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On-line study guides for distance education students: can 'advisor' agents help?

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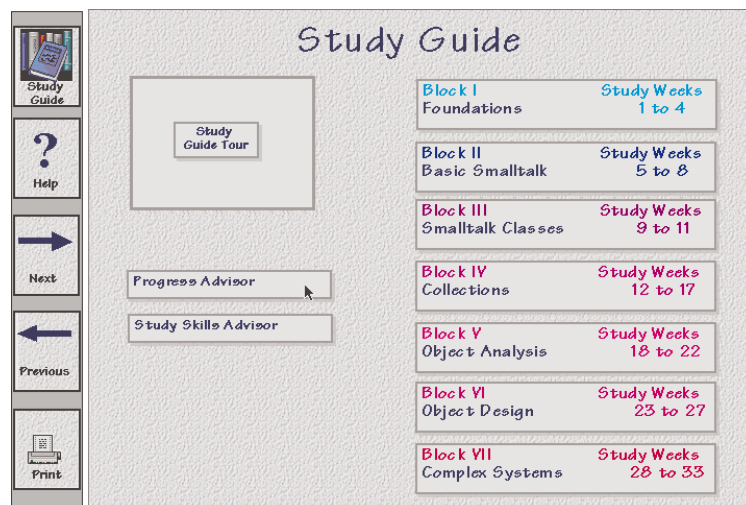
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**Dissertation for MSc in Human-Centred Computer Systems, School of
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Abstract

This project focussed on the construction of a prototype on-line study guide for the 'M206 Computing: An Object-oriented Approach' distance education course provided by the Open University (UK). The specific problems students encounter while studying a course with a complex media mix such as this course have been looked at, as well as the wider issues concerning the problems distance education students encounter whilst studying. A comparison between the difficulties distance education and traditional students have when studying has also been made and a number of interesting similarities and differences observed. A prototype on-line study guide has been constructed using an 'advisor' agent, the Progress Advisor. The Progress Advisor has been evaluated by distance education students who were very positive about it. From this evidence the idea of 'advisor' agents is one worth developing further. While this was a small project, a number of important and interesting issues have emerged from the research warranting further investigation and the importance of further research in this area has been highlighted.

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1. Introduction

This project concerns the use of on-line study guides for university-level distance education courses. Paper-based study guides have traditionally played an important role in distance education. However, as new technologies have emerged they have been exploited for distance education, from its early beginnings with the introduction of a regular postal service to its use of radio, TV, video and now computer technologies (Mood, 1995). This project will look at how these new computer technologies might be applied to improve study guides.

Computer technologies, though, are still relatively new to distance education and there are very few on-line study guides in use. Therefore, it is inevitable that this project follows a research path more than a development one. The project has followed a user-centred design philosophy and used an iterative design method to design, prototype and evaluate an on-line study guide: the aim being to clarify the requirements for a high quality study guide, not just to develop one.

This report, then, will firstly look at the problems distance education students have while studying and critique a number of existing on-line study guides. After clarifying the methodology, it will describe the user study carried out to identify and draft an initial requirements specification. The report then describes the construction and evaluation of a prototype on-line study guide, containing a progress advice 'agent' (the Progress Advisor). The report concludes by looking at a number of specific points raised by the evaluation as well as more general issues raised by the project concerning the use of on-line study guides in distance, and traditional, education.

2. Problem Definition

The course 'M206 Computing: An Object-oriented Approach' is a new distance education course in computing offered by the Open University (UK) and due to start in 1998. It offers an introduction to network computing and an object-oriented approach to software development and covers the practices and concepts required for such technologies.

M206 is a practical and complex course that uses a variety of media and software tools. To enable students to orient themselves to this course, the M206 Course Map, an interactive CD-ROM, has been constructed by the Open University. This aims to help students familiarise themselves with the aims and objectives of the course and the role of the software tools and differing media, allow the student to get an overall feeling of what they will be learning and actually doing during the course, and provide information to guide and pace the student through the course. The Map contains a multimedia 'tour' of the course, an overview of the course resources and information on each of its 'Blocks' - units of study. One of the course's resources is intended to be an on-line study guide.

