

Learning Styles and Hypertext: Exploring User Attitudes

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Abstract

One hundred final year undergraduate students accessed reading material and tutorial activities in the form of hypertext documents with the Netscape browser and their learning styles were classified according to Kolb's (1984) four-way classification of Divergent, Accommodative, Convergent and Assimilative. It was expected that, in the same way that formal lectures and final examinations suit particular students, and hence particular learning styles, activities conducted in a hypertext environment would also be more attractive to particular learning styles. Surprisingly this was not the case. While a number of differences were found in attitudes to hypertext documents between male / female and full-time / part-time students, the only significant difference found between learning styles was a preference by students classified as Convergents to have printed course notes rather than hypertext documents. Initial conclusions from this study are that student attitudes to hypertext appear to be independent of learning style.

Keywords

Kolb, learning styles, hypertext, gender differences

1. Introduction

The use of hypertext documents through World Wide Web browsers such as Netscape is extensive now and set to become even more common in the future. During the last few years the '... Internet has become a very powerful information providing system' (Maurer and Schmaranz, 1994. p. 442). As an alternative to printed material, computer-based hypertext documents offer a number of advantages not the least of which is saving trees! From an educator's viewpoint, the practical advantages of a computer based system over traditional paper-based methods in an educational environment are significant (see Barnes, 1994; Butler, 1995) and the methods exciting. But what do students think about these systems? Observation suggests that students do approach the submission of computer-based material differently compared with traditional paper-based methods. If the World Wide Web is to be the way of the future, then knowledge about human computer interaction in a hypertext environment will be of great importance. The recent series of "Postbox" courses on the Internet run by Patrick Crispen of the University of Alabama is an example of the tremendous interest in the Internet. Crispen's course, of twenty seven emailed activities, attracted over 62,000 people from approximately 70 different countries around the world! There seems little doubt that the World Wide Web will be a major method of delivery for educational material in the near future.

This report summarises the findings of a study of the relationships between student learning styles and attitudes to hypertext documents. One hundred final year students in the Information Management undergraduate degree at Melbourne University completed a thirty-six hour course in Management Statistics that had a major proportion of information and tutorial activities available as

hypertext documents accessed by students through the Netscape browser. All students were well versed in computer usage and well placed to make considered critical comments on computer based information systems. A description of students, the subject they take and the course in which it was offered is given, along with a description of the information system used and an explanation of the “non-hypertext” methods that preceded Hypertext Mark-up Language documents. A brief discussion of the problems encountered in the development of the system is given. Kolb’s learning styles inventory giving the four groups of Divergers, Accommodators, Convergers and Assimilators is explained. Differences in attitude to the use of hypertext documents is then discussed in terms of learning styles as well as gender differences, previous web users and enrolment status.

2. A Background to the Course, Students and Subject

The Bachelor of Arts (Information Management) began in the Melbourne College of Advanced Education in 1988 and when the college amalgamated with Melbourne University in 1991, the title of the degree was changed to “Bachelor of Social Science (Information Management)”. The rationale for the degree was to produce graduates with the skills to liaise between upper management and computer professionals in the business environment. The course is of four years duration consisting of two years academic study followed by one year of professional placement in paid employment in the workforce, then the final academic year. All students complete core studies in Accounting and Economics in their first year and complete a second major during their degree. A wide number of options are available to students, including the continuation of Accounting and Economics (the most popular option since the course attracts a very “business-oriented” student) as well as Legal Studies, Psychology and Computer Studies. The core aspects of Information Management include studies in Management, Communications Skills and Computing (including database design, human-computer interface issues and expert systems) along with Systems Analysis.

Students enrolling in the final year subject 480.319 Management Statistics IMC06 had all completed at least two years of academic study, including a core computing subject, with most having been employed in the business community for a year in their professional placement program. This allowed students to bring a wide variety of experiences to their final year subject. All were competent in mathematics, but most students had chosen a “business studies” focus throughout their secondary schooling, not a scientific one, and hence the mathematics ability was not of a particularly high level for students attempting a statistics course. This was to be expected since the degree had a business, not a scientific flavour. Interestingly, the current degree is being phased-out in favour of an Information Systems degree to be run in the Science Faculty of the University. Clearly the new degree will have a different focus and attract a different student. Of 106 students in the subject at the end of semester, 64% were female and 36% male, while 23% were full fee paying overseas students from a number of Asian nations. For the majority of overseas students, English was their second language.

