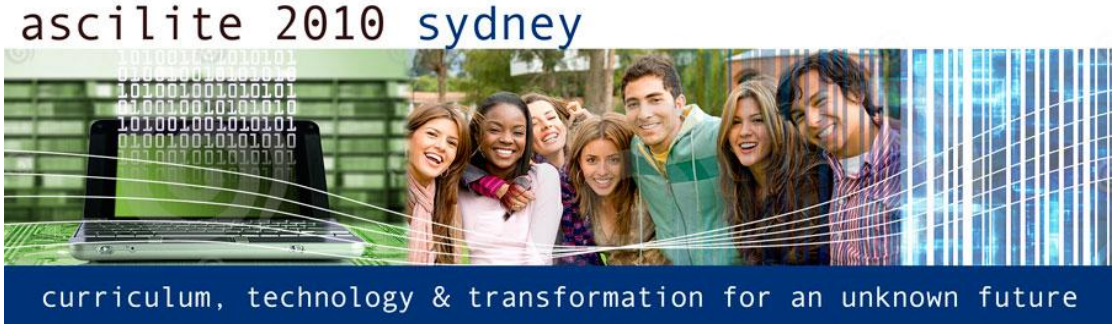

Otago Virtual Hospital: medical students learning to notice clinically salient features

Phil Blyth, Swee-Kin Loke & Judith Swan
University of Otago

Part of learning to become a doctor involves learning to read or notice the world as a medical professional. Such identity formation can take place by participating in social practices within virtual worlds. In this paper, we report early findings from a case study of seven medical students performing the role of junior doctors in the Otago Virtual Hospital (OVH), focussing on the degree to which they noticed and recorded the salient features in a clinical case. Using video recordings of in-world activity, submitted patient notes, and audio recordings of pre- and post-interviews, we provide early evidence that solving an open-ended case in OVH has the potential to require students to notice, record, and integrate significant elements of the case by themselves. One of the aims of our descriptive study is to isolate variables that can eventually be used to study the nature of learning in virtual worlds with greater precision.

Keywords: virtual worlds, identity development, medical education, salience

Introduction

The Otago Medical School modified its curriculum in 1997 in a bid to address the overemphasis on factual content and the inadequate preparation of students in terms of professional attitudes and communication skills (Schwartz, Loten, & Miller, 1999). Professional attitudes and identities are intricately tied together, and Reid, Dahlgren, Petocz, and Dahlgren (2008) recommend that helping students construct their own professional identity is a promising way to prepare them for the workplace. Gee (2007) contends that a measure of identity development is the extent to which one reads the world as a member of a particular community: in this study, how a medical student foregrounds and backgrounds particular aspects of a patient presentation in order to participate meaningfully as a member of the "interpretive communities" (Fish, 1980, p. 14) of medical professionals. Similarly, Rogoff (2003) affirms that changing one's way of "noticing" (p. 237) is a measure of one's cognitive development.

One part of recognising salient components of a patient presentation includes "alarm bells". Ali (2005) believes that "certain symptoms should make your ears prick up, your neck hairs bristle and your heart pound" (p. xiii). This specialist registrar goes on to suggest that students can learn to recognise these "alarm bells" from ward rounds and professional experience. Learning to recognise the less dramatic, but not necessarily less important, components of a patient presentation is also important to the medical professional. Cultural psychologist Bruner (1962) hypothesised that the development of "heuristics of inquiry (...) attitudes or methods that has to do with sensing the relevance of variables" (p. 93) is best supported through contextualised problem-solving. Gee (2007), Shaffer (2006), and Steinkuehler (2006)

argue that such problem-solving in the form of participation in social practices can take place fruitfully in computer games and simulations.

In this paper, we report our early findings from a case study of seven medical students performing the role of junior doctors in the Otago Virtual Hospital (OVH), seeking to gain insights on the degree to which the students noticed and recorded the salient features in a clinical case.

