Renewing the curriculum to more effectively accommodate clinical rotation: An overview of an ALTC Priority Program project

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Traditional medical curriculum approaches to clerkship involve all students returning to campus one or two days a week for lectures – however, this approach is poorly suited to modern hospital rotation practices (in which different student groups attend different hospital specialties, e.g. oncology or paediatrics) and most importantly, all students attend the same lecture on the designated weekly topic, rather than individually focusing their study on topic areas relevant to their particular hospital experiences. The project seeks to renew the curriculum and teaching methods of the crucial latter years of medical training through a flexibly delivered, student-centred approach based on innovative technologies. This paper outlines the scope of the project and the presentation will discuss its progress to date.

Keywords**:** Problem-based learning; Research projects; LAMS; Medicine; ALTC projects

Background

Despite the efforts of teaching staff to help students make connections and apply their on-campus learning to life in the hospital, there exists a separation of these two worlds. In part, this is a result of students undertaking their studies as separate subjects with the expectation that, along the way, they would 'discover' the connections between them (Murray-Harvey & Slee, 2000). Also contributing to the lack of connectedness is the common view of practising medical practitioners that the important learning about medicine occurs in hospitals, not at the University. Therefore, despite the efforts of University staff to help students make connections and apply their on-campus learning to life in the hospital, there exists a separation between these two worlds. There is extensive literature in other fields that provides evidence that better connections can be forged between these two worlds (Bain, 1999; McNaught, Whithear, & Browning,1998) and it is our aim to use this research to design learning Modules that demonstrate best practice using a problem-based learning style delivered by e-learning methods. Each Module represents approximately 25 hours of educational material and activities (typically five case studies of approximately five hours each) on a single scientific strand topic. UWS will be implementing nine modules over a three year period (years 3-5).

E-learning can be used as vehicle to deliver a radically re-designed course that provides a learning environment that is student-centred, authentic, problem-based and collaborative. By incorporating readings, lectures and other illustrative materials, case studies and activities within a Learning Activity Management System (LAMS) sequence students will be able to participate in "real-world" problem-solving activities where there will be a heavy emphasis on the application of the skills learnt in their practical experience during their clinical rotation (Johnson & Aragon, 2002). Students will be able to select the Module appropriate to their clerkship specialty rather than attend a lecture on a specialty that has been selected by the course program, which may, or may not, have any relevance to the student's current hospital experiences. As Bastieaens, Merrienboer & Hoogveld suggest (2002), when a more project-centred approach is employed it gives students the opportunity to explore authentic scenarios where they can make their own decisions on how to implement their learning. Merrill (2002) agrees learning is promoted when students are engaged in relevant "real world" problems.

Taking a more problem-based learning approach provides students with the opportunity to gain theory, content knowledge and comprehension in a more authentic way (Major & Palmer,

2001). In addition, this approach helps students develop advanced cognitive abilities such as critical thinking, problem solving, and communication skills (Barr & Tagg, 1995).

Project Outline:

This project will integrate Learning Design approaches, problem-based learning and best practice in e-learning delivery methods to address the challenges of maintaining student engagement with scientific basis of medicine learning modules whilst the students are undertaking their clinical rotations (in hospitals) in their 3rd, 4th and 5th year of study in a Bachelor of Medicine degree program. These clinical rotations (also called "Attachments") comprise a compulsory clerkship practicum which presents unique difficulties in the delivery of relevant information and just-in-time support, given that students are spread across a range of hospitals, many quite a distance from the University.

The pilot will concentrate on one university's implementation of the proposed new approach (University of Western Sydney School of Medicine) supported by Learning Design and e-learning professionals from Macquarie University E-Learning Centre of Excellence (MELCOE). In addition to the two Core Partners (UWS & Macquarie – MELCOE), learning designs will be developed in close consultation with a team of medical experts from a number of Advisory Partners (Macquarie University – Australian School of Advanced Medicine; Melbourne University – Biomedical Multimedia Unit; the University of Sydney - Centre for Innovation in Professional Health Education and Research; and La Trobe University - Faculty of Health Sciences to ensure the products of this development can be readily adopted by other medical Faculties at other universities. An international observer with expertise in learning design and medicine (from the Northern Ontario – School of Medicine) will also provide feedback to the project

Additionally, once the designs have been fully developed, the exemplar learning design Modules can be stripped of their content and adapted for use by other Faculties where students are also involved in practicum programs during their study (ie. Teacher Education (Macquarie) and Nursing (La Trobe). In turn, these Faculties could develop their own library of best practice learning designs for sharing with other universities.

