

Improving access to and use of digital resources in a self directed learning context



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This paper presents the background to and progress of a project investigating the use of courseware and other digital resources by undergraduate medical students in a self-directed learning environment (shared open-access computing space) within a problem-based curriculum. The investigation draws on three parallel streams of data collection; automated usage monitoring, survey and focus group. Over 60,000 individual computer sessions and more than 500 surveys are currently being analysed. Preliminary analysis reveals that only a small percentage of the available courseware resources are regularly used, and that the level of usage appears to be highly dependent the level of promotion and support provided by teaching staff. Analysis of Internet usage data reveals that medical students rely heavily on Google and Wikipedia to locate and access self-directed learning resources and that they are relatively unsophisticated in their use of search tools. The results of the investigation are informing the design and development of an innovative software support tool that aims to improve students' awareness of and access to a wide range of digital resources.

Keywords: usage monitoring, self-directed learning, social bookmarking,

Project background

This paper reports on an ongoing project that investigates undergraduate medical students' use of 'courseware' and other digital resources to support self-directed learning activities within a problem-based curriculum. It is being carried out a large Australian university that has invested heavily in educational technology to support and enhance teaching and learning across all curricula in recent years. The university's medical faculty has been a major recipient and participant in this investment, which among other things has seen the development of numerous innovative courseware resources to support the delivery of discipline-based knowledge in content areas that students consistently misunderstand or have difficulty with.

While several courseware resources can be purchased (at low cost) by student on CD-ROM for use on personal or home computers, most can only be accessed via computers located in various shared computing spaces throughout the faculty and its allied clinical schools. Some of these courseware resources are occasionally timetabled as instructor-led 'laboratory' sessions, however they are more typically used by students in a self-discretionary, self-directed manner, with or without recommendation by teaching staff.

We have been investigating students' use of selected courseware resources since 2000, using an automated data collection system developed in-house (e.g. Judd & Kennedy, 2001; Judd & Kennedy, 2004; Kennedy & Judd, 2007). In 2005 these investigations were extended to include monitoring of the day-to-day use of all courseware and other digital resources, including websites, within our faculty's two main student computer laboratories (hereafter referred to as the Student Computer Resource Centre or SCRC). Analysis of these data revealed that students' level and degree of use of individual courseware resources ranged from minimal and superficial to frequent and intense (Judd & Kennedy, 2005). Although we did not at that stage have access to student login data, our analysis of the usage data indicated that less than 20% of courseware resources attracted widespread use (accessed by more than half the relevant student cohort) while almost two thirds of all resources attracted little use (accessed by fewer than 10% of the relevant cohort). It was clear that despite the high levels of financial and intellectual capital invested in developing these resources, many were being routinely under-utilised or overlooked by students.

The reasons why medical students did or did not use particular courseware were not investigated at that time. However, the extent to which particular courseware resources were used by students could have reflected a range of educational issues particular to their specific curriculum context. Some of the factors

that may have impacted on resource usage include workload pressures on students, the extent to which resources were promoted or recommended by teaching staff, the degree to which resources were explicitly aligned with curricula, and the perceived importance or quality of resources. Developing an understanding of why students choose to use (or not to use) particular courseware resources is critical in any attempt to maximise the potential benefits of educational technologies.

The current research and development project was designed to examine the degree to which medical students use courseware and other digital resources in their self-directed learning and to determine why they use (or don't use) particular resources. It also seeks to assess the association between students' use of courseware use and their perceptions of workload, understanding of expectations, and overall satisfaction with their learning experience. The results of these investigations would then inform the design and development of a software tool or tools intended to improve students' access to and use of courseware and other digital resources within self-directed (and problem-based) learning environments.

Project methodology

The research component of this project employed three streams of data collection:

- automated software-based usage monitoring,
- survey, and
- focus group.

The usage monitoring involved the installation of a custom-built software agent on 80 shared computers across our faculty's main computing laboratories and small-group tutorial rooms. The software agent was an enhanced version of the one described in a previous study (Judd & Kennedy, 2005), with specific improvements including:

- the ability to capture users' login names (to allow us to identify individual computer sessions as belonging to medical or 'other' students and to identify which cohort medical students belong to),
- the ability to capture the title and url (or filename) of the active window of the active application. This data is captured whenever the user shifts focus between windows (whether within or between applications) or the title, url or filename of the active window changes.

A three-page questionnaire ("Computer-based resource usage survey") was implemented across all 2nd (n=296) and 3rd (n=308) year medical students. It included sections on:

- demographics,
- where and how often students accessed computers to support their studies,
- how often and for what purposes they used the computers in the faculty's main shared computing space (SCRC),
- how useful and reliable they find various web sites students commonly use to locate and/or access information or resources and,
- justification for and ratings of the use of specific courseware resources.

