Managing networked learning environments for health via XML databases and Zope

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ABSTRACT

A networked learning environment to support health education in five institutions was developed using XML, SQL and object databases and Zope. Paragraphs from curriculum documentation, communication tools and learning resources are assembled dynamically from distributed databases (with distributed authorship) into a unified student portal. Information can be dynamically reconfigured for different kinds of output. This paper describes the technologies and processes used to drive the printed word from web based databases.

Keywords

Networked learning environments, VLE, Zope, Medicine.

1. INTRODUCTION

Standard web based technologies of XML, SQL and object databases, Python, Perl and Zope[1] were used to develop and deliver a 'networked learning environment' in three medical schools and two related programmes (subjects allied to medicine and biomedical sciences) in the United Kingdom as part of a project funded by the higher education funding councils for England and Northern Ireland.

Learning in health-related subjects is under pressure from increasing numbers of students, reduction in the burden of factual knowledge in favour of evidence based and communication (vocational) skills, and increasingly distributed 'geography' for learning. In order for staff and students to adhere to a centrally planned curriculum it is necessary to deliver curriculum documents and resources, including problem based learning cases, from and to a variety of distributed locations[2],[3]. In addition, medical students are increasingly 'shared' between one or more higher education institutions and the NHS.

The flexibility of this home-grown approach facilitated delivery of existing curriculum documentation (much of which contained complex structure and formatting) and facilitated the upkeep of information in the on-line version by the primary owners. Curriculum documents no longer exist as a single word processed files and printed versions are dynamically derived (in PDF) from distributed databases via the web-based version.

2. METHOD AND RESULTS

The use of XML, databases, Python, Perl and Zope allowed for the integration of information and communication tools[4], access to learning resources, self-selection, self-assessment and feedback (currently being adapted to include personal and academic reflective records of achievement and problem based learning). Prior experience of learning support systems indicated that the method needed to adhere to five simple principles:

- replace administratively-heavy processes with accessible, flexible and accurate tools;
- enable rapid prototyping and discardable interfaces;
- utilize data available from existing sources (e.g. student record), and dynamically manage information in distributed relational databases;
- distribute maintenance of information to the information owners by providing authenticated on-line editing;
- achieve the above with minimal training requirements for staff and students.

The interactive on-line curriculum (Figure 1) was based on databased versions of degree programme handbooks and module study guides which were initially structured using styles in MS Word in order to aid navigation when represented on-line, and provide contextual information about the item of information being translated. The guides were translated and uploaded into a relational database using XML as a translation format.

Figure 1. A list of available first year study guides are illustrated on the left, resources and events/news on the right. Access to other tools are available from button bars.

Documents are generated dynamically from multiple databases and the content delivery system creates some links from linkbases[5] (Figure 2). Searches retrieve specific paragraphs (rather than whole web pages) and can be either free-text or based on XML tags, enabling users to create a tailored document containing, for example, just the reading lists from all of the first year study guides.

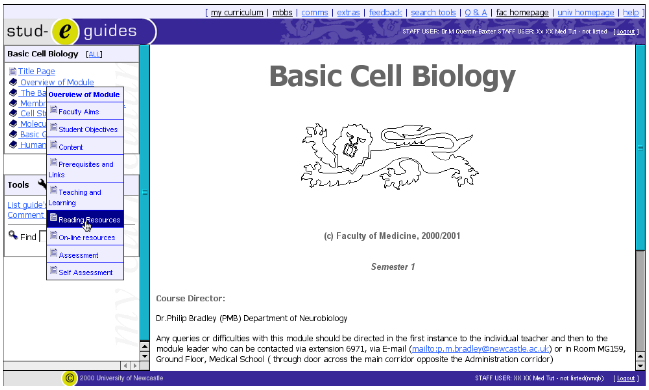

Figure 2. Paragraphs of text with XML descriptions are the basic building blocks. Links are automatically included from linkbases.

Areas designated to house learning resources (such as handouts, slides, animation, URLs and courseware) are owned and maintained by geographically dispersed staff using web forms and 'file upload' (Figure 3). Some meta-data is added dynamically to uploaded resources which increases the precision of searches e.g. all resources associated with first year 'Basic Cell Biology'. On-line self-assessment questions can be modified directly by staff.

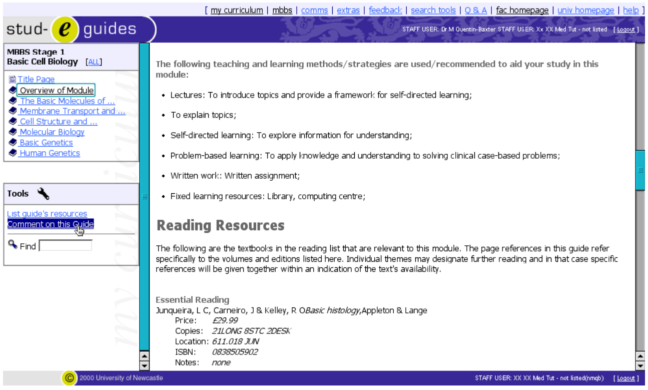

Figure 3. The text on this page is composed of information from distributed document and reading databases which are maintained 'owned' by different people. Context-sensitive links to student support and feedback appear on every page.

Documents are displayed using CSS which enables them to be presented differently according to, for example, the capabilities of the browser or whether the output is destined for web or PDF (Figures 3 and 4).

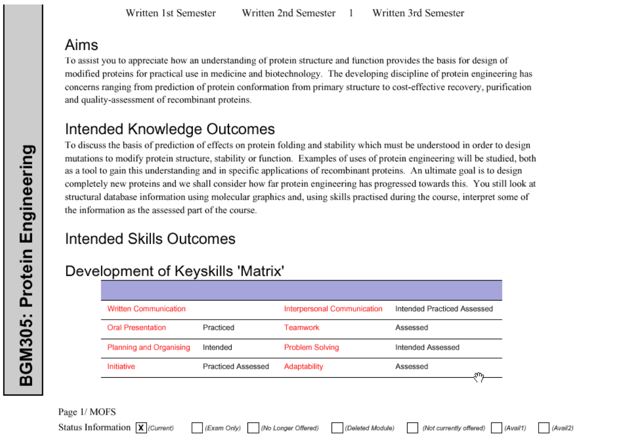

Figure 4. Documents with complex formatting (superscripts, extended ASCII character set and images) can be output to Web or PDF pages.

3. CONCLUSIONS

The use of non-proprietary software enables the content of the databases to be re-purposed and re-sited easily and link in with new features, such as reflective personal development plans. The use of IMS is being investigated in order to facilitate data exchange with other systems. The unified student portal has grown with the addition of information types which increases the navigation options and adds considerable value to the overall experience.

4. ACKNOWLEDGMENTS

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5. REFERENCES

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