

Implementation and Student Assessment of Intranet-Based Learning Resources

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The recent development of Web browsers and tools has enabled the wider use of the Internet for learning and teaching. Such developments have also provided effective methods of information management within institutions through the establishments of Intranets. Within the School of Pharmacy and Biomedical Sciences, University of Brighton, UK, the use of the Intranet has been extended to provide an integrated learning resource to enhance the quality of pharmacy education. The Pharmacy Intranet was developed as a learning support management system for module courses across the Department providing course information, directed access to Internet-based learning support material, academic lecture notes, links to relevant computer aided learning (CAL) packages and worksheets within a structured framework. Electronic monitoring of Intranet usage and subsequent questionnaire-based evaluation demonstrated that the Intranet was deemed to be a useful learning resource, empowering students to take greater responsibility for their own learning.

INTRODUCTION

Background

There has been a gradual increase in the use of material from the Internet (World Wide Web, [WWW]) in Pharmacy-related teaching, with applications including universal distance-learning(1), specific courses with Internet learning resources as part of the course material (2) and Internet databases being linked into appropriate coursework(3). Such growth is bound to be linked to the ability and attitude of students with respect to the use of electronic learning media, and several workers have commented on the need to train students in the use of Information Technology (IT) and its application in the classroom(4,5).

What is an Intranet?

Intranets originated from within industry(6) and are fairly new to Higher and Further Education. Blackmore(7) reports on the introduction of a general Intranet within Wirral Metropolitan College, UK, and comments that it has provided improved student and staff access to Internet-based and in-house generated learning resources.

An Intranet can be defined as: "any network which provides similar services within an organization to those provided by the Internet outside it but which is not necessarily connected to the Internet."(8) The most common example is the use of one or more World Wide Web servers on a network for distribution of information within a company. This might include regional company news, the company on-line library, and employee information, which is only accessible to staff, and not by external users. Due to the availability of inexpensive or free commercial browser and Web server software, Intranets have become a major growth area in corporate computing. This allows a simple, uniform hypertext interface to many kinds of information and application programs. The School of Pharmacy and Biomedical

Table I. Typical module page contents

Subject area
Module Page
module outline/overview/welcome
staff contact details/e-mail link
timetable, electronic noticeboard
lecture notes (learning support material)
past examination papers/practice questions
links to other sites
Computer Aided Learning (CAL) packages

Sciences, University of Brighton Intranet is a computer based learning resource for students which is intended to empower students to take greater responsibility for their own learning strategy, and to increase access to learning resources.

Components of the Department of Pharmacy Intranet

This School of Pharmacy offers BSc Pharmacy and a new MPharm, as well as a group of courses under the heading 'Modular Science Scheme' (MSS). MSS courses include BSc Pharmaceutical and Chemical Sciences, BSc Biomedical Sciences, and BSc Biological Sciences. This paper focuses on the MPharm. course which currently has only first year students of which there are 103.

The Developmental Intranet is therefore divided into a hierarchy reflecting these separate subjects. Each Degree course consists of modules, with each module having its own Web page. Each Module Page is divided into separate sections the contents of which are in keeping with the general scheme shown in Table I.

Figure 1 shows the Pharmacy Intranet Welcome Page, which the student encounters after logging in through the protected gateway. The Intranet has been designed with its own identity separate from the Departmental Internet Page, and it presents a user-friendly interface. Students can then select the relevant course. Figure 2 shows the main MPharm.