Three focus groups were conducted with 2nd year medical students, exploring a range of issues and themes arising out of our preliminary analysis of the usage monitoring data and questionnaires.

The usage data is being analysed from both resource- and user-centric perspectives. A subset of courseware resources, ranging from low to high levels of use, have been identified and these will be individually assessed in an effort to identify both intrinsic and extrinsic characteristics of their content, design and delivery that might help explain their patterns of use by students (e.g. size, scope, educational design, technical design, ease of use, content alignment with key stages of the curriculum, explicitly recommended resource by staff, etc). Various exploratory data analysis techniques will be used to examine individual- and group-based user behaviour including multivariate techniques such as cluster analysis or multi-dimensional scaling, and sequence analysis (Kennedy & Judd, 2007; Kennedy & Judd, 2004; Judd & Kennedy, 2004).

Preliminary results and progress

More than 73,000 individual computer sessions were captured during a 14-month period from April 2006. Of these, 84% took place in the SCRC. Fifty-eight percent of sessions were attributable to medical students and almost one in three of those sessions included access to the faculty's LMS. Virtually all (>

99%) of 1st and 2nd year and almost all (96%) 3rd year medical students used the faculty's main computing laboratory during the course of the investigation. The median frequency of sessions for both 1st and 2nd year students was about once per week, falling to about once per fortnight for 3rd year students. Approximately 90% of 2nd and 3rd year medical students responded to the questionnaire. Of the 2nd year students, 47% reported using the main SCRC "once or twice a week" which concurs with the actual usage data. These students also reported 'dropping in' to the SCRC to access the faculty's LMS (85%), email (78%), courseware resources (65%), the student portal (59%), other course-related resources (48%) and to search for course-related resources (41%).

A small number of students used the shared computers on at least a daily basis. The three most popular courseware resources (across all students) were used 7952, 2311 and 1303 times respectively but most others were used on fewer than 100 occasions. Medical students used Google to search for information (of any type) in 83% of sessions in the SCRC. Approximately 70% of those sessions included at least one Google search for course-related information. The corresponding values for Wikipedia were approximately 30% and 42% respectively. Medical students accessed the university Library in only 8% of sessions. Very few students used advanced searching techniques (e.g. boolean constructs) to locate information.

These results are informing the design and development of a prototype software support tool that will be implemented during 2008. The tool will include a range of functionality organised around four main contexts of use (of digital resources) – learning, general, personal and shared – designed to accommodate individual students' needs and their immediate curriculum context. That is, the tool will be able to be customised *for* individual students (based on their membership of a particular student cohort and records of their previous resource usage) and *by* individual students (based on their immediate and past personal preferences).

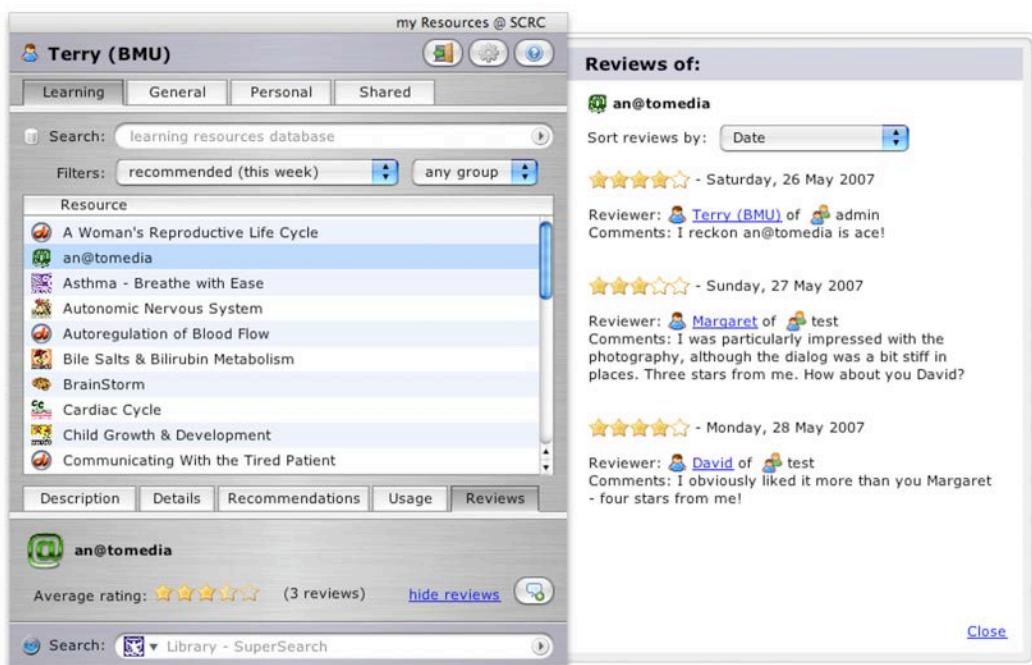


Figure 1: Prototype software support tool: review section of learning resources component