Description of OVH

The OVH is a virtual hospital in which medical students, playing the role of junior doctors/housemen, solve open-ended clinical cases. These cases are written by practitioners and drawn from real-life events. Reflecting the actual practices in a New Zealand emergency department (ED), students can use their avatars to: move around the hospital; communicate with patients and peers via text chat (e.g. to take patient's history); examine the patient (e.g. requiring interpretation of chest sounds); order laboratory and radiology tests from an extensive list; check the results of these tests (e.g. X-ray images); share documents with peers (e.g. ECG results); prescribe from a range of medicines readily available in New Zealand EDs; and write patient admission/discharge/handover notes. The OVH is built on the OpenSim-based New Zealand Virtual World Grid (http://www.nzvwg.org.nz).

Hew and Cheung (2010) reviewed 15 empirical studies on the educational uses of 3-D virtual worlds and mapped out these uses into communication spaces (e.g. foreign language students exchanging opinions), simulations of space (e.g. international students acclimatising to the real world university campus), and experiential spaces. The OVH is best classified under the latter category: students learn housemanship by practising housemanship via their avatars, acting on the virtual world and in turn undergoing the "return wave of consequences" (Dewey, 1916, p. 139) in the form of patient/peer responses.

Reviewing the uses of virtual worlds in medical education, Boulos, Hetherington, and Wheeler (2007) highlighted the examples of the HealthInfo Island (http://infoisland.org/) and the Virtual Neurological Education Centre. The former provides consumer health information services in Second Life and in the latter, avatars experience the symptoms of specific neurological disabilities so as to better understand these illnesses. Other medical examples include part-task clinical skills related simulations such as Heart Murmur Sim (http://bit.ly/iefAx). The OVH differs from these three examples in that it simulates the everyday patient-doctor and doctor-doctor interactions in an ED, starting from patient admission, examination, negotiation of treatment plan, to submission of patient notes. The OVH is similar to and was inspired by the University of Auckland virtual medical centre (Honey, Diener, Connor, Veltman, & Bodily, 2009), though it is unique in that the OVH patient exhibits a combination of human and automated responses. A human participant (e.g. tutor or classmate) manages the dialogue with the junior doctors, while the system takes care of the patient's physiology (e.g. blood pressure). The labour-intensiveness of tutor involvement is thus reduced as a non-expert can play the patient convincingly.

Methodology

A case study was conducted with seven medical students (three fourth-, three fifth-, and one sixth-year students) who worked on the same clinical case in three groups (Groups 1, 2, and 3) during three separate sessions (each lasting about 90 minutes). The clinical case involved a 76-year-old patient, Gertrude, whose neighbour had found to be increasingly forgetful (e.g. not collecting the newspapers) and generally unwell (e.g. feverish). The students took on the role of housemen and a member of faculty played the role of the patient. Upon ending the scenario, the students and tutors held a debrief session (e.g. to discuss decisions made and points highlighted) followed by a post-interview. Faculty level ethical approval was obtained.

Three sources of data were captured: video recordings of in-world activity during the task; patient notes submitted; and audio recordings of pre- and post-interviews. Data of students independently noticing salient elements in the clinical case were identified. The salient points (e.g. patient's dehydration) were determined by practitioners developing the case. "Trustworthiness" (Guba & Lincoln, 1989, p. 233) was maximised by: triangulating multiple sources of data (validity); carrying out three runs of the same scenario with three different groups (reliability); and maintaining both insider (authors 1 and 3 are members of

faculty) and outsider (author 2 is a researcher) viewpoints throughout the study (objectivity). Negative examples of students being 'given' the salient points of the case were actively sought.

Hew and Cheung (2010) identified 14 out of 15 descriptive studies in their review and hypothesised that the lack of variety in research methods is due to the current lack of understanding in the educational uses of virtual worlds. One of the aims of our descriptive study is to isolate variables that can eventually be used to study the nature of learning in virtual worlds with greater precision.

