The Web between lectures and self-managed learning

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Abstract

Lectures and self-directed study are all too often perceived by teachers and students as distinct educational activities. This paper describes how World Wide Web and 'interactive meeting' technologies are being used to help establish and maintain context and continuity for learning. The tools and their role in lecture preparation, presentation, and self-managed study are described. Initial trials have successfully demonstrated the potential of the system to improve the quality of both lectures and subsequent self-managed learning. However, interviews with teaching staff revealed serious reservations over the amount of time and effort that would be needed to become familiar with the technology and produced the comprehensive, highly structured and integrated resources required. Factors that determine if the approach will be more widely adopted by teaching staff are concern with the flexibility to re-design courses and curricula and the provision of essential staff development and support.

Introduction

Like much of higher education, in the next few years the University of Wales College of Medicine (UWCM) is expecting a massive influx of additional students. For the foreseeable future lectures are likely to continue as one of the principal methods of teaching. Although this approach is effective for conveying factual information, there is little evidence for it being successful in promoting critical thinking and problem solving (Bligh, 1971). Dialogue and discussion are recognised as important elements in promoting higher level cognitive processing, but a conventional lecture does not accommodate this well. How will sufficient opportunity be created for a student to talk with a tutor and their peers? With so many students, and such busy curricula, it is difficult to see how the necessary space and time can be created. An alternative approach may be to explore modifying traditional teaching and learning practices so that they become more integrated and participative.

Lectures are an increasingly becoming a precious opportunity to meet with a subject expert. Perhaps more can be made of the 'lecture event' as a forum for raising issues and problems, and as an opportunity to express opinions and ask questions. However, there are factors that may prevent this from happening. For example, rarely in a class of 100 plus students are more than a few confident individuals prepared to 'stick their necks out' and ask a question (Fear of embarrassment is often cited as a major reason preventing students asking questions in lectures). It is often the case that students have not prepared well enough and consequently do not feel knowledgeable enough to query the expert. It may be that the lecturer themselves is comfortable with giving a monologue and are reluctant to be put on the spot by a smart student. These and other issues must be recognised and any approach to make the lectures more interactive must be sensitive to alleviating their potential negative impact. Technology can help in the lecture theatre by enabling students to participate by responding to questions anonymously, and allowing the expert to pose questions that pre-empt or diagnose learning difficulties. Better preparation on the part of students may be encouraged if topics, issues and questions are raised in advance and the opportunity created to discuss them online with other students and subject experts.

Lectures are commonly treated as stand-alone, one-off performances. Although usually one of a series, what goes on in the time between lectures does not receive as much attention as perhaps it should. It is left pretty much to the student, with maybe some guidance from a handout or course-handbook, as to how they about managing their study time. In order to make more of the opportunity a lecture affords for clarifying misunderstandings and misconceptions, the factual information that would have normally been delivered through a lecture could be learnt instead via self-managed study. However, this would require that the lecturer and student co-ordinate more carefully learning activities prior and subsequent to a lecture. Technology can assist in this by providing a means of establishing and maintaining context and help create continuity between lectures and episodes of self-managed learning.

From the student's point-of-view establishing and maintaining context is essential for effective learning (Tessmer and Richey, 1997). For example, it helps considerably if self-assessment activities are performed in the context of the problem students are working on. The activity may be multiple choice, essay, or short answer; the critical characteristic is that it is generated from the student's learning issues (Barrows, 1994). At UWCM the aim has been to use available technology to engineer a richer learning experience by bridging the gap between lectures and self-managed learning (see Figure 1). In order for this to occur, teaching staff required tools that made the process of authoring and delivery of learning materials more easy and straightforward. Correspondingly, students required a means of revisiting issues raised in a lecture, to review their performance and follow-up with further information and online activities. The remainder of this paper describes the technologies used to try to achieve this, their role in teaching and learning, and a summary of evaluation reports based on use of the system by staff and students at UWCM.