Management statistics began as a second year subject “Business Statistics”. It was initially a year-long course with a one hour lecture and a two hour IBM computer workshop / tutorial per week giving a total of 84 student contact hours. The subject was semesterised in 1990 and altered to two, one-hour lectures and a two hour computer workshop giving a total of 56 student contact hours. During this time, the workshops were changed from using IBM to Macintosh computers as they offered superior networking capabilities. A further change was the movement of the subject from second year to final year, giving the advantages of more “mature” students but with the reduction of contact to one two-hour lecture and one two-hour computer workshop / tutorial per week for nine weeks giving 36 contact hours. The other, quite significant change, was in the students themselves, as most brought considerable business insight into their subjects after twelve months in paid employment in their professional year. On top of all this, there have been increasing student numbers over the past few years. Other subtle changes have been in the attitudes and expectations of students attracted to the course when it was offered by the college compared with those attracted to the

mainstream Melbourne University, and in the significant changes in secondary education Victorian schools that “supply” students to the course. A discussion of these factors could (and probably has) fill many books! Computing technology has always been an integral part of the teaching process for the subject as students used statistical software and spreadsheets for much of their analyses. Given these factors, technology was initially seen as more a way of lightening the administrative load of dealing with a reasonably large number of students, than improving teaching. However it became clear that the use of a computer-based information system was one way of maintaining a quality teaching program.

3. The Hypertext System

Prior to the use of hypertext documents on the web, Macintosh network systems were utilised for students to collect and deliver weekly folio material for regular feedback. Students accessed a Statistics Icon on the Local Area Network (LAN) to find relevant subject information. Once inside the Icon, students could obtain information relevant to weekly activities or send information to their lecturer via a “drop folder” There were also folders containing files relevant to each week of the course which students could read and act upon where required. Many of the files were in text format to enable students with their own IBM computers to download files for reading at home. At least one-third of the students in the subject had their own IBM computer while a only a few individuals had Macintosh machines.

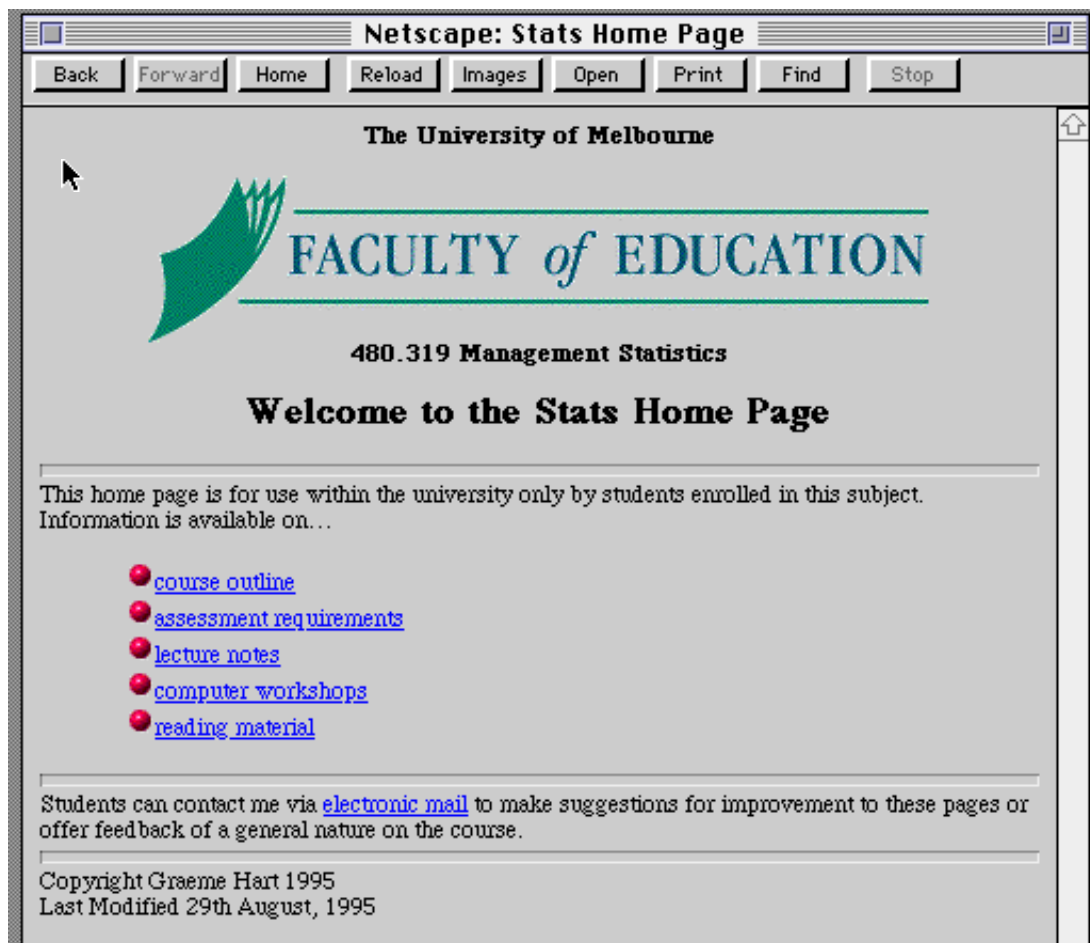


Figure 1. The Statistics Home Page on the World Wide Web.