Research Questions

The following questions will be addressed by this study:

- What is considered "best practice" for the teaching of the scientific basis of medicine within the field of medical education?
- What learning designs can be readily adopted by the Faculty of Medicine as a means of delivering best practice?
- How can the curriculum be delivered to facilitate students' learning in relevant and connected ways when they are out on clinical rotation?
- What learning designs can be readily adopted by other disciplines as templates for best practice?
- How can identified barriers to academics' adoption, adaptation and reuse of learning designs be overcome to ensure sustainability?

Project Aim:

To develop contemporary medical curricula that meet student and employer (hospitals) needs, and provides the basis for ongoing personal and professional development for staff and students.

Project Outcomes:

- Six cohesive, e-learning Modules that demonstrate best practice in medical education. They will be based on pedagogically sound learning designs suitable for use by undergraduate School of Medicine students. These Modules will be developed, in close conjunction with medical content specialists by professional educational developers and e-learning experts, thus ensuring they will be effective learning designs in which good pedagogy has been embedded.

- Accompanying documentation that guides practitioners through the delivery of each of the Modules. This will help staff understand the rationale for using the Modules' exemplar learning designs. This will facilitate the consistency of content, delivery and quality and will be an opportunity to demonstrate best practice in learning design.

- Sharing of the Modules through repositories and other communities, where relevant.

- Enhanced student engagement by introducing a range of readily accessible and relevant instruction in a flexible mode to accommodate variability in the time and place of student study (due to the requirements of hospital rotations).

- Creation of a community of educational developers, academic staff and medical professionals who are participants in the project, and are able to engage with staff in their own and other universities to disseminate the project outcomes.

- A series of workshops to promote the adoption of best practice and introduce a Learning Design approach, and sharing of experiences among practitioners.

- An online community (including promotion of discussion forums and repositories of learning designs) to support the project which will be available to the wider community.

- Research articles and conference presentations at national and international level.

* Note that in cases where modules involve restricted medical content that cannot be generally shared, the underlying learning design structure can be shared independent of the content.

Approach

Project funding will be used to support research for establishing a sound theoretical underpinning for the project, whilst educational development will be supported to design, review and disseminate project outcomes. Some funding will also be allocated for consultation with our expert Advisory Partners. The project does not anticipate funding being required for new software development (as the software will build on existing open source components such as LAMS V2 for integration with common learning management systems, eg. Blackboard, WebCT, Moodle, Sakai, etc.).

The project will also include face-to-face workshops for sharing of experiences, peer review, evaluation and an online community incorporating discussion forums. It is intended that the Modules will be uploaded to a number of existing repositories (eg. ALTC Exchange, Technology-Supported Learning Database and LAMS Community).

Methodology

The project will employ a design-based research methodology (Reeves, Herrington & Oliver, 2005) which involves a flexible, iterative process as follows:
1. The Start Up Phase will involve the analysis of current learning design, e-learning and problem-based learning research literature to determine the needs and opportunities for

application of learning designs, by researchers, educational developers and teaching staff.

2. Three initial Modules and documentation will be developed consistent with the design solutions identified in Step 1 above and in consultation with the Advisory Partners.

3. The Implementation Phase will involve trialling the first three modules with the University of Western Sydney's 3rd Year School of Medicine students in 2009.

4. The outcomes of the Implementation Phase will be evaluated by students and staff, Advisory Partners and peer reviewed.

5. Revise initial three Modules and documentation in light of critical needs from evaluation and peer review and devise development framework.

6. Development will then begin on the next three Modules.

7. Outcomes will be disseminated through workshops at other universities. Modules will be uploaded to an online library for interested staff to implement the Modules in collaboration with the Advisory Partners during the latter Implementation Phase to enable wider dissemination. If a Module contains restricted medical content, the underlying learning design structure can be shared independent of the content.

8. Implement second group of three Modules.

9. Project outcomes will be evaluated by an external evaluator, and Modules will be revised in light of evaluation outcomes. Revised Modules will be uploaded to an online library for interested staff to implement the Modules in collaboration with the Advisory Partners.

