Integrating WWW into an on-campus laboratory-based teaching program

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Introduction

Structure of Second Year Psychology Program

In recent years, we have introduced a significant computer-based component into our second-year laboratory-based program in psychology at Monash University's Clayton campus. The program comprises two sequential semester units of thirteen weeks duration during which students attend four one-hour lectures and a four-hour laboratory class per week. The four lecture streams comprise two core units of study, one optional topic and a stream of statistics. The laboratory program complements the lecture topics, but is structured as a stand-alone program taught to three separate groups of students. The laboratory component of the course is labour-intensive to teach, and the use of the World Wide Web (WWW) described in this paper is centred on material presented as part of this laboratory program. Examples used in this paper will be taken from the first semester program, PSY2011. Hypertext links to this dynamic teaching site are unlikely to be valid beyond the end of 1996.

Previous use of computer software within our course

Computer-related activities have been designed as far as possible to make use of existing generalist software products, rather than specialist psychology software. This strategy is partly pragmatic (generalist products are readily available at no additional cost to our department), but is also driven by an educational principle that the skills we teach in the context of psychology should as far as possible be transferable skills. The types of "generic" and custom-written products incorporated into our laboratory program are listed below in Table 1.

Table 1. Computer products used in our Psychology Laboratory Program	
Generic Products	**Psychology-specific Custom Products**
- word-processing (Microsoft Word for Windows) - data analysis - spreadsheets (e.g. Microsoft Excel) - statistical packages (e.g. SPSS for Windows, Systat)	- custom-written software to run psychological experiments - electronic tutorial and testing

- email (Pegasus Mail)
- newsgroups (e.g. Trumpet Newsreader, Netscape)
- lecture materials (e.g. Microsoft Powerpoint, Microsoft Word for Windows)

programs
- a custom-written Statistics tutoring package

Most of our computer-related activities have been restricted to PC-based programs using a DOS / Windows standard student computing environment delivered from the University's centrally-managed Novell fileservers. Limited customisation for psychology students has focussed on providing menu systems and Visual Basic custom interfaces to guide students through specific tasks using standard software packages.

Trial use of Web materials in 1995

In 1995, we made our course notes available on the World Wide Web in addition to printing traditional hard-copy booklets and providing printed handouts for laboratory class exercises. The rationale was that the Web version of course material could be easily updated, and would have a "value-added" component of hypermedia links to Internet resources relevant to each course topic.

The possibility for timed release of background materials, instructions, and follow-up information was a major advantage of the Web as a content delivery medium compared with the traditional static hard-copy medium. In running our lab classes, there are often aspects of an experiment that are not revealed to students until after they have attempted to solve or generate something on their own or they have collected certain prescribed data. In some circumstances, the students themselves are acting as "naive subjects" in an experiment which they will later write up from the perspective of the experimenter. The data they analyse for these write-ups are the data they themselves generated or collected, and such data obviously can only be made available after the event. In most experiments, although the nature of the data can to some extent be predicted ahead of time, there are often idiosyncracies associated with running the experiment *that particular time* that may need detailed discussion or additional background material.

A further advantage of Web-based materials in a collaborative teaching environment such as ours (with parallel lab classes complementing a number of independently-taught lecture streams), is that course materials are open to scrutiny by colleagues. Conceptual and/or hypermedia links to other areas of a student's course both within and beyond psychology can be made readily by other staff browsing the course content. In the modern teaching environment, we are rarely directly exposed to the teaching practices of other staff, and so many opportunities for linking of content across units are missed. This collaborative teaching model could prove to be especially useful in cross-disciplinary areas of psychology, such as cognitive neuroscience, which spans psychology, physiology, philosophy, computer science and linguistics).

Issues arising from our initial Web trial

Difficulty of maintaining source documents

Our original concept was that a single source document would serve as the source for both our standard hard-copy booklets and HTML documents. HTML documents could be generated relatively automatically (e.g. using Internet Assistant or similar software) and then placed on the Web. However Web documents

generated from documents designed for printing do not always use the hypermedia environment effectively because they are inherently linearly structured. There is evidence to suggest that the least successful form of computer-aided learning is that which merely involves transcribing pages of printed text to electronic form (Welsh, 1993). However any structural change to the source document to tailor it for the hyperlinked Web environment entails that the HTML version(s) take on an independent life separate from the original source. This raises the serious problem of multiple source documents which need to be maintained.