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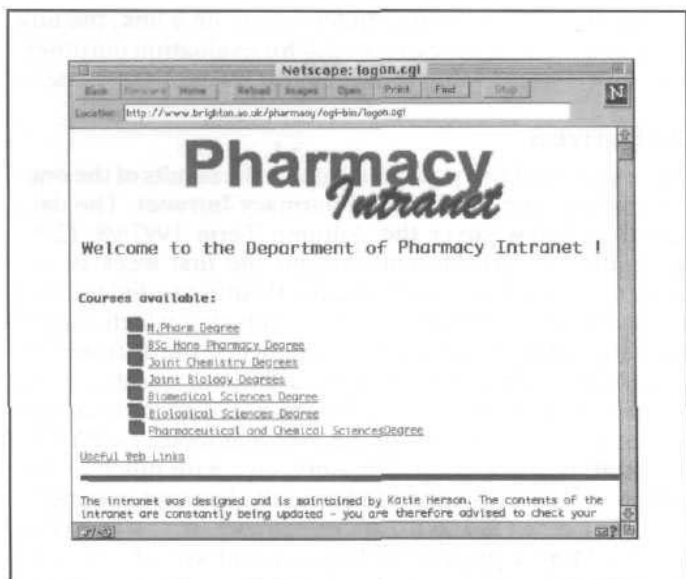


Fig. 1. Pharmacy intranet welcome page - screen shot

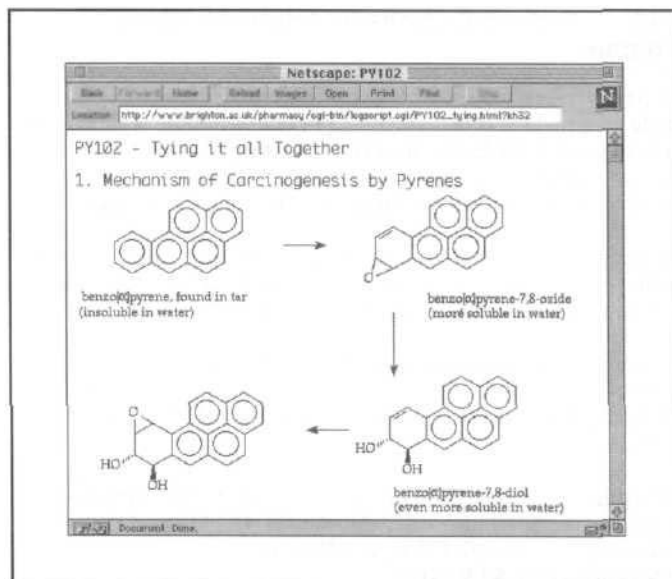


Fig. 3. Pharmacy intranet PY102 lecture page - screen shot.



Fig. 2. Pharmacy intranet MPharm Degree menu page - screen shot.

Menu Page. Past examination papers can be accessed from this page and downloaded. Students can access the appropriate module link for further menu/content pages as indicated in Table I. Figure 3 shows the start of one of the later sets of lecture notes downloadable for the module PY102, 'Fundamentals of Drug Molecules'. PY102 was one of the primary modules used as an Intranet-based teaching model. Clearly, graphics such as chemical structures can easily be integrated into Intranet content.

Why Establish an Intranet?

In recent years there has been a change in the perception of universities in the United Kingdom, both in terms of being service-providers and students as service receivers. Particularly, in 1997, the Dearing Report was commissioned by the UK Government to look at all aspects of Higher Education(9). Two of the recommendations of that report are relevant to this work: (i) that IT should be an integral part of the learning strategy of all students; and (ii) that all

students should contribute £1000 (U.S. \$1,600) per academic year toward their tuition fees. This has created a greater sense of "customer awareness" on the part of students. Independent of this development, the way in which British universities are funded is beginning to include measures of teaching quality in the form of Teaching Quality Assessment (TQA) exercises, and additional technology-led learning resources are part of this School's strategic drive toward TQA. External forces notwithstanding, it was this School's intention in building an Intranet to provide better service to its students, and introduce a new wave of value-added technology-based learning resources which enables them to take greater responsibility for their own learning. The Intranet has the added advantage that many of the resources are pre-existing, and additional resources have been procured at little or no cost. These include the University's Web server, the Departmental Web site, and Web implementation competence.

Intranet Versus. Internet

The Intranet has several advantages over the Internet as a learning resource; they include:

- software licensing - links to licensed software can be made available to all registered users without copyright violation;
- bespoke learning management system - as opposed to general Internet resources, the Intranet material is tailored specifically to the students' courses, with material originating from their educators;
- confidentiality - educators' learning material is available only to internal, authorized users.