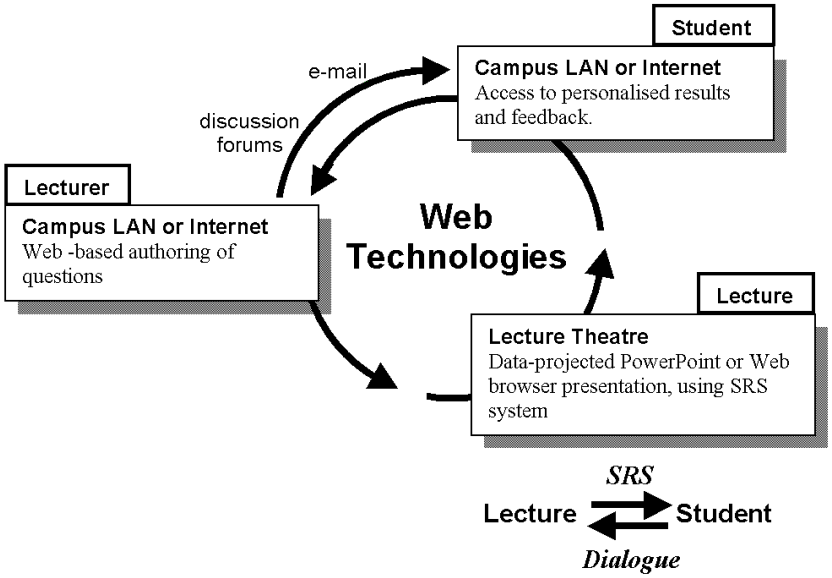


Figure 1 A schematic showing participants, events and locations involved.

Resource preparation

Although computers and data-projectors are available in all the main lecture theatres at UWCM, the vast majority of teaching staff still prefer to use 32mm slides rather than give presentations using a Web-browser or PowerPoint. There is clearly some way to go before many educators conquer their fear of, acquire the time, or make the effort to use C&IT effectively. Given that the working lives of practising health professionals who teach are very busy, greater effort must be made to bring the benefits of C&IT closer to them. A simple Web-based authoring and tutorial environment has been developed to make it more convenient for staff and students to publish and access Web pages with the minimum time and effort.

Figure 2 Example authoring screens from the ASPIRE system

Project ASPIRE

Project ASPIRE (see: http://medico.uwcm.ac.uk/media/lt/projects/aspire/) was established with the aim of simplifying the authoring and maintenance of Web pages containing images and interactive questions (see Figure 2). A 'tutorial' interface provides access to structured sets of Web pages ('Topics') which may contain any combination of text, image and interactive question (multiple choice, multiple response or text-entry). As well as being able to FTP upload images and text/HTML files, authors are able to search and retrieve images from an online clinical image archive (there are also plans to interface with a streaming video server). Access for both authors and tutees is authenticated, each be able to view only the topics they have rights to, or which have been made globally available. Session-tracking features mean that use of tutorial can be monitored and logged, suspended and resumed at a later date. Topic specific discussion forums are easily created and managed by the author, and access restricted to only those users who have rights to view the topic.

Any JavaScript and frames compliant web-browser can be used to author pages or run tutorials. In order to achieve cross-browser and cross-server compatibility most system functionality has been engineered server-side using PHP and MySQL (PHP is a free, server-side, cross-platform, HTML embedded scripting language, see: http://www.php.net/. MySQL is a free, cross-platform, multi-user, multi-threaded SQL database server, see: http://www.mysql.org). Although developed on a Microsoft NT/IIS Web server, ASPIRE has been successfully transferred to a Unix platform and tested using a Linux/Apache combination. The software is freely available to developers who subscribe to the Open Source philosophy (see: http://www.opensource.org/).

Evaluation

The first version of ASPIRE has undergone trials and evaluation by clinical teaching staff and undergraduate medical students. It has been successfully used to author undergraduate and postgraduate in-course formative self-assessment on the Web. Feedback from both lecturers and students has shown the system to be both reliable and intuitive to use. The facility to search and retrieve up-to-date clinical images whilst authoring questions was viewed as a particularly valuable feature. For further information on the ASPIRE project and future development plans refer to http://medico.uwcm.ac.uk/media/lt/projects/aspire/.