10. Outcomes will once again be reviewed, development framework adjusted accordingly and disseminated through workshops at other universities.

11. Review of the project outcomes. Further dissemination will be undertake through conference papers, journal articles and guides (available through open source software and creative commons licences) via new and existing repositories.

Methods will triangulate both quantitative and qualitative data. A literature review will be conducted to form a sound theoretical basis for the research. A detailed mapping and analysis of current models will be undertaken on an ongoing basis throughout the project and five meetings will be run with our Advisory Partners to establish best practice and undergo evaluation.

Theoretical Underpinnings:

a. Learning Design

Learning Design for the higher education environment is a complex task, especially in light of the increasing diversity of the student body. Learning materials need to be re-designed to take advantage of different student ability levels, learning approaches & media, and curriculum re-developed to support a huge variety of outcomes that are often discipline specific. Learning Design is a professional activity for which many of our academic staff are not trained. In this project we will implement a number of learning Modules that will provide comprehensive guidance for staff authors (medical content experts) that will assist them in developing an appropriate sequence of learning activities based on template Learning Designs. Once finalised, these Learning Designs will then be implemented with students, with the software stepping students through the learning activities according to the structure of the design.

In addition to establishing best practice in medical education, this project will also explore the issues to emerge from the implementation of learning designs and identify barriers to their widespread adoption and ways of overcoming them. This will follow-up on from the previous work in Learning Design of a number of our Project Team members (Cameron, 2006, 2007; Dalziel, 2007, 2003; Ellaway, Dalziel & Dalziel, in press; McAlpine & Allen, 2007; Philip, 2007, Philip & Nicholls, 2007. These findings will then underpin the development of the Modules that address these adoption challenges in its design.

A number of excellent learning design repositories have been/are currently being developed to provide teaching staff with an opportunity to share examples of good design practice and the Modules developed in this project will be made available to these. The Modules will be

designed so that academic staff will be able to tailor these exemplary examples to meet the individual lecturer's and/or course co-ordinator's particular requirements, whilst providing them with the underlying pedagogical principles involved in the learning design.

b. Problem-Based Learning (PBL)

PBL is an educational format that is centred around the discussion and learning that emanates from a clinically based problem. It is a method that encourages independent learning and gives students practice in tackling difficult situations and defining their own gaps in understanding in the context of relevant clinical problems, hopefully making it more likely that they will be able to recall the material later in the clinical setting. It is a way of learning which encourages a deeper understanding of the material rather than superficial coverage.

This learning style has been incorporated as a curriculum component in a number of medical schools around the world. The small group setting usually used in PBL encourages students to take an investigative approach and take a detailed look at the issues, concepts and principles exposed by the problem. It encourages the development of skills such as literature retrieval, critical appraisal of available information and the seeking of opinions of peers and specialists. PBL allows students to become more involved in, and responsible for, their own learning, and most students and staff report that this is a highly enjoyable way to learn and teach.

Each problem is intended to encourage the student "to develop an appreciation for the interrelated nature of the physical, biological, and behavioral mechanisms that must be considered with each health problem". By participating in this learning format, students will become proficient in the process of problem analysis, hypothesis generation, and the generation of learning issues that warrant further exploration. Each problem is intended to provoke critical enquiry, encourage independent access to a variety of learning resource materials, and generate small group discussion. The depth and breadth of the discussion on any particular topic will vary, depending on where the students are in their course of study (Queens, 2007)

In the context of the UWS Modules, students will be spread across different hospitals at different times, and rather than returning to campus for lectures on the scientific basis of medicine (as typically experienced by students in a traditional medical course), students will use an adapted online form of Problem-Based Learning to explore the underlying scientific research relevant to their particular clinical rotation.

c. e-Learning

Delivering the Modules via an e-learning environment offers a number of advantages to students on clinical rotation (Kassop, 2003):

Student-centred learning: Students can access activities and work independently or with their peers online. Particularly in the discussion group mode, students have the opportunity to explain, share, comment upon, critique and participate in activities among themselves even though they will not be in the same physical location. In addition to promoting discussion, online delivery can foster higher-quality work. Before students respond to a discussion question or to another student's posted comments, they can refer to their course materials and think through their answers. As a result, students have the opportunity to post well-considered comments without the demands of the immediate, anxiety-producing face-to-face discussion, which often elicits the first response that comes to mind rather than the best possible response (Cameron, 2005). This has been found to be a particular advantage to students whose first language is not English.