Process of Establishment

The School of Pharmacy had an existing WWW site on the University Web server and the Intranet became an extension of this. A private area was set up on the server to only allow access from restricted IP (Internet Protocol) addresses; those within the University and those dialing into the University. Software was written to record usage of the site.

In August 1997 the structure for the site was decided upon following discussions with key teaching and Web

Table II. Technical details for Intranet logging program

All page requests to the Pharmacy Intranet are logged by a single script which is called with a parameter telling it which web page to view and who the user is. If the script is called without the <user> part then it displays a 'please enter your name' form to collect it, before passing them onto the requested page.

The script reads in the desired page, goes through it looking for all the 'hrefs' to local pages and changing them to call itself + pagename + username, before writing it back to the user.

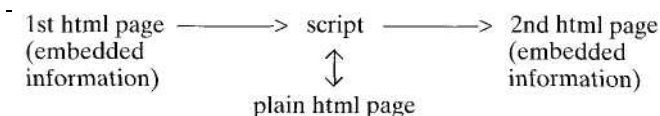
The script is called using the form `http://htmlroot/cgi-bin/<page>?<username>`. The script will look for the page using the `htmlroot`, where `htmlroot` is the filepath to the HTML documents.

The <page> part comes through in the `PATH_INFO` environment variable `$pathinfo = $ENV{'PATH_INFO'}` and the <username> in the `QUERY_STRING` `$user = $ENV{'QUERY_STRING'}`.

The script then change the hrefs from 'page1.html' to '/cgi-bin/page1.html?<username>'.

The script then logs the data to the log file specified which is a plain text file.

This process can be seen diagrammatically as:



The script is written in PERL running on a UNIX web server.

development staff. Suitable material (see Table I) was requested from teaching staff members. Content arrived in many forms and was converted into HTML (Hypertext Markup Language) and GIF (Graphics Interchange Format) files. Material in Microsoft Word 6.0™ can be easily converted to HTML using Microsoft Internet Assistant™, whilst other material required manual conversion.

The converted files were transferred onto the site and the path names adjusted. As the term began (September 1997), students were trained in the use of Internet/Intranet software. As the term progressed, material was continually added and updated.

Intranet Usage Monitoring

Intranet usage by students is monitored using a logging program. Before accessing the Intranet the students are required to enter a valid username. This username is logged to a text file and the Welcome Page is displayed embedding the script location and their username into each link on the page. As they request a link by clicking on it, the script is called which logs their name, date, time and page requested and then generates the next page, again embedding the script location and their name. This can be seen in the location bar on Figures 2 and 3 where "kh32" is the student username. The pages themselves are all written in standard HTML, which means they can be produced by anyone with basic HTML knowledge.

In effect, every time a student clicks on a link, the link name and their name are recorded for evaluation purposes. A technical note (Table II) is included for Web developers.

OBJECTIVES

The objective of this paper is to report the results of the one-term induction period of the Pharmacy Intranet. The data described below cover the Autumn Term 1997/98, (29th September to 12th December) plus the first week of the Christmas vacation for comparison. Results are divided into two sections: (i) Intranet usage monitoring which logged students as they browsed the contents of the Intranet by monitoring their logins; and (ii) a 22-item questionnaire completed by the first year MPharm intake on their experience of the Intranet. One of the first year modules, PY102, was used as a model for Intranet usage with much of the learning material being posted onto the Intranet in parallel with lectures. Educators' overhead acetates were downloadable in advance of lectures, and worksheets, past examination papers and practice questions were posted exclusively on the Intranet.

RESULTS

Intranet Usage Monitoring

The Intranet ultimately consisted of 189 separate pages, which were accessed a total of 13,550 times over the study period. Figure 4 shows the total daily access count for all pages. Predictably, the access counts are low at the beginning of term when the Intranet is coming on line, as there were not many pages present. The apparently anomalous peak at 02/10/97 is due to the Intranet training session of the then 103 MPharm students. The highest peaks around 11/11/97 correspond to the run-up to an MPharm PY102 Phase Test (a multiple choice answer test which contributes 17 percent to the overall module grade). The dates indicated on the abscissa correspond to Mondays. Weekends can clearly be seen as troughs, with some students still accessing remotely or coming in to use University computers. The underlying increase from 04/11/97 to 09/12/97 reflects the demand-led addition of material to the Intranet, where the initial supply created further demand as students began to see the potential of this learning resource.

