Designing reusable online clinical reasoning templates: A preliminary evaluation

Helen Wozniak
Centre for Innovation in Professional Health Education and Research, Faculty of Medicine
University of Sydney

Mark Hancock
School of Physiotherapy, Faculty of Health Sciences
University of Sydney

Joanne Munn
School of Physiotherapy
University of Otago, New Zealand

Gosia Mendrela
Flexible Online Learning Team, Office of PVC Learning & Teaching
University of Sydney

As increasing resources are devoted to the production of online learning materials it is important that both the usability of such resources by educators and the educational usefulness of these resources for student learning are evaluated. Outcomes from such evaluations provide information that can be used to inform future development of online learning materials. This paper describes two clinical reasoning templates that were developed to enable easy incorporation of content materials by educators without specialist web design skills, and easy access to the materials by students with minimal software requirements. Preliminary evaluation data will be presented describing the usability of the templates by educators and students.

Keywords: online learning, health science education

Background

Whilst evaluation of learning in higher education is a well researched area, evaluation of online learning materials is only just emerging (Richardson, 2005; Hess et al, 2005). Effective implementation of online learning materials requires careful evaluation of both the student experience with the online learning materials and the usability of the templates by educators with little or no online educational design skills (Sheard & Markham, 2005). A common problem with the development of online learning materials is that their use is not sustainable over time requiring complex technical skills before the materials can be disseminated to different learning contexts. In addition there are frequently problems related to access and usability of the materials by students.

During 2005 two online clinical reasoning templates were developed as part of a USyd eLearning project (University of Sydney, 2005). The aim of the materials was to allow students to work though clinical information on their own, and model the clinical reasoning process undertaken by practicing clinicians to determine the patient's clinical problem. The templates needed to provide opportunities for students to follow their clinical reasoning processes and also where indicated, receive pre-designed feedback. The templates also needed to have components that can adapt to different disciplines, be easy to use, and create an interesting learning experience for students.

The templates

A team consisting of two educators in the School of Physiotherapy, two educational designers and a project manager developed two templates that enable students to work through the patient assessment (history taking and physical examination) and develop a clinical diagnosis and treatment plan. The project was limited by the lack of availability of a data base storage system that would allow individual student

responses to be stored as they work through the clinical case. Initially the templates were developed for the discipline of physiotherapy; however as described below in "the educator's view" section below, are able to be adapted for any context. The project required 650 hours of educational designer and project manager's time which included planning with a review of the available technology, development with formative evaluation of project processes, construction of a website with guidelines for modifying the template content, and two sessions to introduce the templates to other interested academics as part of the implementation phase of the project.

The student view

Students require the program Adobe Flash Player 8, which is commonly used by web providers, to work through the two types of cases. If the computer does not have the necessary software the template is able to detect this and direct the user to download the free software. In this study the cases were delivered in the Unit of Study's website through the learning management system (LMS) WebCT. The case instructs students to move through each of the sections at their own pace and work independently of any lecturer input. Depending on the template used the student is required to input their reasoning processes with justifications.

The first model "Clinical Reasoning" asks students to engage in a deductive clinical reasoning process by recording and refining their thought processes as clinical information is progressively revealed. The design was influenced by the hypothetico-deductive approach to clinical reasoning which is commonly used by novice practitioners (Higgs & Jones, 2000). At the completion of the case the students are able to compare their reasoning with that of the academic who developed the case. The Clinical Reasoning model has five sections (Figure 1):

- Instructions for the students
- History section, where after each presentation of information the student is required to enter their hypothesis and reasons based on the information they received. As further information is revealed they are able to modify their hypotheses with the aim of reducing the number of hypotheses as more information is given
- A physical examination section whereby a similar process continues
- A solution section where the student is able to compare their final hypothesis and reasoning about the patient's clinical problem with the lecturer's answer
- A treatment section where the student develops a treatment plan

The second "Efficiency" model encourages students to be selective in their choice of clinical tests to arrive at the correct diagnosis in an efficient manner. It encourages more of a 'pattern recognition' approach to clinical reasoning which is characterised by speed and efficiency (Higgs & Jones, 2000). After being supplied with the patient's history, students are asked to select the most important examination results, hence recognizing clinical pattern of a condition, before making a diagnosis. The Efficiency model consists of four sections which were applied to the discipline of ophthalmology as follows:

- Instructions for the students
- History section for patient history information and images or movies
- Ocular examination: Results of clinical tests with images and movies where necessary
- Diagnosis where the student chooses a diagnosis and enters justifications for their choice which can be emailed to the lecturer.