There are many issues that need to be considered in the construction of an on-line study guide for this course and these will now be discussed. Some concern the nature of the course itself, and some cover the wider issues of distance learning.

As M206 students will be using a variety of software tools, they will be spending a large amount of their time undertaking computer based work. Traditional teaching can offer lab classes and demonstrator support, but as distance education students will be working mainly on their own, this raises issues about the level of support offered. Students taking the M205 course (M206's predecessor) found that the practicals and TMA's (Tutor Marked Assignments) could take considerably longer than the estimated times and that they would often spend a great deal of time, with little or no help, attempting to get their program to work (Morgan, 1989). On top of this, access to a computer may be limited. Students may be using a work computer or borrowing one so may not have the amount of time required to complete the work as long periods of study are often needed to obtain successful solutions (Morgan, 1989).

As can be seen here, the students needed more assistance in planning their study time. Such assistance is termed 'pacing' and has been described as providing planning approaches to studying and feedback on progress (Yule, 1985). There are many difficulties in pacing a distance education student. There is often a tension between the amount of time that is

considered appropriate to accomplish a task and the amount of time a student realistically has available (Shale, 1987). Due to time constraints arising from personal/work commitments, a student may have to alter their study strategy to one which is more time-efficient (Marland et al, 1984). This is indeed what the M205 students found themselves doing, with many adopting study strategies which were more assignment driven (Morgan, 1989).

The extent to which pacing is important can vary according to the course. M206 is a course that uses a complex media mix and it has been suggested that the more complex the mix of media, the more important it is to provide pacing for the student (Daniel and Shale, cited in Yule, 1985, p316).

Traditional teaching implicitly sets pacing through daily/weekly lectures or seminars and frequent tutor contact. Tutorials in distance education may only be fortnightly or monthly and even then students are not obliged to attend. Tutor contact is largely initiated by the student when they feel they need support. To ensure pacing in a distance education course, a course is often divided into discrete teaching units. In the case of M206 this is accomplished by dividing the main topics into 'blocks' and then dividing each block into a number of 'chapters' which the student works through during each study week.

However, this form of pacing only produces feedback as to where the student is on the course, enabling the student to keep up to date in their work. Feedback on the student's academic progress and academic advice is only given through assignment feedback and through any contact the student may have with their tutor. Feedback is an important issue in distance education: the nature of distance education means that the student is separate from their tutor in time and space, but the tutor is still there to direct them (Rowntree, 1992). Perry and Rumble (1987) stress the importance of two-way communication in this process with the tutor providing feedback. Rowntree (1992, p130) also stresses the importance of feedback in learning,

“We all need feedback in order to learn. It tells us about the results of our actions. It can therefore prompt our critical reflection, perhaps enabling us to do differently next time.”

In a study where distance education students were asked to rate the effectiveness of a set of features of a study guide, feedback was rated highly, in fact, the second highest of eighteen features (Dekkers et al, 1993). This demonstrates how important feedback is in the role of

learning.

Any communication in distance education is obviously fraught with the difficulties that distance produces, but solutions can be built into the course. Study guides are frequently used in distance education courses to give pacing advice and feedback. They guide the student through the course using a variety of techniques: highlighting key concepts; directing the student to readings; explaining terminology; providing summaries and overviews of material; providing SAQs (Self-Assessment Questions); offering a suggested study calendar, and so on. However, the emphasis is on the student to be aware of and to gauge their progress through the course as well as their academic progress (outside of formal feedback).

Store and Armstrong (1981, cited in Lyall, 1991) suggest that one essential attribute of feedback should be its immediacy. Traditional teaching, with frequent lectures/seminars/tutorials lends itself to feedback being immediate. However, as communication in distance education is usually facilitated by media such as print, video, audio tape, and so on, there is a lack of immediate feedback. Lyall (1991) suggests that computers, now increasingly used in distance education, could be used to bridge this gap and improve the quality of distance education teaching. Peer support through feedback is also more readily available in traditional teaching: distance education students have less face to face contact with each other. In traditional teaching one's fellow students are often the first port of call for help with work, to gauge how well you are doing, and for support in general.