Geared to lifelong learning: With medical science continually evolving, one of the roles of medical educators is to help medical students to find and learn information on their own and in concert with their colleagues. The online environment encourages initiative. Students direct their own use of Internet links, search engines, discussion boards, chat, e-mail and other

media. While such resources cannot guarantee student initiative, they establish a framework that gives precedence to the autonomy of the learner.

*Enriched course materials***:** A well-constructed, creative, good quality, multi-media learning object can be accessed by medical students in hospitals anywhere in the country. World-class resources can be accessed, viewed, and studied 24 hours a day, 7 days a week.

*On-demand interaction and support services***:** Students from hospitals can also use e-mail, chat rooms, and discussion boards to establish impromptu or scheduled study groups that defy conventional time and space restrictions. This can be of vital to importance to medical students who can be situated in hospital placements far from the University's lecture theatres and also allows students to be more flexible in their learning, so that interesting ward rounds or specialist consultations are not missed.

Immediate feedback: Even though they do not see a lecturer every day, online students can have access to them. Online students can e-mail questions to their lecturers and engage in a dialogue that would be hard to duplicate in the face-to-face world.

Most importantly, online tests and quizzes can be constructed with an automatic grading capability that provides immediate feedback and references to text and class notes that explain the correct answers. Assignments, including grades and markers' comments, can be returned to students more easily online and usually with more detail than in the face-to-face environment. There is no need to wait for the next face-to-face class to return an assignment.

An intimate community of learners: It is common for participants in online courses to develop a strong sense of community that enhances the learning process. This suggestion is well supported by theories of learning that highlight the role of social interaction in the construction of knowledge (Brook & Oliver, 2003).

e-learning offers scope to organise teaching differently (Naace, 2004). Neither lecturers nor students have to be (always) present in the classroom; it allows for access to materials that would otherwise not be available in a classroom, and allows lecturers and students to structure learning materials in a variety of ways; enables different preferences for learning to be more easily accommodated, and makes it easier for students to access learning. Bates' research (2003) has confirmed e-learning is not necessarily better or worse than face-to-face education although it is different. The ideal e-learning model that we would be emulating in this project, according to Mayes & de Freitas (2004) would engage the students in meaningful tasks, give rapid feedback, encourage reflection through dialogue with peers, align assessment, and would encourage the creation of a community of learners through discussion.

As a key focus of our Modules will be to promote a collaborative, student-directed, research oriented approach to learning, evaluations from students will be vital to alert the project team to changes that may need to be made before introducing the second set of Modules.

Dissemination Strategy

As the project involves academic, research and educational development staff across five universities, the potential for dissemination is high among the participating universities. By offering workshops at additional universities at the end of the Implementation Phase, combined with online resources, the staff at other universities will be able to examine the Modules and documentation. An ongoing liaison with the project team will be maintained online to facilitate adoption. As the project develops there will be more information for potential adopters. In this way, the project team can progressively build a community of users, which will continue after the project is complete.

Methods for effective professional development and mentoring will be developed during the project to suit discipline and institutional contexts regarding sharing and reuse. The Carrick Institute approach to dissemination will be adopted using "consultation, collaboration and

support for ongoing dissemination both during the project and after the project is completed" (Carrick Institute, 2006, p. 1).

All project deliverables will be made freely and openly available as either open source software or open content (using a Creative Commons license). The project will use existing dissemination vehicles such as the Carrick Exchange, the LAMS Community and Newsletter, ECU's Technology-Supported Learning Database and national and international conferences.

Conclusion

This project will integrate Learning Design approaches, problem-based learning and best practice in e-learning delivery methods to address the challenges of maintaining student engagement with scientific basis of medicine learning modules whilst the students are undertaking their clinical rotations (in hospitals) in their 3rd, 4th and 5th year of study. The compulsory practicum that medical students undergo presents unique difficulties in the delivery of relevant information and just-in-time support, given that students are spread across a range of hospitals, many quite a distance from the University. The Modules produced in this project will address this issue directly and are an innovative approach to curriculum renewal. Additionally, once the designs have been fully developed, the exemplar learning design Modules can be stripped of their content and adapted for use by other faculties where students are also faced with similar challenges in their own practicum programs.

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