The LAN system proved to be extremely robust and effective and resulted in considerable time-savings with the collection and organisation of student work. Indeed, one could say that the system

greatly improved the overall “Management of Information” related to student progress. One of the (minor) drawbacks of this system, was the lack of access for students external to the university campus. Students required a UNIX account to access the Macintosh LAN and this was not available for undergraduates. With increasing numbers of part-time students, external access was becoming an important issue, particularly since the network was the single method available for students to submit their work. Course material from the very practical and workable LAN format, was converted to HyperText Mark-up Language (HTML) documents and a home page created to access information. This page can be found at the Uniform Resource Locator (URL) <http://hector.insted.unimelb.edu.au/stats/home.html> and is shown in figure 1. A Power Macintosh 6100/60 was set-up as a server via Ethernet using MacHTTP 2.0.1 software with standard protocols in the configuration file. The statistics home page was modelled on the existing LAN system of placing relevant information in various “sections”. Of course the great advantage of hypertext is that extensive links can be created to make relevant information readily accessible, and this was done to a certain degree in the modified documents. The main intention of this system however, was not so much to improve the accessibility of information, since this was already being done well via the LAN, but rather to improve communication from student to lecturer in the context of relevant activities. In this sense, the hypertext system worked extremely well, with student feedback on weekly activities being automatically send to the lecturer’s electronic mail account. This meant the lecturer didn’t have to go and seek the information, rather the information came to him. Students still used the old LAN to send large Microsoft Word files to a drop folder and to access examples of the Computer-Based-Test which they sat in their final workshop.

There were, however, a number of “hardware” problems. In the second week of semester, there were interruptions to regular provision of the university network which led to problems in workshops / tutorials. Fortunately, at this early stage of the semester, the work to be covered was relatively straightforward and so students were not unduly troubled. Later in the semester, a cable linking the server to the main university network was damaged. This problem took over a week to be located and then repaired and during this time, students could not gain access to any of the course material and this, understandably, led to quite a deal of frustration on the part of students, although fortunately again, this occurred during the mid-semester recess. The main problem throughout the semester was the limitation in the number of users able to access the home page at any one time. The teaching lab contained 20 Macintosh LCIII computers, but only about a dozen of these could access the Statistics Home Page simultaneously. This occurred, even though the preferences on the server were set to accommodate 25 users. The problem was associated with the number of IP addresses allocated to the lab and led to many students working together to access material or performing other workshop activities until a link became available. Again this problem was reflected in students’ written feedback and will need to be overcome for future classes.

4. Kolb’s Learning Styles Inventory

The inventory used to quantify student learning styles was that developed by Kolb (1984). Kolb developed an inventory to classify learners on the four dimensions of concrete experience, active experimentation, abstract conceptualisation and reflective observation; the relationship between these learning styles is shown in figure 2.

