

Whose assessment in a problem based learning medical program?

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This paper describes work in progress of an electronic assessment project at the University of Sydney. The Faculty of Medicine has developed an online format for the Modified Essay Question (MEQ) written assessments used in its problem based learning (PBL) medical program. The MEQ is used to assess a student's approach to a problem, particularly their reasoning skills and understanding of concepts. The goals of this project include assisting students perform optimally in the MEQ assessment, implementing improvements to the efficiency of written assessment administration and enhancing the quality of feedback to students. Four trials of the online MEQ have now been conducted. Faculty and student feedback on all four trials have been very positive. Students have reported that they have more time to plan and draft their answers and that the electronic format is more motivating than using the traditional paper assessment format. Faculty staff have reported that the online MEQ reduces the burden of marking student answers, while also improving the provision of student feedback. This project is attempting to meet the assessment challenges faced by a medical school with large student enrolment numbers by efficiently assessing the application of knowledge and clinical reasoning in a PBL context.

Keywords: online, assessment, medical education, problem based learning

Introduction

The University of Sydney Medical Program (USydMP) is a four year course with graduate entry. The medical program is problem based and designed to be student-centred in the sense that it is based on student participation in PBL tutorials. In the first 2 years, students in groups of eight or nine are presented with a virtual patient at the beginning of each week, and begin to analyse the patient's problem before they receive any other campus sessions (for example, lectures or practical classes). Patient problems are grouped into approximately seven week long blocks of study. The blocks of study are based on body systems (for example, respiratory, cardiovascular and gastrointestinal).

The two major written assessment instruments used in the USydMP are the Single Best Answer (SBA) question (a type of multiple choice question in which the student has to choose the best of four alternatives), and the MEQ in which the student has to write answers to a sequence of questions based on a patient's problem.

Students sit three formative written assessments prior to completing their first summative assessment towards the end of Stage 2 of the program. The SBA papers are computer marked, but until the recent development of the electronic Modified Essay Question (eMEQ) instrument, MEQ papers have used a traditional paper assessment format and have required marking by hand. When the graduate entry USydMP began about ten years ago with around 100 students, the marking load was considered by Faculty as not too much of a burden. However the current intake is approximately 300 students per year and this burden has become much more prominent.

Development of the eMEQ

The MEQ in medical education

The MEQ instrument has been used in a number of medical programs both nationally and internationally. The MEQ is particularly suitable in assessing students' response to a problem, particularly their reasoning skills and understanding of basic and clinical science concepts. It is a case-based approach to assessment and can be seen to be consistent with students' learning in a PBL program.

Each case in an MEQ paper requires students to proceed through a patient problem in a sequential manner much like a PBL tutorial. The items (or questions) of the MEQ address the clinical reasoning steps sequentially. The first items usually explore the diagnostic hypotheses, and mechanisms underlying the clinical presentation. As the clinical scenario evolves, items may focus more specifically on interpretation of investigations, and management issues. Understanding and knowledge of basic science mechanisms and concepts related to the clinical problem can be assessed at any point during the paper. Community and Doctor, Evidence Based Medicine and ethical issues can also be incorporated into the MEQ format. With the unfolding of the patient problem, new information will be presented that may provide students with the answer to an earlier question. In this way the MEQ can mimic clinical practice in the sense that it tries to represent a patient's problem developing over time, while requiring the student to use what is known at any one point to make appropriate decisions about diagnosis and treatment. For MEQ assessments students are not permitted to preview the outcome of the problem or to turn back to change previous answers. This feature requires that the student to comply with the rule that the MEQ is a "no look back and no look forward" assessment.

The eMEQ from the faculty's perspective

The eMEQ was developed with a number of goals clearly in mind.

Firstly with the large growth in enrolments since the beginning of the new millennium, the burden of marking assessments has grown significantly. It was hoped that an electronic format would make the marking process more efficient and absorb less time than the traditional paper format.

Secondly, the paper MEQ format requires extensive invigilation to ensure that students comply 'no look back and no look forward' rule. This requirement means that a typical summative assessment may necessitate having up to between seven and ten invigilators within an assessment venue to ensure student compliance. The eMEQ however electronically enforces the rule.

Thirdly, to ensure marking quality, the eMEQ was developed to allow for each student answer to be reviewed independently by a number of assessors and inter-marker reliability assessed. Additionally, individual marker's own mark-remark reliability can be calculated.

Fourthly, it was anticipated that the eMEQ format would improve markers' reading of answers through a combination of the minimisation of layout problems and the absence of the many instances of illegible handwriting that characterise paper answer formats.

Fifthly, statistical data on each question and case would be available to examination committees as a part of the assessment review process. The statistical information available would include the discriminator, percentage correct (the percentage of the number of students that submitted a correct response for this question/number of responses) and so on.