Findings and discussion

In this paper, we report our early findings from two video clips of in-world activity, the three patient notes that the groups submitted, and the pre- and post-interviews. The first video clip (3:19 min) involved Group 2 students noticing the importance of checking if the patient was allergic to any medications while prescribing drugs (http://bit.ly/aTcyVA). The second video clip (4:26 min) involved Group 3 students noticing the salience of ascertaining adequate social support at home *after* having discharged Gertrude (http://bit.ly/au7jWH). In their patient notes, Group 3 highlighted the need to further "explore social history", a point which Group 1 also documented after having admitted Gertrude for one night. A comparison of all three groups' patient notes also revealed that only Group 2 documented the patient as being dehydrated. The patient's drug allergies, social history, and dehydration were all crucial pieces of information for accurate diagnosis and handover in this clinical case.

The pre- and post-interviews further reinforced our finding that solving an open-ended case in OVH required students to obtain and notice significant elements among the flux of messages by themselves. The degree of interpretive freedom appears to be higher in OVH, notably when compared to the students' current learning experiences. For example, in a pre-interview, one student (Group 3) described a new unit in the medical curriculum in which students examined human but "ideal patients" with "really obvious signs that we can pick up" (e.g. heart murmurs). In a post interview, another student (Group 2) revealed the irony of framing paper cases by their titles (e.g. "Myocardial Infarction") such that the diagnosis was usually obvious. This sixth year student affirmed that the patient's history was always "given" in paper cases. Looking at Case 1 of a third year examination paper (University of Otago, 2009), we observe that the tutor had both given the patient's history and framed the case such that *every* given piece of information (e.g. "type 2 diabetes", "raised JVP", "no significant proteinuria") was salient to answering the questions. Students were hardly required to distinguish salient from non-salient elements in these paper cases, which might explain why another fifth year student (Group 3 pre-interview) identified the "experience in recognising the signs" as what stands between his current state and his becoming a doctor.

From our work involving another role-playing simulation, we reported how clinical problems were framed more tightly in paper cases compared to virtual ones (Loke et al, in press). We hypothesise that the static nature of paper requires all the necessary information to be laid out in advance; whereas interactive digital media require students to "*probe* the virtual world" (Johnson, 2005, p. 45) to gather information (both relevant and irrelevant) as the scenario evolves. The collection of irrelevant information, as occurs in real life, is enhanced by having a real human playing the patient role.

Herrington, Oliver, and Reeves (2003) suggested that requiring students to detect relevant from irrelevant information augments the authenticity of learning activities. It is noteworthy that all seven students verbally expressed that their virtual participation was "realistic", with several expressing that it was similar to their General Practice runs and that they felt like the actual housemen of the hospital.

Conclusion

In his presidential address at the American Surgical Association, Mulholland (1958) explained why participating in social practices is the best way to learn certain aspects of doctoring:

> In the present state of surgical knowledge, we cannot transplant charged tubes to a younger brain to make the process of learning easier or faster. Recorded history is available, but the most difficult parts of it must be relived by each new learner. (p. 305)

Such experiences can be relived meaningfully and safely in virtual worlds. Boulos, Hetherington, and Wheeler (2007) believe that a virtual world can be "an ideal simulation resource" (p. 240) where medical students can practise doctoring without risk of harm to patients or themselves. In this paper, we provide early evidence that performing the role of junior doctors in the OVH has the potential to require a higher degree of identifying and interpreting the salient features in a clinical case compared to current learning experiences. Such interpretive freedom constitutes a pre-requisite for students to learn to read the world as doctors. We will continue to invite more students to solve different cases in the OVH in the course of the year.

Nonetheless, it would be meaningless to seek the expansion of interpretive freedom for its own sake. We hypothesise that the nature and level of interpretive freedom in OVH resembles that in real-world hospitals and our future work will seek to investigate that claim.

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Author contact details:
Swee-Kin Loke
Higher Education Development Centre
University of Otago
Dunedin
New Zealand.
Email: swee.kin.loke@otago.ac.nz

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