Low student usage of Web during trial

The obvious educational advantage of Web-based courseware appeared to be its immediate availability to students in the latest form. Web-based material can be regularly updated and information can be presented in a manner that is responsive to student feedback and to the individual needs of any particular student group. Any errors or omissions can be remedied immediately and without costly reprinting of material, and additional material can be inserted in relevant places by hyperlinks when and where required. However, our students for the most part did not consider themselves to be computer-literate, and appeared to feel under enormous time pressure in their studies. So although they were happy knowing that there were up-to-date materials available to them, students rarely used them because it was easier to refer to an out-of-date hard-copy version in their hands. It did not appear to occur to them that accessing more up-to-date information would often have saved them time by clarifying difficult concepts and / or correcting errors and misconceptions.

Planned use of Web materials in 1996

As a result of the trial of the Web as a medium for delivering course material in 1995, we learnt two important lessons:

1. that authoring for the Web is inherently a different process than authoring for the print media

2. that providing a hard copy of Web-based materials will result in students using the hard copy rather than the Web, even when they "intend" to do otherwise.

As a result, we opted to construct our laboratory program material for 1996 specifically for the Web (assuming that students would access the Web using Netscape 1.2, the Web browser currently provided by Monash University for its standard staff and student computing environment). Details of overall course structure and lecture details were printed in a course booklet given to each student in the first lecture as usual, and this material was duplicated on the Web as happened in 1995. However, only the laboratory class timetable was included in this printed manual, along with a URL for the course home page which linked to the [full laboratory program on the Web [HREF 2]](#).

This paper examines the design of our course web site along with the perceived benefits and potential pitfalls of this approach. It should be kept in mind that *at no stage have we conceptualised our Web material as replacing face-to-face teaching*. Rather use of the Web allows us to use face-to-face (class contact) time more effectively. In addition, use of newsgroups (a key feature of our use of the "internet", although not strictly part of the WWW) allows for asynchronous "face-to-face discussion" which serves to enhance our real face-to-face discussion.

Design of our Web Site

Navigational concerns

The Home Page for our Web site [HREF 3] is a welcoming page describing the generic layout of Web pages and providing links to Internet tutorials [HREF 4] provided by Monash University library staff. It then describes the specific resources available through the page to students in the course (PSY2011). Once students become familiar with the contents of this page, they want to navigate to relevant material quickly. To facilitate navigation, we have a Quick Index at the top of the page (a design suggested by N.Bailey of Monash University's Computer Centre [HREF 5]). This Quick Index has links to the things that students most commonly need to access for their course work and has improved user-friendliness of the Web site considerably.

In order to reduce the possibility of the "lost in hyperspace" phenomenom (Neilson, 1990), we wanted to set our Home button to be our course's Home Page. However, due to constraints of our student computer network, we had to settle for a Home button setting that returned to a menu of Psychology undergraduate resources [HREF 6]. It should be noted that this transparent customisation of the Home button can cause difficulties for computer novices who are using the same Web browser for subjects other than psychology. The difficulties arise because the Home button works differently depending on the subject context in which they are working. "Mysterious things", such as standard buttons behaving differently for reasons beyond a student's control or understanding, can lead to feelings of incompetence in using computers. We therefore spend time emphasising navigation proficiency in Netscape (using the Forward / Back buttons, the View History option, bookmarks and the Home button), and we try to explain the concept of hyperlinks so that students come to understand what is actually happening when they "click on the blue bits". The value of customisation is that students can complete set tasks without extra help, and the positive reinforcement from using the computer successfully encourages them to try to understand the underlying concepts.

Design of content

We have tried to structure our pages such that the basic information for each laboratory class is readily available through obvious structured links within "conceptual neighbourhoods" (Eklund, Garrett, Ryan and Harvey, 1995). We have also provided further annotated links to other materials which provide background or related information. We have opted for separate documents where the background material is not absolutely required, or is assumed pre-knowledge so that we end up with as brief a linear document as possible, but with built-in cross-referencing and extra tutorial-style detail where appropriate. In some instances, we make use of tutorial material generated elsewhere - for instance, in our lab class on Behaviour and Heredity [HREF 7], we direct students to tutorial material on basic genetics from M.I.T and from the University of Texas. Further cross-referencing and tutorial material (e.g. weekly lab summaries) are added at short notice when required. In order to emphasise new material, new links are added at the top of each lab topic page e.g. Computer attitudes topic [HREF 8] with a sequence of added information.