Figure 5 shows total daily page count for all pages with the PY102 proportion shown in white. It can clearly be seen that PY102 makes up a high proportion of total daily accesses.

Figure 6 is designed to show that of the PY102 pages, Lecture Pages were those that were being accessed most. Broadly, there were two types of Intranet page; Menu Pages which allowed students to navigate through the module, and Content Pages which dealt with administrative aspects of the module (timetable, learning contract, staff contact details etc.) as well as course material (links, access to CAL packages, downloadable lecture notes etc.). Figure 6 shows the total accesses to PY102 Content Pages, with the accesses to lecture notes shown in white.

MPharm Students' PY102 Questionnaire Results

A 22-item questionnaire was distributed to the first year MPharm students which solicited answers with respect to the Intranet in general, and then more specifically with regard to Module PY102. Of the PY102 students, 103 started the degree, and 99 completed the questionnaire at the end of

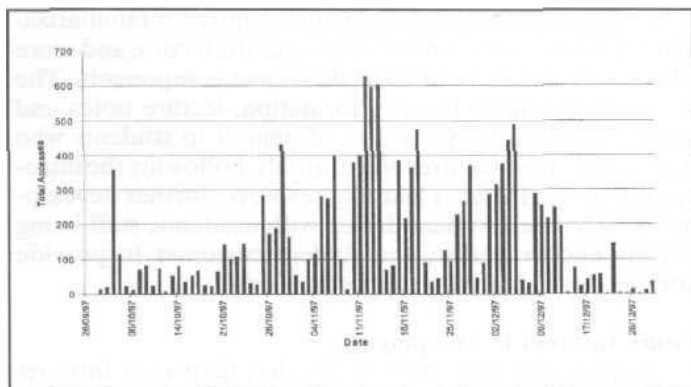


Fig. 4. Total daily intranet accesses

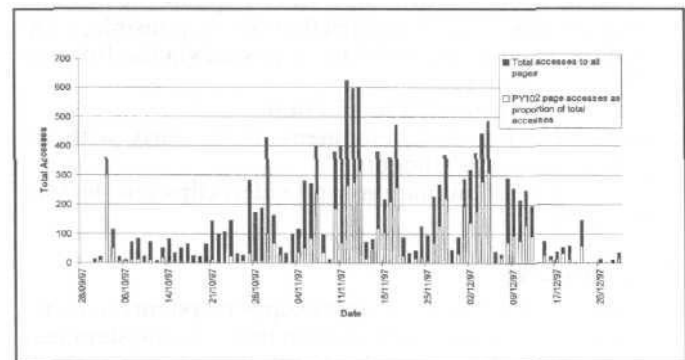


Fig. 5. Daily PY102 page accesses as a proportion of total page accesses.

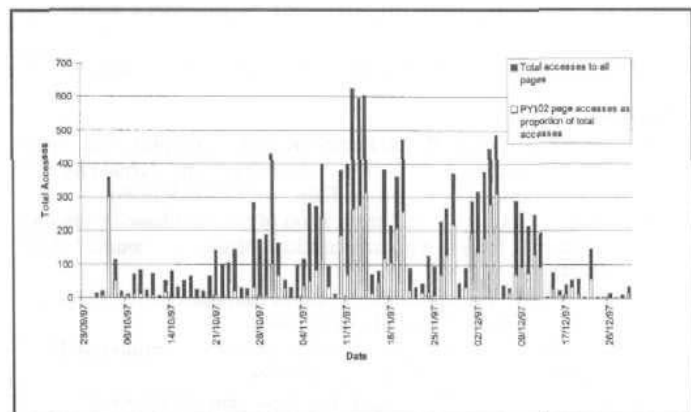


Fig. 6. Daily PY102 lecture page accesses as a proportion of total PY102 content page accesses.