Learning resources

The learning resources component of the tool will enable students to search across a range of sanctioned learning resources, comprising standalone courseware, documents and websites. Information on each of these resources is stored in a networked database and will include:

- general information about the resource (type, location, keywords)
- a detailed description or abstract of the resource
- specific recommendations of the resource by staff, including who the resource is recommended to and when the recommendation is in effect
- usage statistics for the resource
- user (student and staff) submitted reviews of the resource

Students will be able to conduct a keyword search across all resources in the database, filtering the results on the basis of recommendation and usage. They will be able to view any of the above information for all of the found resources (and/or contribute a review) and to launch or open any resource directly by double-clicking its icon. Students will also be able to conduct site-specific web searches for a number of pre-defined sites (e.g. Google, Wikipedia, the university Library) from within this section (this facility will be available within all sections of the tool).

General resources

The general resources component of the tool will provide access to a range of general-purpose applications and websites. These will include the kinds of applications students require to access resources and create documents (e.g. web browsers, pdf viewers, word processors, media players) and frequently visited university websites (e.g. university home page, library home page, student portal, LMS login).

Personal resources

The personal resources component of the tool will fulfil two main roles: to provide students with individualised usage statistics and to enable them to bookmark and organise their own collection of resources. The usage statistics will be presented as either a simple 'recent items' list or on the basis of the student's actual usage over the course of the year. The bookmarking facility will be modelled on social-bookmarking services (see Hammond *et al.*, 2005). Students will be able to bookmark websites and local or networked documents and applications by either dragging and dropping a url, link or file icon onto the bookmarking tool or by clicking an 'add bookmark' button within the tool, which will interrogates the user's active application and document and, if possible, extracts its title and url or file path. While students will be able to designate individual bookmarks as private, new bookmarks will be public by default allowing them to be searched by all students on the basis of the keywords or 'tags' that have been assigned to them.

Shared resources

The shared resources component of the tool will provide an interface for students to conduct keyword searches across the corpus of public bookmarks. By selecting a returned resource, the user will be able to view a list of users that have bookmarked the resource along with any notes they may have added and the keywords they have tagged it with.

Implementation schedule

We plan to complete development of the software support tool by early 2008, ahead of testing and implementation during semester I, 2008. The tool will be installed on the majority of the shared computers within the main building of our faculty, covering some 180 computers across the two main computing laboratories (50 and 100 workstations respectively) and small group tutorial rooms (30 workstations). In the first instance it will only be available to medical students (the tool will automatically load if the user's logon details identify them as such) but subject to the results of a planned evaluation in the second half of 2008, may be extended to other biomedical students. The development of a 'portable' version of the tool, which can be installed on students' own computers, will also be investigated. Evaluation of the tool will be informed by interviews or focus groups of users plus a detailed analysis of actual usage (all transactions by users are logged by the tool's backend database).

Concluding comments

Our ongoing analysis of the 2006-07 automated usage data confirms the results of an earlier preliminary study (Judd & Kennedy, 2005) that self-directed courseware usage is patchy and highly dependent on the level of recommendation and support it receives from individual teaching staff. Moreover, despite our best efforts at designing engaging and interactive resources around constructivist principles (Jonassen 1988, Oliver 2000), if we are to use usage as a benchmark, students clearly prefer generalist encyclopaedic resources, where richness and diversity of content rather than learning design is front and centre. This finding is supported by students, particularly medical students, increasing reliance on Wikipedia ahead of more traditional sources of information like the library and specialist content sites. Through the development the software support tool described above we hope to raise the profile of less popular yet valuable courseware resources, and improve access to relevant digital resources generally. While there is an onus on students within self-directed learning environments, and problem-based curricula in particular,

to rely on their own skills and judgment to locate and use suitable resources to support their studies, not all appear to be either capable or willing to do so. By providing more detailed and accessible information about individual resources, including peer and staff reviews and recommendations within a single personalized interface, students will hopefully be in a much better position to locate resources in the first place and then assess their relevance and importance to the task at hand.

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