PC221

Reusable learning objects in undergraduate medical education

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For many years attempts have been made to integrate science and clinical practice in the education of medical students and doctors. Curricula such as those at Guy's, King's and St Thomas' (GKT) have gone some way to introduce this approach. In particular we have introduced some clinical experience into the first two years of the course. This clinical element has been an addition to the basic science, rather than the starting point of the students' learning. In the later years of the course when students are on clinical attachments in small groups on many sites it has been difficult to ensure the coverage of core material and the continued presence of basic science elements alongside the clinical experience.

There is a need to provide electronic learning resources that can be "reused" by students at all levels and of different healthcare disciplines. Developments such as the GKT Virtual Campus give us the opportunity to do this in a way that provides a common format and common access to learning material and resources that can become familiar to students, and can allow access at multiple levels to return to problems throughout a programme and between courses reinforcing and expanding the students' learning. We have developed an innovative system of Web-accessible reusable learning resources and the indexing and database systems necessary to deliver them appropriately.

A reusable learning objects may include short, single web page tutorials, simple lecture notes, PowerPoint presentations, annotated and animated diagrams and photographs, validated and reviewed external web sites, video clips, and simulations. We have built a relational database based on SQL server (running on a Windows 2003 server and IIS 6.0) to run and catalogue the resources. We have designed the database query and indexing system to be structurally in line with other institutions, projects (national and international) and standards in order that interoperability is possible between data stores in the future.

We have begun to populate the database with learning objects in a variety of formats that have been converted from older formats. These have mainly concentrated on basic cardiovascular and respiratory learning objects (respiratory volumes, the gas laws, lung structure and anatomy, gas transport in the blood) and are available as single images and complex Flash animations. We are also in close liaison with academic content specialists to develop learning objects as well as intending to provide staff training in using metadata (descriptive information associated with each learning object used for indexing, cataloguing and searching), which is critical to the success of the project.

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Where applicable, the experiments described here conform with Physiological Society ethical requirements.

PC222

Frequently asked questions: an on-line solution to an off-line problem

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At the Guy's, King's and St Thomas' (GKT) School of Medicine we have developed an on-line Frequently Asked Questions (FAQ) system for our first and second year medical students in response to requests from academic staff to provide an area where the answers to commonly asked student questions could be made available. The FAQ database driven system allows students to type any question into an on-line form and then select a subject area to which the question relates. At GKT we run a phase based curriculum across the medical course. Phase 1 provides a basic 12 week introduction covering basic pharmacology, physiology, biochemistry and anatomy in term one. Phase 2 runs from the second term in year 1 to the end of year 2 and is based around 37 clinical scenarios.

A student can simply submit a question anonymously, which is a feature that has proved very popular in encouraging students to use the system. When a question is submitted, an email is automatically sent to the appropriate tutor who will then log on and supply an answer. Any student may visit the web site any time and view all of the previously asked questions. Clicking on a question displays the tutor's answer and the date on which it was submitted. Creating a system that is dynamic and both subject and context specific allows greater flexibility in how it is used by students and staff. Staff may use it to identify areas of difficulty in the curriculum or post answers to individual student queries that would be of benefit to the entire year. Students may view questions on individual subject areas by simply clicking a button or they may search the entire question bank by keyword. Staff who have logged on to the web site to answer questions may also delete their questions and/or answers in the event of duplicate or irrelevant questions being posted.

This system is currently in use for the first and second years of our medical course with a view to expanding it to the clinical years, the Graduate Professional Entry Program (GPEP) and throughout the Biomedical Sciences curriculum. It integrated with our virtual learning environment (the GKT Virtual Campus) and with each scenario across Phase 2 to provide students with immediate access to scenario specific commonly asked questions. The system is accessible both on and off-campus which proved popular with students off site and at home and staff who can respond to student questions without having to be on-site. There have been 600 questions posted and answered since it was launched. As we develop a clinical scenario-based curriculum it is anticipated that clinical scenarios will be able to link back to this system allowing true vertical integration of this system across the medical course. It is anticipated that the number of questions asked in each academic year will reduce over the life of a course due to recurrences of the same issues over time.

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PC223

Peer-assessment of formative essays in the final year of a BSc

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Assessment loads have increased due to significant increases in student numbers and a relative stagnation in staff numbers. Assessment of students' work is now a significant issue in many universities in the UK. This potential problem is compounded by increased consumer pressure, either directly from students or else from parents. One response to this challenge has been the increased use computer or machine-marked examinations. In many universities, however, final year students tend to be assessed using essays and other forms of structured writing, including library projects and dissertations. These are time consuming to mark and students frequently claim to be either ignorant or unsure of the marking criteria.

In Bristol we have examined peer-assessment of final year essays, in the Physiological Sciences degree program, as a vehicle to manage the assessment burden and also to provide students with insight into how their written work is assessed, including how grades are determined. Results indicate that students are able to grade essays to within ±5% of the mark awarded by experienced teaching staff.

In each of 2 years, an essay title was made available to students (n= 25 and 22) 7 days prior to the assessment. The essays were then written under examination conditions and scripts identified only by candidate numbers. After a break of 30 min, the marking scheme was developed collaboratively by the students in a process that was moderated by two members of staff. Each student was then allocated an essay from the group at random and was required to grade the essay according to the agreed marking scheme and some additional guidelines regarding structure. The mark had to be justified by the inclusion of three comments about the positive aspects of the essay and a further three comments focussing on those aspects that could be improved upon. Each marker identified themselves on the script using their candidate number.

Because each student received a mark for their work and allocated a mark to the work of another, it was possible to look for the existence of any correlation between the mark received and the mark given.

In each year a correlation was found to exist between the mark a student received for their work and the mark they awarded to the work of another student. Using graphpad Prism (version 4.0), a correlation analysis indicated the presence of a correlation ($P<0.0001$, $n=22$) and that approximately 45% of the variation in the mark given could be accounted for by the mark received.

Anonymous questionnaire comments from students were positive. Many found the opportunity to see how another student had approached the question and interpreted the same areas of the literature invaluable. Several students openly stated that it caused them to reflect critically on their own essay, something they had not tended to do previously.

In summary, peer-assessment of final year written work benefits both students and staff.

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