The educator's view

The templates were designed using an Adobe Flash file reading content materials from xml documents, and images and videos from a set directory structure. This allows educators to develop new case studies by inserting their own materials using a simple text editing program such as Notepad or WordPad. The headings can be modified to suit the terminology in various disciplines, and images and movies can be added to enhance the case. The templates are made available to educators through the University's learning management system (WebCT). This includes fully completed examples, a zipped file with all the

components necessary to create a case (folders and files) and instructions to assist educators to adapt the materials. Educators are able to modify the content of each component of the .xml files (including headings) and review their changes immediately on their local computer.

The main limitation of the templates is that the relationship between each of the sections of the template (xml files and swf file) is not able to be altered without an experienced Adobe Flash developer.
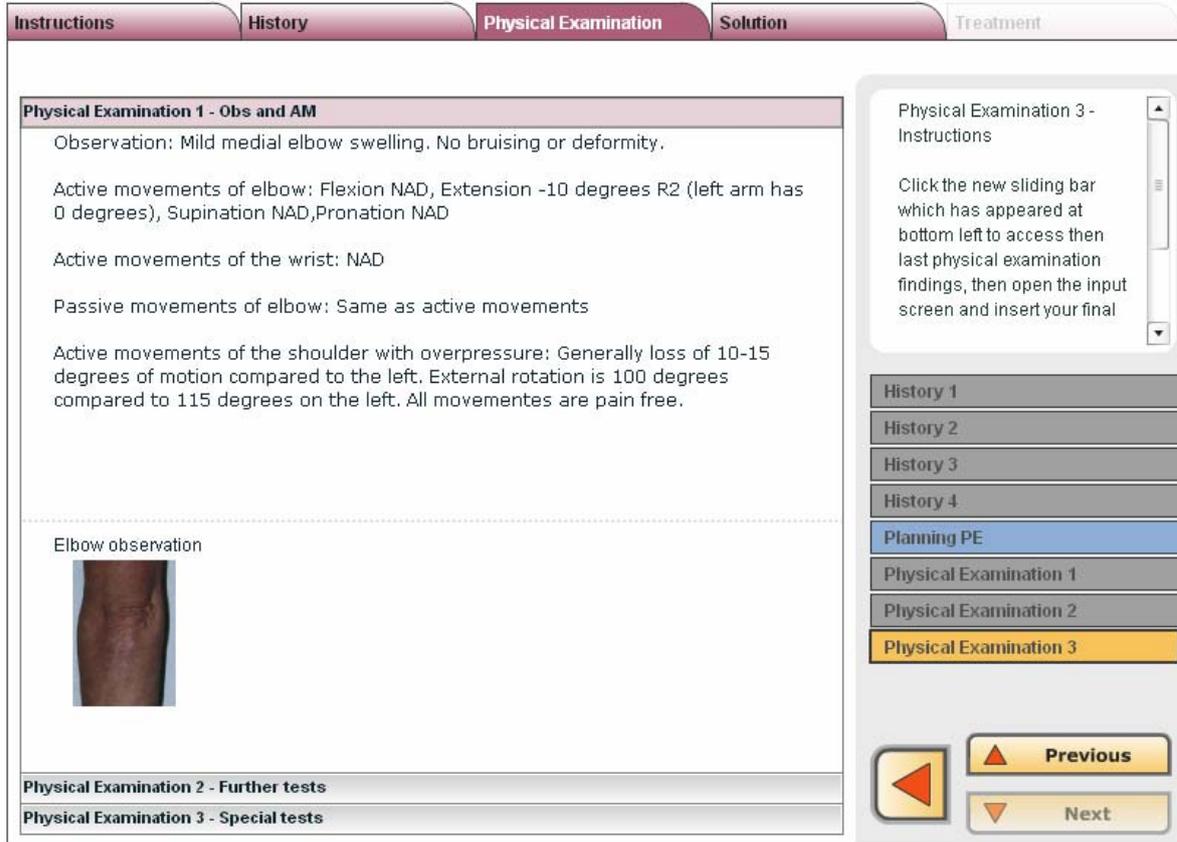