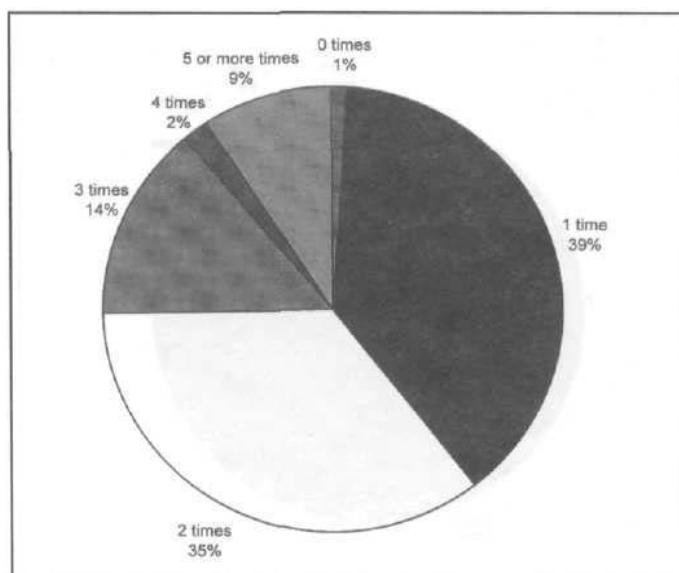


Fig. 7. Average number of times intranet accessed by students per week (n=99).

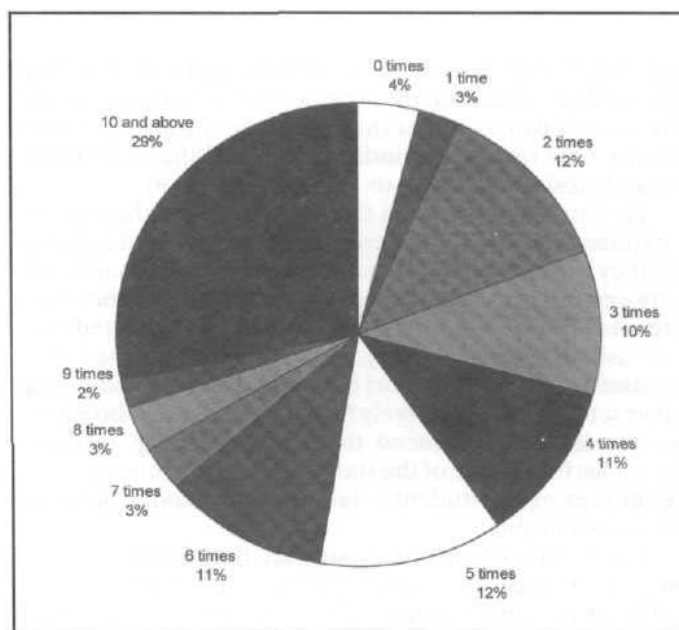


Fig. 8. Number of times students accessed the intranet to download lecture notes (n=99).

the Intranet induction study. Since only eight percent of students had previously used the Internet routinely, and 62 percent had no experience at all (not shown), training on this type of learning resource was clearly requisite - any department looking to emulate this undertaking must bear in mind the consequent resource implications. Such training would however satisfy the need for Internet as well as Intranet competency.

Intranet accesses increased steadily from zero (when there were few relevant pages). All respondents except one stated that they used it at least once per week (Figure 7). Once per week should be interpreted as meaning one Intranet session per week, which involves looking at, perhaps, several sets of notes and Intranet noticeboards. The time per session depends of course upon the content.

One of the objectives of establishing the Intranet was to provide a learning resource. Course evaluation data show that many students find the co-requisite tasks of writing notes and listening to what is being said in lectures difficult, and that they can miss key points. Access to copies of educators' overhead projection texts was allowed via the Intranet to address this issue. Figure 8 shows the relative numbers of student availing themselves of this facility, with four percent of students not using it at all. Moreover, of those students who did download lecture notes, 62 percent (not shown) did so at least once before the relevant lecture. Thus, there appears to be a preparative aspect to having these resources on line.