The Lecture

Although the most common method of teaching in HE, conventional forms of lecture are often criticised as offering an impoverished medium for communication (Kimmel, 1992). There are known difficulties with maintaining student attention and promoting higher level thinking and problem solving (Mannison et al., 1994). Different methods and techniques have been used in an attempt to make lectures more interactive (Steinert and Snell, 1999). UWCM is fortunate to have had a system installed that has been specifically designed to facilitate interactive meetings (IML Question Wizard, see: http://www.imlltd.co.uk/), locally referred to as the Student Response System (SRS, see: http://medico.uwcm.ac.uk/media/lt/srs/). This has been used for undergraduate teaching at UWCM since 1997.

The Student Response System

The Student Response System utilises IML Question Wizard software. This is a Microsoft Windows OLE server that enables the embedding of interactive questions directly into programs, such as Microsoft PowerPoint, in the same way as pictures, video clips and sounds. The software allows the creation of questions, the polling of an audience using infrared handsets and the results to be dynamically displayed as a chart and saved to a database (see Figure 3). Stored data can be statistically analysed and the results retrieve and reviewed during the lecture, e.g., correlation's can be performed to compare answers to different questions. Students are able to participate in a ‘lecture’ by indicating an answer or opinion to questions posed by the lecturer.

The following question types are possible:

- ***single choice*** – stem and two or more items from which one is chosen
- ***single vote*** – list of items against which either a ‘tick’, ‘cross’ or ‘question mark’ is selected
- ***single value*** – response is value in a range, e.g., on a scale of 1 to 10
- ***multi-stage vote*** – similar to single vote, but performed several times against a list of issues
- ***multi-stage value*** – similar to single value, but performed several times against a list of issues
- ***many choices*** – stem and two or more items from which more than one may be chosen

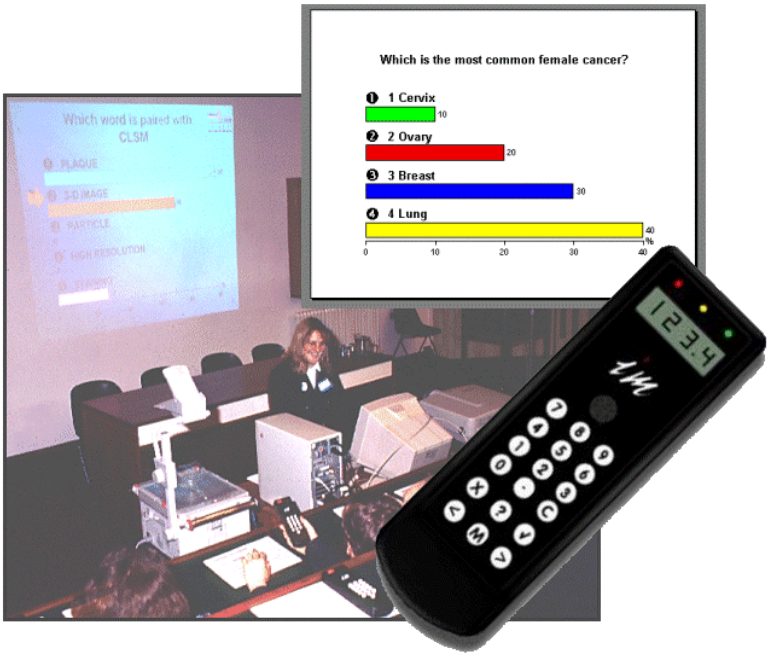


Figure 3. A typical lecture with the Student Response System in use. Inset is an example of charted feedback and the infrared handset used to indicate responses.

Once questions are authored they are stored in a database and then incorporated into PowerPoint presentations. Prior to asking questions in the lecture, it is possible to get students to identify themselves by entering a personal identification number into the handsets. This can then be used to retrieve an individual's results from the database. During the course of a lecture questions are displayed and the audience prompted to answer by pressing buttons on their handset. The system's infrared receivers capture the signal, which is analysed by the computer used to show the PowerPoint presentation. The data-projected display shows the audience real-time feedback of the total number of handsets that have responded. When the lecturer is satisfied with the number of responses received polling is ended, the results are stored in a database and the question display up-dated with a graphical (e.g., bar or pie chart) representation of the results. This can then be used as the basis for subsequent discussion.