Figure 1: Clinical reasoning model

Preliminary evaluation research

A learning-centred framework (Phillips et al, 2000) was used to select the focus of this evaluation. Since the project aimed to develop accessible and useable templates, summative evaluation data is required to assist in making a judgment about the implementation of the templates and the ability of the templates to transfer to other areas of the institution (maintenance evaluation). The research to be presented aims to begin this process and is specifically seeking to determine information about:

- The usability of the templates by the students and the educators, including the instructions and ability to access and use the learning materials
- The flexibility of online materials and the workload associated with either completing them (students) or developing context specific materials (educators).

Two questionnaires were developed (one for educators and one for students) using guidelines provided in the report by Philips et al (2000). It was decided not to use an online questionnaire because recent research has indicated that a poor response rate of less than 20% is likely to occur with online surveys (Sheard & Markham, 2005). The University of Sydney Human Ethics Committee approved the conduct of the research.

Seventy-eight undergraduate physiotherapy students enrolled in the 3rd year Unit of Study PHTY3053 Musculo-skeletal Physiotherapy C completed the questionnaire (56% response rate). They were asked to complete three different cases as part of this unit of study during the first semester of 2006. Two cases

were modeled on the "Efficiency template" and one was modeled on the "Clinical Reasoning template". There was no summative assessment component for completion of these cases; it was promoted by the educators as a useful study tool to gain formative feedback on student learning of course content, and that some content would be covered in the written exam. Students were encouraged to complete the questionnaire in the last teaching week of the semester before the final examination, regardless of whether they had accessed the cases. The questionnaire consisted of 15 questions based on Likert scales or open-ended questions asking learners about both the usability of the cases and value of the cases to their learning in this unit of study.

Preliminary results show that the majority of students (86%, n=67) completing the survey had accessed successfully at least one or more of the cases. Of the 14% (n=11) who had not accessed any of the cases, stated reasons ranged from difficulties having a computer to access the materials, to lack of time. Many stated that they planned to use the cases for revision before the final examination.

In addition educators who were currently using or planning to use the templates in their teaching were also asked to complete a similar questionnaire, the details of which are currently being collected. It was felt that the open-ended questions would enable unanticipated issues to be identified, which is considered an important aspect in the conduct of information and communication technology evaluations (Scanlon et al, 2000).

Conclusion

A key to the smarter use of educational technology in higher education is making the learning materials easy to use and adaptable for different applications, whilst being mindful of the development time required to meet these ideals. Evaluation of educational technology needs to be sensitive to the nuances of the online learning process as well as the usability of the online materials. The results of this evaluation will aim to begin to address these issues and highlight aspects that need further consideration, not just for the use of these templates, but more broadly for dissemination within the institution.

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Author contact details

Helen Wozniak, Senior Lecturer. Centre for Innovation in Professional Health Education and Research, Faculty of Medicine, Edward Ford Building, The University of Sydney, NSW 2006, Australia. Email: hwozniak@med.usyd.edu.au (During this project Helen was responsible for the management of strategic USyd eLearning projects within the health sciences faculties at the University of Sydney)

Mark Hancock, Lecturer, School of Physiotherapy, Faculty of Health Sciences, University of Sydney, PO Box 170 Lidcombe, NSW 2141, Australia. Email: m.hancock@fhs.usyd.edu.au

Joanne Munn, Research Fellow, School of Physiotherapy, University of Otago, PO Box 56, Dunedin 9015, New Zealand. Email: jo.munn@otago.ac.nz . During the majority of this project Joanne was based in the School of Physiotherapy, University of Sydney and recently moved to the University of Otago.

Gosia Mendrela, Educational Designer, Flexible Online Learning Team, Office of PVC Learning & Teaching, University of Sydney, Engineering Link Building, The University of Sydney, NSW 2006, Australia. Email: gosiam@usyd.edu.au