A number of preliminary interviews have already been conducted by the Open University who have found that the M206 Developmental Testers were especially interested in a number of features of an on-line study guide (see summary in Appendix 15). Students were interested in the benefits that interactivity can bring such as providing better feedback on their progress and being given active reminders. Some saw an on-line study guide as an opportunity to reduce the amount of paper, though others wished to print out copies. Some wanted it to be a guide and not a record and others wished to be able to tick things off.

In the light of the above, this study will therefore set out to:-

- clarify the difficulties distance education students have whilst studying.
- compare and contrast these with the difficulties of traditionally taught students.

- study how new technologies can be applied to help reduce these difficulties.
- construct a prototype to test what should be in a successful on-line study guide.

This project will do this using the on-line study guide for M206 as a case study.

3. Review of Existing Study Guides

On-line study guides

Electronic study guide for BIS11 - Computers in Business

Gippsland Division of Computing - Monash University

An electronic study guide for the distance education 'BIS11 Computers in Business' course at Monash University has been developed (Hewson and Styles, 1994). This electronic study guide is divided into sessions corresponding to the sections in the existing paper-based study guide, each has a list of learning and performance objectives. There are hypertext links, references pages and a glossary function. Students can enter their own text annotations into a notebook which can be edited or printed. Diagrams are ticked to show progress and an overall map is marked showing which sections have been visited. A progress indicator shows the overall percentage of the course completed. Review exercises are presented as quizzes to test the student's understanding of the key points of each module.

Wind Energy Training Course Study Guide

(<http://www.iesd.dmu.ac.uk/~slb/wcsga.html>)

De Montfort University

Each module of this guide has an introduction, aims and objectives and structure of the module. A tool bar is provided at the bottom of each page to go to particular areas, though some of the icons are confusing and do not have corresponding text to aid their meaning. A day to day 'schedule' for the course is given. The tasks to be completed each day are stated with guidelines on the time expected to complete each task. A total time guideline is given for each day. Hypertext links take the student to particular resources or tasks. An overview of each of the tasks for each module is given with hypertext links to take you to the actual task.

There is no overview of where you are in the study or module or any way of giving an overview indicating what areas have not been accessed. As this study guide contains a considerable amount of hypertext links as well as icon options to go to places, initial navigation is confusing and it is easy to get lost and forget what you were trying to do in the first place. The temptation to keep clicking on links could prove a 'useful' distracting task for an unmotivated student.

Study Guide Principles of Ecology: Biology 330

(<http://sorrel.humboldt.edu/~kll1/studyindex.html>)

Department of Biological Sciences, Humboldt State University

Information including the lecture schedule, assignments, lab and field schedule, lecture materials and office hours can be accessed. The study guide provides an index to the 12 main topic areas of the course which are each accessed via a hypertext link. Each topic is structured in a similar way. The first part lists key terminology, then a list of questions is given, together with a suggestion that the student should, after having studied this topic, be able to answer them. Although no worked examples to the questions are given, or definitions given to the key terminology, there is a 'writing practice' section. Here, the student can email the tutor with a practice answer or suggested definition. The tutor will reply via email with comments and suggestions.

CuDOSS System

(<http://www.ilrt.bris.ac.uk/cudoss/>)

Institute for Learning and Research Technology at the University of Bristol.

The CuDOSS Project has produced the CuDOSS System to help students improve their study skills such as time management, essay writing and revision. Each topic is dealt with in its own particular unit which usually has an introduction, an explanation, a set of worked examples and further references. The exercises provide the main basis of interaction between the student and the system. Students can enter text in response to a question or use check boxes. The student can then check their input with the worked examples and save them to an electronic personal 'Workbook'.

Other features include word processing; drawing, charting and database tools; the ability to save notes, text and graphics into a personal 'Learning Journal'; an automatic 'Jump Log' to revisit areas of the study guide; the ability to share materials and send email to students and staff; and hyperlinks to resources within and outside the university. These features, and the navigation around the system, are controlled by the use of 'button bars'. The CuDOSS System can also be customised using a series of 'wizards'.