Teaching staff at UWCM have put considerable effort into developing innovative lecture formats using the SRS. Its potential for enhancing lectures has been well illustrated. For example, in combination with data-projected PowerPoint slides, it has been used to present clinical cases to a large audience (150+ students). Using feedback received from the audience a lecturer is able to assess the understanding of the audience and their own performance in communicating their ideas and explanation. Armed with this information they are in a much better position to adjust their commentary appropriately and respond to the needs of different groups in the audience. At the same time, students are able to provide an answer and judge their performance in relation to their peers, anonymously without fear of embarrassment.

Evaluation

When interviewed, teaching staff reported that the SRS had in all cases improved the conventional lecture toward a more interactive and participative experience. When well planned and practised, lectures were judged by all concerned to be more interesting and engaging. The majority of students

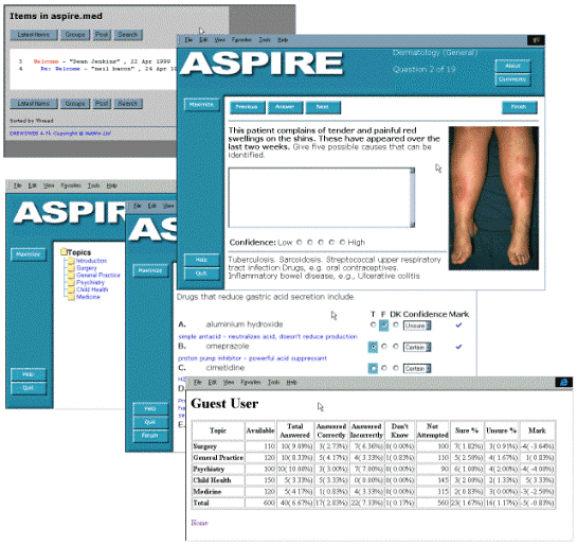
involved also made positive comments about the modified lecture format, although the novelty factor of the system was often mentioned. In lectures that used the SRS, students were judged by teachers to talk more and ask more questions (for a more complete analysis and discussion see Roy, 1996). It should be mentioned that studies have not yet been conducted that objectively show improved learning outcomes. However, collective opinion from both teachers and students does strongly suggest that this form of interactive lecture contributes in a very positive way to both the act of teaching and the learning experience.

However, given the positive reports by teaching staff, it is surprising that more use has not been made of the SRS. Interviews revealed a number reasons why staff might be deterred from using it. Lack of appropriate training and support was identified as a major factor, but the most commonly cited reason was lack of time. Busy undergraduate curricula, combined with the working lives of practising health professionals, made it difficult for staff to find the additional time required to learn new software tools and create opportunities to explore novel approaches to teaching. Another key problem was the complexity of the software used for authoring the questions. The stand-alone IML authoring application was criticised for being inconvenient and difficult to use. Teaching staff became reliant on support staff to author questions rather than do it themselves. This alone was judged sufficient to dissuade many potential users, especially given the constraints on available time.

Interfacing ASPIRE with the Student Response System

The need was identified for a simple and accessible method of authoring questions. Since the ASPIRE system was already being used to author interactive questions for the Web, it seemed appropriate to modify the authoring and tutorial interfaces to perform updates and queries directly to the SRS database. This allowed Web pages and questions to be created at any time and location in preparation for a lecture, and for students to have access to their responses along with tailored feedback. For initial trials, questions were presented as usual by being included as OLE objects in a PowerPoint presentation. Collaboration with IML Ltd is ongoing to facilitate dynamic up dating of SRS polled responses to a Web browser display. This would avoid the additional stage of having to author a PowerPoint presentation and allow all activities to be performed online using the Web.

Figure 4 Example tutorial screens from the ASPIRE system.