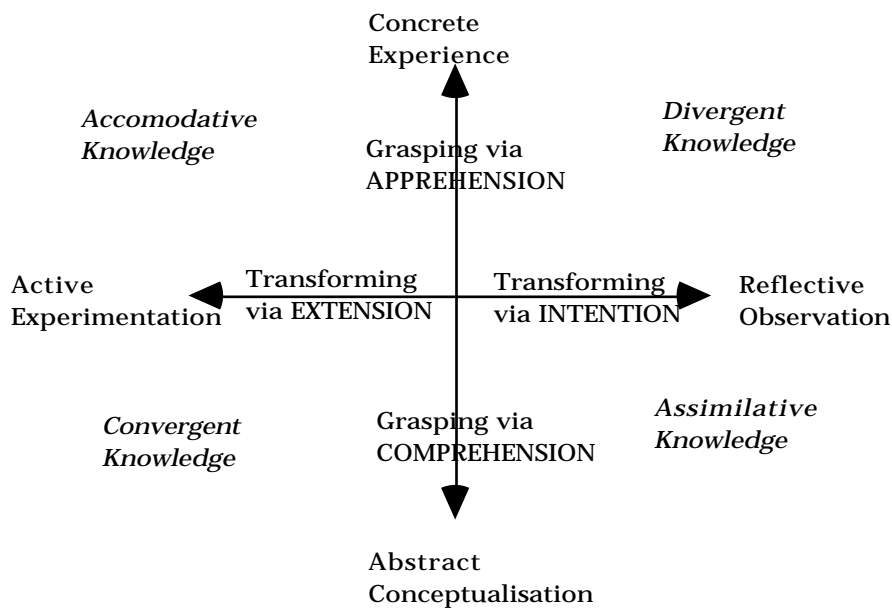


Figure 2. Structural Dimensions Underlying the Process of Experiential Learning and the Resulting Basic Knowledge Forms (From Kolb, 1984, p. 42).

While some researchers question the validity of Kolb’s learning styles inventory (Cornwall and Manfreda, 1994; Geiger, M., 1992), others support the validity of the scales as a measuring instrument (Romero, J. et al, 1992). The intention of using the inventory was simply to indicate the main approach to learning that individual students had. To this end, students were asked, during the first workshop / tutorial, to complete the learning styles inventory and note where they were placed on the graph. Shirley Alexander, of the University of Technology in Sydney, kindly gave a copy of her Hypercard stack of Kolb’s inventory for use by students. The completed learning style location of each student was collated to produce the overall picture shown in figure 3.

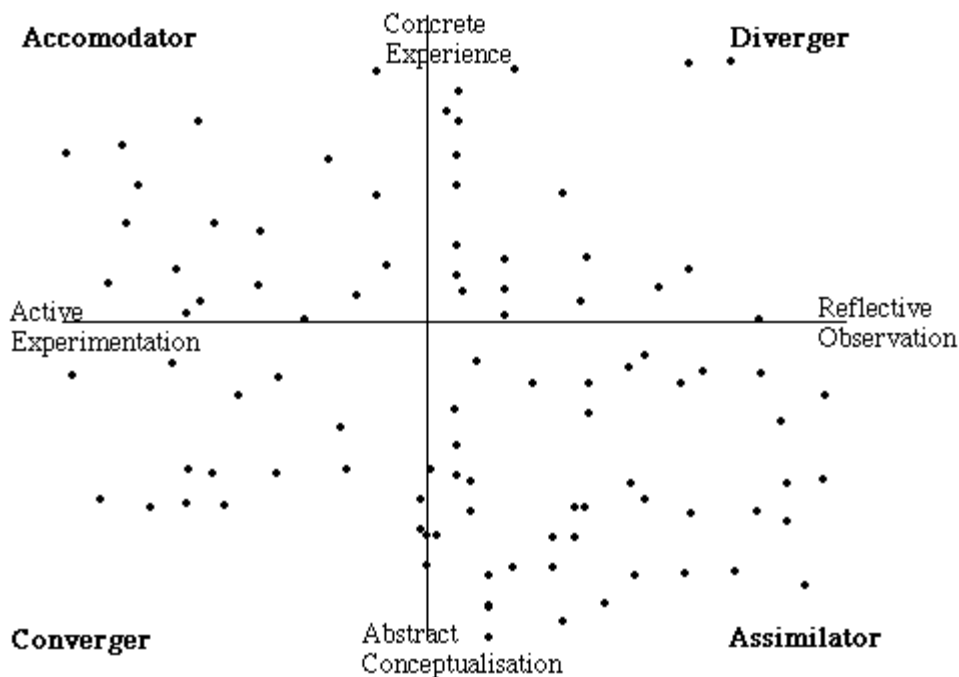


Figure 3. Distribution of Student Learning Styles.

Of the four learning styles, 21% were Divergers, 22% were Accommodators, 25% were Convergers and the largest group, Assimilators, represented 32% of the student body. Once students had completed the Hypercard stack and been advised of their learning style according to Kolb's inventory, they had the opportunity of commenting on how "accurate" they thought the prediction of their learning style was. Most students considered the prediction of their learning styles to be fair and accurate.