PASS (Personalised Advice on Study Skills)

(<http://129.215.172.45/CRLIHome.html>)

Centre for Research on Learning and Instruction at the University of Edinburgh

This system uses an electronic questionnaire based on the Approaches to Studying Inventory (Entwistle & Ramsden, 1983) to identify students who may have poor study strategies. The self-administered questionnaire consists of questions which are responded to by clicking on one of the given answers. This information can be displayed using 'StudentView' which represents the study strategies of each student as a single point within a three dimensional space. The three axes correspond to three approaches to studying: the deep, surface and strategic approaches (see Joughin et al, 1992, for an overview of 'approaches to studying' research). Within the space is an area that represents poor study strategies, that is, high surface approach scores with low strategic and low deep scores. Clicking on one of the points within this area will identify the student having difficulties.

The final component of this system is a 'StudyAdvisor' which gives tailored study skills advice to students, assessed from the questionnaire ratings. Individualised study skills guides can be printed out and students' own annotations can be added to this.

Other Internet-based study guides

A number of study guides on the Internet do not use any of the advantages of the electronic form and could simply be used in paper form. Some merely give a list of questions to be answered after viewing a tape (<http://www.easc.indiana.edu/pages/easc/curriculum/eastasia/1995/general/CHINA/REMEMBER.htm>), or present a list of the course's topics with details of class times and recommended reading (<http://www.scitec.auckland.ac.nz/~pearson/225/study-guide.html>). These do not appear to be study guides or on-line study guides in the sense that this project is interpreting them. They offer no features or information to guide the student through the material, nor do they use technology in any way other than to put textual information onto the Internet. There is often a feeling that posting information onto the Internet makes it more available, however, the subject matter of these study guides does not suggest that students would necessarily have a computer linked to the Internet, nor are they distance education courses.

Paper-based study guides

DM871 Intelligent Systems: Analysis and Design Study Guide

Open University

This provides an overview to the course which includes an introduction, aims, notes on terminology, course structure, how to study the course and assessment information. The main body of the guide provides information on each of the units including objectives, introduction, overviews of particular methods, direction to readings, summaries, and SAQs. Appendices provide possible answers to some SAQs, exercises and a summary of knowledge-based systems.

D309 Cognitive Psychology Study Guide

Open University

This provides an introduction which covers the aims of the study guide, details of the course books, and how to use the study guide. The study guide is divided into study weeks which provide a summary of the material, direction to readings, lists of key concepts, links with other material, assessment information and revision hints for the exam.

Conclusion

There appears to be a wide interpretation as to what an on-line study guide is. Many of the above 'study guides' appear to be 'hand outs' put on the Internet. Some contain no interactive components and do not exploit new technology. There appears to be a rush to use new technology without exploring its advantages and disadvantages. Pasting text onto the Internet does not enhance its effectiveness.

Study guides need to be well thought out to explore how best to present the material in a way which will help the student pace themselves as they progress through the course and to understand the material. Merely providing a list of questions or a list of topics covered by the course will not on their own achieve this. Of the existing on-line study guides reviewed, most offer little or no support for pacing (except for De Montfort's, which seems 'over-paced').

Some guides are not truly integrated with a particular course and are general aids to

studying, a study guide is not the same as a study skills guide/manual/handbook. These standalones may be useful for students seeking to improve their study skills in general and those which have exploited new technology offer new ways of accomplishing this.

4. Methodology

Cohill (1991, p111) states that to achieve good design,

“..... requires a shift away from a reliance on rigid development methodologies, and recognition that no two information problems are alike. Design is a process of exploration and a uniquely human activity that cannot be easily explained, categorized, or packaged as a set of rules.”

As this project concerns itself with a new area for the design of an interactive system, this approach is highly relevant: there is no tried and tested design method for such systems and there is no guarantee that an existing method would suit this unique design area. Therefore, it was decided to look for the most appropriate method and adapt it for this project.

It was felt that the most appropriate design method would be based on an iterative design process. An iterative process will solve problems where the initial requirements specification is incomplete, as a number of designs can be tested and improved on, while the specification can be modified as a result of information gathered during testing (Dix et al, 1993). This will suit this project as on-line study guides are such a new area and the specification may change in the light of further information gathered throughout the project. Indeed, the whole project could be thought of as the search for a clear specification.