One concern raised by teaching staff was that the Intranet would be seen as an alternative to attending lectures, and that some students would download notes rather than at-

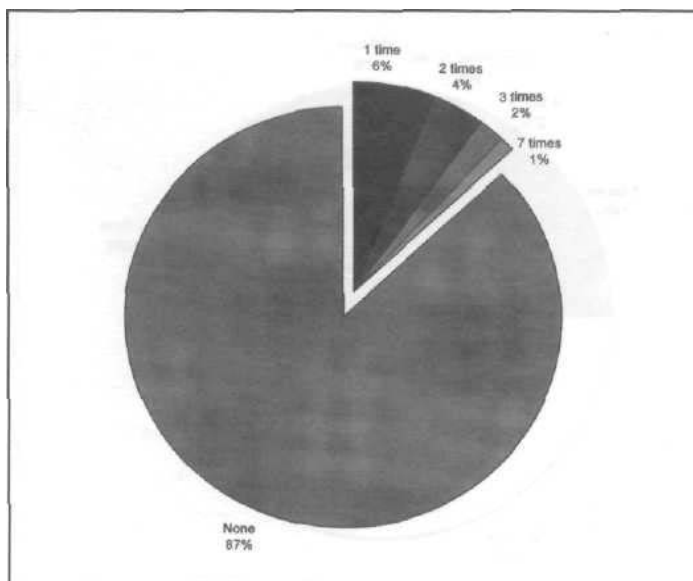


Fig. 9. Number of students who downloaded lecture notes instead of attending the lecture (n=99).

tend. Thirteen percent of respondents said that they had done so at least once. Of these respondents, 10 had done this only once or twice - rather than using the Intranet in lieu of lectures. One respondent indicated that he/she had done so routinely instead of going to lectures (Figure 9).

To distinguish between the inquisitive and the acquisitive student, respondents were asked if they valued material that they had downloaded themselves more than handouts. Forty-one percent said that they did, 55 percent did not, four percent didn't know (not shown). Those who indicated 'yes' were asked to explain why; the answers indicated that investment of time and effort by the students into obtaining a clear set of notes, effectively from the educator who was to give the lecture, enhanced their 'stakeholding' in those notes. This fulfills one of the stated aims of the Intranet, that of empowering the student to take greater responsibility for their own learning.

The results of the study suggest that Intranet-based learning resources have an important role in improving the quality of pharmacy teaching by providing an integrated interface by which students are able to access learning support resources. Students, as purchasers of higher education, will undoubtedly apply more pressure in the future for academic staff to improve the quality of the learning provision within courses. The Intranet provides a means by which academic staff can effectively manage the students' learning by ensuring that students are directed to appropriate learning resources including Web-based material, computer aided learning packages and other references. The provision of lecture notes on the Intranet encourages student ownership

of lecture support material, an opportunity for familiarization of lecture content prior to the specific lecture and more efficient assimilation of didactic course components. The provision of course based information, lecture notes and notices on the Intranet is also of benefit to students who unavoidably miss lectures and tutorials. Following the introduction of this Intranet learning resource, further developments have been student driven with academic staff being actively encouraged by the student customer to provide Intranet-based learning support material.

Future Intranet Developments

- empowering educators to develop their own Intranet pages and therefore encouraging Module Page 'ownership'
- training educators to independently update the Intranet pages for Modules for which they are responsible, without the need for material to be posted via the Intranet Development Team
- increase student/staff interaction
- distance-learning development, particularly with regard to overseas students
- integration of animations and video clips into lecture material

CONCLUSIONS

The use of Intranet-based learning support systems is clearly an acceptable means of providing an integrated system that can be developed sequentially as resources become available. On the basis of the results of this study we would recommend the development and adoption of Intranet-based learning support systems as a means of improving the quality of pharmacy teaching in other Schools of Pharmacy.

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