5. Student Attitudes to Hypertext Documents

Toward the end of the course, students were asked to reflect on their use of hypertext documents and to give feedback by completing a paper-based questionnaire utilising the usual five-point Likert scales as well as a number of general questions to identify the "good" and "bad" features of the hypertext system. While most students were happy to agree or disagree with various statements by responding on a five-point Likert scale, very few provided written comments. This was particularly the case when asked to identify negative features, as almost all students indicated that there were no negative features. Hence students were requested to give written responses via electronic mail through a hyperlink for their last workshop activity. There was a strong response to this. The questions asked were based on observation of students during the computer workshops. It had been particularly noticed over past years of using computer based systems for information delivery, that many students would obtain printouts of documents rather than read them on screen or save as a textfile for reading on their home computer. In effect, students were creating their own "workbook". In fact, a course book was developed and produced in the previous year to overcome this very problem. If hypertext documents were to be truly successful in terms of efficient delivery of information, then printing of documents would seem to negate any delivery advantages and a course book may as well be employed. Hence, attitudes and approaches to viewing / printing documents was of interest in this study. In fact, the only difference found between learning styles was in a question concerning the use of a course booklet. In this case, convergers were more likely than other groups to want to have a printed course handbook than use the web. A range of tests was applied to the data but no other significant differences were found. This was quite surprising since observations during workshop / tutorials tended to suggest students had different approaches to using web documents and so it was expected that differences would be found between the learning styles. Given this situation, the responses were examined with regard to the other major groupings of those who had used the web before, gender groupings and full-time / part-time students.

Most students (87%) were first-time users of web documents although others had some experience with the web, mainly through current or previous employment. Those students who had used the net before were much less likely to print out information than those who were first time users.

Females were much more likely than males to print out important information. This finding caused much amusement in the final lecture when these results were discussed and a number of female students made passing comments in their written responses to the use of hypertext documents. This finding supported classroom observations. Interestingly, the opposite was true with regard to saving information to disk for later reading in that males were more likely to save information as a text file than females.

It was in the area of enrolment status that the greatest number of differences were found. Full-time and part-time students approached the use of the web documents differently in a number of ways. Full-time students were more likely than part-time students to seek information only when they needed it. This was not a surprising outcome as they had access to computers across campus where they could access the Statistics Home Page at any time. The part-time students, on the other hand, were generally only on campus for a morning or afternoon at a time and often had to return to work after classes. With regard to the ease of navigating around the hypertext links, both groups found this easy, although part-time students found it "easier" than full-time students. It appeared as if full-time

students were more likely to save information as a text file, however the differences were not statistically significant. Part-time students indicated that they were more likely to prefer using the web pages on their own, although this may simply reflect that they were forced, by their circumstances, to work individually. It was interesting that full-time students were more likely to prefer to have a course booklet than use the web. Part-time students made many comments in passing of how they “really loved” the web as they could get information and communicate with their lecturer at any time and often from work or home.

6. Discussion

There have been numerous studies in relation to learning styles and the use of computer-based instruction (Krahe, 1993; Larsen, 1992; Li, 1993; Ellis, 1993). The original idea of there being a strong relationship between student learning styles and attitudes to the use of hypertext documents appears to be without foundation. While there were a number of differences found on the basis of gender, enrolment status and previous use of the web, only one significant difference was found on the basis of learning style, in that convergers were more likely than other types, to want to have a printed course handbook than use the web. The overall result was a surprising one given observation of students in the tutorial / computer workshop situation and calls for a more rigorous approach to investigating attitudes to the use of hypertext. It is clear from students who offered reflections on the information system, that the use of hypertext documents was very popular. From an educator’s point of view, the system was an improvement on the previous Local Area Network approach in that weekly student folio material was “delivered” to an email account, from where it could be read and collated. The other major impact of having a home page as a central point for the dissemination of information was that there was a major reduction in the number of student questions at the end of semester! This was one of the most noticeable outcomes of the study. The next twelve months will see a number of stages of continuous improvement, with modifications made based on student feedback during and at the conclusion of the course. The current set-up was intended to be quite simple, restricting material to essentially hypertext documents. A more Graphical User Interface will be developed with the introduction of “clickable maps” on pages, particularly the home page. Links will be established to the computer based testing software so that students can access weekly “quizzes” to check on their progress through the semester and gain regular feedback. HTML forms will be used to collect information from students and send the information to either an electronic mail account or collated in a remote folder. A major development will be the development of scripts to give students instant feedback on their workshop folio submissions. This would be a significant step and would require technical and programming support. The amount of learner control (see Sims and Hedberg 1995) over the actual learning environment is another aspect worthy of consideration as the information system is developed and expanded in features and complexity. Certainly there is much movement in the development of client-server technology with the advent of second generation software such as Hyper-G (see Maurer and Schmaranz, 1994; Maurer, Scherbakov and Schneider, 1995) so that more powerful systems for the delivery of course information will be available soon. While this study has not found any evidence that hypertext may improve the effectiveness of the teaching process, the creation of a subject home page with associated hypertext links certainly proved to be very popular with students, and led to major improvements in the efficiency of the management of information dissemination and the collection of student submissions.

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