Our prime consideration is to provide a minimalist framework for the traditional directed-learning "didactic" environment with which students are familiar, but at the same time to build in support for student-centred learning in both a topic-focussed (directed) and interest-focussed (non-directed) way. Our use of newsgroups (discussed in greater detail below) also has this dual aim of minimalist support for anyone to "ask the teacher questions" at any time, but provides additional support for students and staff to supply information, raise their own queries or issues and share their own perspectives on a topic.

Graphic design

We opted for a basic design using only standard HTML as far as possible (although we have used centred

headings and tables). In our 1995 Web trial, we attempted to pretty our pages with small graphics, however our 1996 pages have graphics only where required as part of the course content. For example, we have a table pointing to sample GIF files which are facsimiles of the experimental stimuli used for a Language Acquisition experiment [HREF 9]. We also have experiments such as the McCollough Effect [HREF 10] for which the visual stimuli are actually presented via the Web. We have specifically avoided background images, image maps as navigational tools, and custom-designed "pretty pages" as being distracting rather than professional. We assume that well-organised links and content will motivate our students to explore the learning environment rather than game-like or advertising-style features of our presentation. This strategy works well because most of our material is text-based and we have made "visual material" such as data files available to students via the student Novell network rather than the Web since the analysis software such as SPSS for Windows and Microsoft Excel are available through that medium only.

Interactive Forms (CGI scripts) for data entry

In addition to basic content, we used Perl CGI-scripts to generate interactive forms for collecting data for some experiments. For example, the Computer Attitudes laboratory topic included a standard survey for scoring computer attitudes, the Computer Attitudes Survey [HREF 11] (Loyd and Gressard, 1984). Our psychology students also generated their own new survey [HREF 12] after consideration of issues surrounding survey construction and factors influencing use of computers. The second survey is an example of a CGI script that could not be generated in advance of the class, and emphasises the need for technical support to be readily available at short notice, or for teaching staff themselves to have sufficient technical capability.

The CGI scripts generated forms, checked that data entered by students conformed to what was expected, and then emailed the data to a course account, from which information was extracted and processed. The email allowed us to track time and date of completion of work, and we also emailed a copy of each data set to the individual student as confirmation of their data submission. The CGI scripts did some basic checking of email addresses against class lists, but there was no serious attempt to authenticate users.

Newsgroups

Some psychology laboratory classes were designed around active discussion of critical issues of psychology material, for example each of the following topics resulted in focussed discussion via the newsgroups:

- Ethical Issues in Psychology [HREF 13]
- Drugs and Behaviour [HREF 14]
- Behaviour and Heredity [HREF 7]

The Netscape browser used by our students incorporates a newsreader and interprets hypertext links within news articles. We were able to place links in our Web pages to the relevant newsgroups, and we were also able to place links to our Web pages in news articles. This latter feature proved to be a very useful "noticeboard". New information added to the Web site could be readily accessed from a news post announcing its placement. Students with queries, and students encountering difficulties finding information could be pointed to the appropriate URLs via newsgroups.

Monash newsgroups are not currently carried by newsservers outside of Monash University so that discussion within the newsgroups can not be demonstrated "live". However, discussion was very lively with over 600 posts to the monash.psych.psy2011.labs newsgroup during the semester. The use of the newsgroups was useful to students because it was regularly monitored by staff, and it proved to be a very

newsgroups was useful to students because it was regularly monitored by staff, and it proved to be a very fruitful way of gaining information. In our experience, course newsgroups without appropriate nurturing by teaching staff carry very little traffic and contribute little educationally to a course. By contrast, our newsgroups provided a intellectual and social focus so that for a number of our students, psychology content became part of their daily routine in a way they had never envisaged.

Computer Laboratory Manual as a source of computer help

Our students come from a non-technical background, and it was our responsibility to provide sufficient support for them so that use of computers would not distract them unduly from the psychology content (the primary reason they took the course and our primary teaching responsibility). To this end, we provided a Web-based computer manual tailor-made for students of psychology operating within the Monash University student computer environment. The Computer Laboratory Manual [HREF 15] was designed for ease of navigation, making extensive use of Quick Index menus. It did not attempt to replicate or replace manuals for individual software packages but rather, attempted to supply basic information, from which students could "bootstrap" their learning.