Trialling the eMEQ

Different perspectives on the eMEQ

Four trials of the eMEQ have been conducted involving approximately one hundred students and twenty Faculty staff and roll-out is planned for early 2007. Faculty and student feedback on all trials have been very positive. Although there is some concordance in elements that both Faculty members and students find positive about the eMEQ experience (for example, improvements to legibility of answers in the online format compared to the paper format) there are some interesting differences in perspective which prompt questions suggested by the title of this paper. These questions include:

- Is the eMEQ designed primarily for the benefit of Faculty assessors or to improve the assessment experiences of medical students?
- How can we apply the different perspectives of assessors and students to develop more effective assessment instruments in PBL medical programs?
- What theoretical directions for further research are suggested by the perspective of students in particular?

Faculty have reported that the eMEQ facilitates marking and student feedback processes and enables examiner feedback comments to be appended electronically to students' answers, in this way saving time. The following quotes from Faculty markers illustrate these positive features of their experience of the eMEQ:

- Much quicker than messing around with booklets and papers;
- Marking interface is pretty good;
- No handwriting reading problems (really brilliant!) and therefore I can keep a constant speed up in my marking;
- Much more convenient - I can work around my other commitments at hospital much more easily.

On the other hand students have reported that they have more time to plan and draft their answers and that the electronic format is more motivating than using the traditional paper assessment instrument. The following student comments exemplify the main elements of the student perspective:

- It's much easier to formulate answers and edit as you go along;
- Relaxed and fast;
- Great for people who can type quickly (and can think better/faster when they type);
- Techno-cool image like in those movies in the future where they all do school at home and stuff. That's cool!

It would appear from a student perspective using the eMEQ improves the quality of their assessment experience as well as providing a format for students to plan and write their responses. Students value the occasion to use a keyboard rather than a pen, to view online images (e.g. X rays and brain scans), rather than look at printed pictures, and to write their answers in an examination context that is perceived to be more fashionable and 'cool' than the traditional examination room with hundreds of tables.

Students may also value the opportunity to plan and edit their answers in such a way that allows them to demonstrate a more elaborate understanding of medical concepts than may be expressed in the more traditional paper format.

Research implications of the eMEQ

Although Faculty and student reports are both overwhelmingly positive, feedback on the eMEQ experience also suggests some very interesting research directions for the use of online assessments in a PBL context. Table 1 summarises student feedback on the trials of the eMEQ and indicates some possible directions for further research.

The capacity to plan answers was highly rated by many students involved in the four trials of the eMEQ. Being able to provide a planned response and to effectively apply basic and clinical science knowledge to patient problems are key competencies for students in the USydMP. If through the use of the eMEQ format these competencies are not only assessed but also supported, we will be doing a good job as teachers and assessors.

The motivating effect of doing an online assessment was not as frequently commented on (as other topics) in the collection of written student feedback. However during a number of briefing sessions with students, this topic was frequently raised in discussion as a major reason for doing this form of online assessment. A research direction suggested by this student feedback is to consider researching ways in which we can develop assessment instruments that build on the benefits of motivation and the investment of mental effort (Salomon, 1983, 1984).

Finally there were a number of themes raised by students which suggest that the eMEQ might have features which minimise the effects of extraneous aspects of the assessment task. These extraneous features and other distractions included minimising writer's cramp through the facility of typing (as opposed to hand-writing), and having a more comfortable venue for examinations. Pass et al. (2003) describe the work of Gerjets and Scheiter who have emphasised the role of minimising extraneous

cognitive load, while aiming to free up the learners' possibilities of germane or effective load. This suggests an interesting direction for our research as we prepare for roll-out of the eMEQ in November 2006.

Table 1: Summary of student feedback and possible directions for further research

Student feedback	Sample student comments	Possible research directions Research aimed at ...
Capacity to plan answers	It's much easier to formulate answers. The eMEQ [gives me] the ability to move text around and add extra sentences wherever I want	The development of assessment strategies that allow for more effective application of knowledge and planned responses to patient problems (Swanson et al., 2003).
Motivating	It's cool! I get nicely fired up by this exam.	The development of an assessment instrument that maximises the benefits of motivation and the investment of mental effort (Salomon, 1983, 1984).
Typing easier than writing by hand	I type faster. Typing is easier and quicker.	Minimising extraneous cognitive load and other distractions (Pass et al., 2003)
Clarity of images	MRIs and CTs are very clear.	The development of an assessment instrument which allows the freeing up germane cognitive load to respond more efficiently to a clinical problem (Pass et al., 2003).
Student comfort	There is no chance of writer's cramp. The computer room is a better environment to do the exam.	Minimising extraneous cognitive load and other distractions (Pass et al., 2003)

Conclusion

The eMEQ project has attempted to develop an assessment instrument that can mimic clinical practice in the sense that as data about a patient's problem emerges over time, students must apply what is known at any one point to make appropriate decisions about diagnosis and treatment. This project has led to a number of important findings in terms of different perspectives of assessors and students on the experience of using the instrument. The next phase of the project will attempt to explore some of the interesting theoretical and research directions suggested by feedback from students. We aim to apply the theoretical implications of the student's perspective (as well as the assessors' perspective) to develop a more effective assessment strategy that meets the requirements of a graduate PBL medical program.

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