Post-lecture, self-managed learning

In order to help evaluate the effectiveness of coupling ASPIRE and the SRS, students were asked at the start of a lecture to identify themselves by entering their library card number into the handsets. This meant that subsequent use of a handset and archived responses were associated with a known student. Following the lecture, the students used their PIN as a password to login to ASPIRE. Since the PIN was a unique identifier it enabled automatic retrieval of responses from the networked SRS database. Using ASPIRE in tutorial mode allowed students to access and review the previous lecture's slides and their own answers to the questions (see Figure 4). The question display was modified to show appropriate feedback depending on whether an answer was correct or not. However, even if students had not entered their PIN during the lecture it was still possible to view the questions with answers and feedback, but it was not possible to review their own performance. The added value for those who had identified themselves was tailored feedback and a record for future reference.

All student reports were unanimous in their praise of the facility to review lecture material and their responses to the questions. But it was evident that the novelty aspect of the system influenced the comments made. Those interviewed were very appreciative of **any** lecture or course information being made available on the Web and wanted more. At the time of performing the trial not many teaching staff had published their lecture slides or notes on the Web. The primary need of students was to be able to access the content of the lecture presentation. The ability to review answers to questions asked during the lecture was generally thought to be an added bonus. Supplementary information and activities, such as following up feedback from the questions, was thought to be useful but not essential. With encouragement students did use the discussion forums. This was particularly so when lecturers became involved and contributed to the discussion themselves.

Discussion

The purpose of the project was to provide a mechanism to help students better determine their strengths and weaknesses and decide where to focus their learning. The idea was that individualised feedback following an 'interactive lecture' would help to maintain the personal relevance of the topic(s) discussed. Thus, when accessed in conjunction with lecture notes and slides, context would be re-establish and continuity maintained between the lecture and subsequent related studies.

From a practical perspective the component technologies were effective. A means of helping students bridge the gap between lectures and self-managed study was successfully developed and tested. Teaching staff were able to use ASPIRE to author questions for delivering interactive lectures. The Student Response System was well received as a method for enabling self-assessment and feedback during a lecture. Post lecture, students used ASPIRE to review their performance and access tailored feedback. Although the feasibility of this approach was proven, issues arose which suggest that its future adoption and impact might not be as great as expected.

Overall, the students interviewed did not judge the tailored feedback to provide significant added value. It is possible that this finding is related to what and how the students (3rd year medical undergraduates) were studying at the time. In the early years of undergraduate medicine there tends to be a relatively greater study load in terms of learning factual information and less on analytical aspects such as clinical decision making. It was clear that the students who took part in the trial were primarily concerned with gathering 'essential' content, driven by impending exams. Few seemed motivated to pursue information thought to be supplementary to the course. It is possible that the attitudes of students might be more positive later on in the course when there is less emphasis on cramming facts and figures and more on problem solving and critical analysis. Further trials with students in the latter years of the medical course are planned.

For teaching staff, using ASPIRE and the SRS did not alleviate the more fundamental problem of finding the time to author good questions, presentations, feedback and supplementary resources. Without the necessary support infrastructure, the overhead incurred in terms of planning, designing and authoring was judged by many to be too great. The workload of practising health professionals is such that there is little opportunity to investigate, let alone try out, new technologies. It was also evident that many teachers still perceived lectures as a primary means of conveying factual information and making them interactive would result in less being taught. In order for the technology to provide a viable alternative to conventional didactic forms of teaching, a fundamental shift will be required to recognise the potential of the lecture as a forum for discussion.

In summary, sufficient qualitative evidence has been gathered to suggest that interfacing ASPIRE and the Student Response System could have a positive impact on student learning. But it is difficult to determine from this preliminary evaluation the long-term viability of this approach. Further exploration is required to investigate how self-managed learning activities and lectures

might best complement each other. Although a practical and educational need for such a facility has been identified, engineering its place within an organisation presents a further challenge. The deciding factors are organisational and strategic, and concern curriculum design, staff development and support.

Further information:

The ***ASPIRE*** system may be accessed from the following address
http://medico.uwcm.ac.uk/aspire/
Login as Username = '**trial**',
Password = '**trial**'

More information on the Student Response System may be found at
http://medico.uwcm.ac.uk/media/lt/srs/

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