Limitations / Concerns re Web courseware

Hypertext Mark-up Language as an authoring tool

It has been suggested by Pennell and Deane (1995) that HTML has benefits over other authoring tools such that

- it is modifiable by any wordprocessing package
- it is a language with few elements to learn
- updating and maintenance are easy
- references can be live links to material on the Internet
- Web search engines can be linked into courseware
- courseware delivery does not rely on tractibility of computer programmers
- many features of traditional academic genres can be retained

However our initial experience with HTML suggested that some of these superficial attractions of HTML require further analysis. There is certainly a learning curve associated with generating HTML documents and until recently, HTML editors for non-computer-programmers were not readily accessible. Although there are few HTML elements to learn, any sophisticated hypermedia environment needs to go beyond basic HTML for its implementation (e.g. HTML extensions, imagemapping, CGI scripts). Updating and maintaining a dynamic hyperlinked environment is not a trivial task when there are multiple links maintained by a variety of people many of whom are not even known to the courseware designer. Secretaries and / or clerical assistants would require extensive training to handle a multiply-linked Web environment and generally do not have the combination of typing, computer and graphics skills required to maintain a high quality Web site. Neither clerical nor computer support personnel have the requisite content-expertise to update a dynamic teaching environment, and in order to make use of the flexibility, responsiveness and currency of the Web as a teaching and learning environment, teaching staff themselves need to become technically competent to maintain their Web site, adding a significant preparation component to their teaching task.

Web as a platform

Reliability and access

The use of Web materials requires reliable access to the Web server. There need to be sufficient terminals and fast enough connection speed so that students do not lose interest before the pages they have selected are loaded. Access and reliability are always a problem with computing equipment, but it is likely that within the forseeable future many households will have their own private connections to the Internet through Internet Service Providers, making Web-based course delivery more attractive to both students and staff. In our particular situation, we chose to use a Web platform to overcome immediate practical problems of access and reliability of the Monash student PC network which, at the time of designing the course, could only be accessed by using an on-campus university computer terminal connected to the Novell network. One of the most important features of our use of the internet is the ability to link to course-related newsgroups, some of which carry discussion that is part of the student's formal assessment. Since Monash newsgroups are not carried on newsservers outside of Monash, students at this point in time cannot access this part of their course via commercial internet service providers. It should be noted that technology changes quickly, and service providers tend to respond to changing circumstances so current constraints may not be relevant in a few months or years.

Educational Issues

Quality of material on the Web

There are concerns that using the Web in teaching will ultimately be distracting because of the wealth of irrelevant, undesirable, or poor quality material that exists. Furthermore, as a means of containing potential the cost of internet traffic, it has been suggested that coursework should be restriced to preselected sites determined by the instructor. Such a conceptualisation of the Web would not conform to the educational objectives of our teaching program which emphasises independent student-directed, student-controlled research with the responsibility for content-selection and validation placed squarely with the individual student using the information. In using the relatively "new" internet as a standard part of the research environment for our students, we are in a position to emphasise certain aspects of research that are also relevant to the traditional information environment of the print media:

- reliability of the source of information
- authenticity of the information
- validity (theoretical and practical) of the material
- currency of the information

We ask that students make informed critiques of the material they find and especially that they check the sources of information. If no sources are given, we ask them to question whether the information can be considered reliable in any scientific sense of the word.

We also suggest that students record the source of information in a manner analogous to good library referencing. Netscape along with other Web browsers has the facility to store bookmarks, and in more recent versions of Netscape, these bookmark files can be annotated.

Directed learning versus free access to materials

A concern with placing material on the Web is the other side of the "availability" coin. Our course presents some information in a planned order and while the Web allows students to work through material at their own pace, there are certain points within each lab where we require students to "catch up to each other". It can be tempting for students to read ahead without having completed earlier segments of the course, and it is certainly educationally undesirable to allow students to "read the end of the story" before they have looked at the middle.

There are also the obvious copyright-related problems of making course materials available on the Web. However as our materials are an integral part of an intensive on-campus teaching program involving significant face-to-face teaching, we feel that the essence of our program is safe from plagiarism.

Student Feedback on Web courseware

We will conduct formal evaluation of our use of Web within our course, focussing on the requirement this year of retrieving information from the Web compared with the optional use last year. Informal feedback so far suggests that students are very happy with the availability of material through this medium, and in particular, enjoy the discussion available through the newsgroups. We are hoping that the fact that students have to start the Web browser regularly will place the internet within their conceptualisation of "work" rather than "novelty play item" and will lead them to consider other aspects of the internet and computers in general more favourably. The realisation that Web searches, Library searches, Document-delivery services and CD-ROM database searches can all be performed from the one workstation while browsing the course notes may allow students to develop a solid level of computer literacy without even realising it, leading to greater self-esteem and sense of self-efficacy.