Newman and Lamming (1995) propose a framework for interactive system design, based on the traditional ‘Waterfall Model’ of software design, but one which allows more flexibility between the development stages and offers a loop where the design and evaluation of the prototype can be repeated as required. It was decided to use this as a basis for this project’s methodology and the methods used from this framework were: defining the problem, conducting a user study, constructing a requirements specification, designing the prototype and evaluating it. This allowed the project to explore the area of on-line study guides without being dominated by the engineering task of designing and implementing a final system. The prototype allowed exploration of this area by testing out ideas arising from the user study and by gathering information from the user evaluation which led to its modification.

This project aimed to maintain a user-centred approach at all times to focus on the users, distance education students, the study problems they face during their course and an exploration of possible solutions to these problems. In taking a user-centred approach (Norman and Draper, 1986) we must involve users as much as possible in the design

process. Therefore, a considerable emphasis was put on the user study, the aim of which was to become more familiar with the users, the study problems they had, where they needed support and what forms of support would be helpful to them. This information was highly influential in the design process of the prototype and enabled decisions to be taken which were based on information from the users and not simply on what people involved in the design process thought might be useful.

The user study was conducted at the beginning of this project so the project could be driven by the collected data. User studies can be conducted at various points throughout a system's design (Newman and Lamming, 1995), however, time constraints restricted this project to a single user study. The entire project had to be completed in 17 weeks. Given more time, it would have been useful to have conducted a further user study to clarify some issues that arose following the analysis of the initial user study.

A self-administered questionnaire was used to collect the data. This method was chosen as it is highly structured and enables the same questions to be presented to all subjects (de Vaus, 1996). Presenting the same questions to all subjects was important as the questionnaire was given to both distance education and traditionally taught students in order to make a comparison of their responses. A questionnaire is also easy to administer and it can be used to elicit both quantitative and qualitative data. It would have been preferable to have conducted structured interviews with distance education students, but there were two problems preventing this. The first was the method: the amount of time this could have taken to conduct and analyse the interview data was prohibitive and only a small number of students could have been interviewed. The second was the difficulty in obtaining access to distance education students: arranging permission through the Open University to conduct a survey like this is a lengthy process and the study may not have been able to take place until the time allocated to this project was finished. Using a questionnaire also meant that a larger number of students could be surveyed. It meant that it could be targeted at students attending Summer Schools where permission for the participation of students in simple questionnaires is at the discretion of the Course Director.

The method of using a questionnaire was considered a success, it was easy to administer and a considerable amount of data, which will be discussed later in this report, was gathered. The results of this user study were then used to construct an initial requirements specification.

The technique of storyboarding was then used to explore on paper ideas for the design of the system. Storyboarding allows a variety of ideas to be quickly and roughly sketched out on paper to explore what the user interface might look like. As no substantial effort has

been put into them, a designer or design team will not be reluctant to throw away ideas or radically alter them. However, if done on computer, more effort is put in, ideas appear more concrete and refined, and there is a tendency to stick with these designs rather than evolve them or discard them if necessary (Preece et al, 1994). Storyboarding on paper prior to rapid prototyping ensured this did not happen.

Rapid prototyping was then used to try out the validity of the design and to ensure the interactive aspects of the design would work as storyboarding on paper cannot simulate these (Dix et al, 1993). This process produced feedback which ensured that the most appropriate changes could easily be made. The misconception of traditional design processes, that a system can be specified at the beginning and then built to this specification, is avoided by using rapid prototyping. Rapid prototyping views the initial specification as dynamic and supports its modification, thus speeding up the design process or going down blind alleys because of an incorrect or incomplete initial specification (Miller-Jacobs, 1991). Rapid prototyping supports the iterative design process since changes can easily be made.

A prototype was aimed for, rather than a fully implemented system, partly due to time constraints and partly because of the nature of the problem and solution area. On-line study guides are a new area and much research has to be conducted before fully implemented systems can be constructed. A fully implemented system was beyond the limits of this project and because M206 is still under development, the course materials are not yet complete.

Once a prototype had been constructed it was evaluated. Evaluation allows us to learn about the decisions that were taken in particular areas of the design and whether they were appropriate decisions (Newman and Lamming, 1995). Again, in keeping with the user-centred design approach, distance education students evaluated the prototype. Formative evaluation was selected as the most appropriate method since it would provide information that would feed into the continuing development of the system as opposed to summative evaluation which concerns the evaluation of a finished system (Preece et al, 1994). As already stated, this project did not aim to have a finished system. Evaluation, such as this, can provide information as to the appropriateness of the initial requirements specification which can then be altered and the prototype changed to reflect these changes. If aspects of the requirements specification seem appropriate, then the design can be evaluated according to how successfully it implements these aspects. Usually, these two processes will arise following evaluation.

