

The effectiveness of different assessment techniques being used to measure the impact of haptic technologies on Dental undergraduate students' 3-D perceptions, motor and clinical skills.

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Background

The growth of IT in higher education (HE) has led to an expanse of technology enhanced learning (TEL) courses at university level, many of these using IT-based resources such as on-line Virtual Learning Environments (VLEs), computer simulations and video-conferencing (McGill and Hobbs, 2007). There is also a widening use of IT to aid in the assessment of students' learning in higher education although much of this is based on online multiple choice questions and focuses on summative assessment at the end of a particular course (Cox et al., 2008). However, although there is significant research into the benefits of formative assessment (Webb and Cox, 2007) much of this is with children in schools and there is relatively little evidence of the strengths and weaknesses of different formative and summative methods used in higher education. Formative assessment is essentially regarded as a qualitative exercise providing a feedback process to the learner, engaging the learner and teacher in acquiring a common understanding of what has been understood and helping the teacher to modify their teaching to take account of what has been learnt (Black and William, 1998). Using traditional methods, formative assessment in HE includes providing feedback to individual students during a clinical session amongst the students themselves and between tutor and student, challenging students with questions. The assessment research described in this paper is part of the hapTEL project (<http://www.haptel.kcl.ac.uk>), funded by the ESRC/EPSC's Teaching and Learning Research Programme's Technology Enhanced Learning Phase (see <http://www.tlrp.org/tel/>). When students are using haptic work-stations then they will also receive feedback from the system itself, not only through the tactile experience but through the on-screen images which show them how well they have achieved the clinical task. There is therefore a need to research assessment methods to determine how effective different assessment techniques are and how these compare with the traditional formative and summative assessments used in most Dental Undergraduate courses.

Research Questions

The hapTEL project has a range of research goals which relate to the technical, curriculum and evaluation strands, all of which contribute to the work of the project, however the specific focus of the TEL assessment work reported in this paper is to address the following research questions:
What are the strengths and weaknesses of psychological spatial reasoning and manipulation skills tests being used to measure the impact of TEL on students' skills and performance?
How do such tests compare with the traditional formative and summative assessments of students' clinical skills as applied to undergraduate dental students?

Methods

The focused study described in this paper involves 70 Year 2 (total =140) university undergraduate dental students who were tested for a range of 3-D perceptions and spatial reasoning skills at the end of their first university year (June 2009). These involved a series of spatial reasoning, attitude and gross and fine motor skills tests recommended by the British Psychological Society. This cohort of students did not subsequently use the project's haptics technologies but are being assessed (March, 2010) for their clinical skills following two terms of teaching in the clinical skills laboratory. In order to assess the strengths and weaknesses of these pre-tests which are also being used to assess the impact of TEL on the Year 1 students, we shall be comparing the Year 2 results with the traditional skills test results. This will enable us to determine the strengths and weaknesses of such tests to measure the impact of ICT haptic environments on students' learning.

In addition to the results described above, the following data is now being collected and compiled:

- A taxonomy of the traditional assessment methods and techniques used in the undergraduate dental curriculum;
- A record of the formative assessment techniques used by tutors in assessing the clinical skills learnt by the students;

Frame

The analytical framework is based on creating data sets of the pre-test results for each of the 70 students to compare with their clinical skills traditional assessment results. Correlation statistics will be used to identify and examine the interrelationships between the students' abilities as revealed by the spatial reasoning pre-tests and any changes as assessed through post clinical skills tests.

Research findings

The analysis of the pre and post-experience test results will show whether standard psychological tests can be used to predict subsequent clinical skills acquisition or whether such skills can be taught through traditional laboratory work. If the results show a positive correlation with the skills acquired by the students through their clinical laboratory work over the last 6 months, then this will verify that such spatial reasoning tests can be used to predict clinical skills acquisition. The results will provide evidence about the strengths and weaknesses of such measures for use with other TEL research studies.

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