Future Directions

We are considering in future years whether all our material should be Web based, including downloadable custom-written experimental programs and downloadable lecture material that is currently available only on the student Novell fileservers. There are rapid advances in software for Web development (Java, advanced / enhanced Web browsers, Internet Assistant for Powerpoint, etc) so possibilities appear endless. There are also advances in communications technology such that internet access from home is far more viable for all students.

However it should be emphasised that a major objective in designing our Web site is that it works reliably for the majority of students and is readily maintainable by the teaching staff of the course without the need for a fleet of computer consultants. To this end, we have actively chosen to stay away from "bleeding edge technology for tomorrow". We have very deliberately resisted anything too technically ambitious but rather have employed a range of fairly simple technologies in an effective combination to achieve our educational aims.

Conclusion

The Web can be used productively and successfully to enhance an on- campus teaching program to the benefit of both staff and students. The use of technology in this way enriches the educational experience, but does not reduce the resources required for teaching. Rather, it spreads the load differently.

However we should not lose sight of the fact that the primary focus of our particular educational program is *to teach the discipline of psychology*. Computer-aided enhancements to our course must in the first instance enhance our ability to teach psychology and secondary benefits of computer literacy for our students and "workplace skills" should not become the de facto driving force for restructuring teaching programs to the detriment of discipline-area content.

References

J Ekland, P Garrett, S Ryan and J Harvey (1995) "Designing the World Wide Web as an Educational Delivery Medium at the University of Sydney", ASCILITE Conference Proceedings, 12th Annual Conference of the Australian Society for Computers in Learning in Tertiary Education, pp. 132-137.

BH Loyd and C Gressard (1984) "Reliability and factorial validity of computer attitude scales", Educational and Psychological Measurement, Vol 44 pp. 501-505.

J Nielsen (1990) "Hypertext and Hypermedia" Academic Press, London.

R Pennell and EM Deane (1995) "Web Browser Support for Problem-based Learning" in "ASCILITE Conference Proceedings", 12th Annual Conference of the Australian Society for Computers in Learning in Tertiary Education, pp. 441-447.

JA Welsh (1993) "The Effectiveness of Computerised Instruction at the College Level: Five Suggestions for Successful Implementation", Behaviour Research Methods, Instruments & Computers, Vol 25, pp. 220-222.

Hypertext References

HREF 1
http://www.monash.edu.au/psych/staff/lzwise/index.htm - Dr Lisa Wise's Home Page.
HREF 2
http://www.monash.edu.au/psych/psy2011/labprog.htm - Outline and timetable for PSY2011 Laboratory Program with links to lab material.
HREF 3
http://www.monash.edu.au/psych/psy2011/index.htm - PSY2011 Course Home Page.
HREF 4
http://www.monash.edu.au/library/training/ - Monash University Library's Internet training courses.
HREF 5
http://www.monash.edu.au/~nate/ - Mr Nathan Bailey's Home Page.
HREF 6
http://www.monash.edu.au/psych/menu.html - A list of Monash Psychology Department's Internet Undergraduate Resources.
HREF 7
http://www.monash.edu.au/psych/psy2011/b-h.htm - Laboratory material for Behaviour and Heredity Lab Class.
HREF 8
http://www.monash.edu.au/psych/psy2011/compatt.htm - Laboratory material for Attitudes to Computers Lab Class.
HREF 9
http://www.monash.edu.au/psych/psy2011/wug.htm - Laboratory material for Language Acquisition Lab Class.
HREF 10
http://www.monash.edu.au/psych/psy2011/mccoll.htm - Laboratory material for McCollough Effect Lab Class.
HREF 11
http://www-cgi.monash.edu.au/cgi-bin/cgiwrap?user=lzwise&script=compatt.pl - Computer Attitude Scale CGI script for data entry.
HREF 12

http://www-cgi.monash.edu.au/cgi-bin/cgiwrap?user=lzwise&script=ca2011.pl - PSY2011 version of a Computer Attitude Scale, CGI script for data entry.

HREF 13

http://www.monash.edu.au/psych/psy2011/ethics.htm - Laboratory material for Ethics Lab Class.

HREF 14

http://www.monash.edu.au/psych/psy2011/drugs.htm - Laboratory material for Drugs and Behaviour Lab Class.

HREF 13

http://www.monash.edu.au/psych/psy2011/comp_96/ - Computer Laboratory Manual written specifically for Psychology undergraduate students.

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