The prototype was evaluated and once the data from the evaluation was analysed, this data fuelled the next iteration of the design process. As a result the prototype was revised

accordingly and these changes have yet to be evaluated.

In summary, this methodology has worked reasonably well, despite this problem area being a new area for which there are no guidelines concerning methodology: if indeed there can be a defined methodology for this problem area. It has enabled this project to move smoothly from the initial stages of defining the problem to constructing and evaluating a prototype. The prototype has been well received by the evaluators and this reflects the soundness of the methodology chosen and the decisions that were taken during its process.

5. User Study

A description of the procedure for the user study will be given first. This will be followed by a results section which will go through each section of the questionnaire, comparing and contrasting the data from distance education and traditional students. A summary of the key points arising from this study will then be given

Procedure

A questionnaire (see Appendix 2) was given to distance education and traditionally taught students. The questionnaires were identical except for their mode of delivery. Traditionally taught students were invited, by email, to fill in the questionnaire and submit it via the Internet. An email was sent to all undergraduates and postgraduates at the School of Cognitive and Computing Sciences at the University of Sussex. Distance education students were given a supply of paper-based questionnaires and invited, by poster, to fill them in and return them via a provided box. The distance education students were all attending an Open University Summer School as part of their D309 Cognitive Psychology course.

This manner of administration enabled more time to be spent analysing the questionnaires instead of waiting around asking people to fill one in and then collecting them. The raw data from the questionnaires can be seen in Appendix 4 with the data from any statistical analysis being found in Appendix 5.

Results

The data from a number of questions was subject to statistical analysis, namely a Chi-square test (see Appendix 5). These questions were:-

- 7. Do you feel confident about your study skills?
- 8. Do you feel you have been given sufficient study skills advice on your course?
- 9. Do you feel you have been given sufficient advice on how to plan your study time on your course?
- 10. Do you sometimes have problems in planning your study time?
- 12. Have you ever used a study guide before?

However, analysing the data from questions 7, 8, 9 and 10 using a Chi-square test proved to be unreliable and Fischer's Exact Test needed to be used (Coolican, 1990), but, to date, the algorithm for this test has not been found, despite looking in a number of statistical books (Coolican, 1990; Greene and D'Oliveira, 1982; Sapsford and Jupp, 1996). However, the data appears not to be significant, although a further search will be made to find an algorithm so this can be confirmed statistically.

Personal Information

The average age of distance education students was considerably greater than traditional students. However, their reasons for study were very similar with the majority studying out of interest. More distance education students explicitly mentioned work as their reason for study.

Study Skills

There do not appear to be statistically significant differences in people's ratings of their confidence in their study skills between distance education and traditional students. Overall, few students were very confident about their study skills, although most were fairly confident. One distance education student was not confident about her study skills and she was the only distance education student not to list her reasons for studying.

There do not appear to be statistically significant differences as to whether people felt they had been given sufficient study skills on their courses. However, many more distance education students (40%) felt that had been given sufficient study skills as opposed to 14.29% of traditional students, so there may be an important trend here.

In terms of whether they felt they had been given sufficient advice on how to plan their study time, there do not appear to be statistically significant differences. Again, many more distance education students (33.33%) felt that they had been given sufficient advice than traditional students (14.29%), again perhaps indicating an important trend.

Of the 6 distance education students that felt they had been given sufficient study skills advice on their course, only 2 of these felt very confident about their study skills. The distance education students who felt they had been given sufficient advice on how to plan their study time, also felt they had been given sufficient study skills advice. Distance

education students who felt they had not been given sufficient study skills advice (or were unsure) also felt they had not been given sufficient advice on how to plan their study (or were unsure).

The traditional students who felt they had been given sufficient study skills advice, also felt they had been given sufficient advice on how to plan their study time.

The numbers of both groups having problems in planning their study time was similar, 73.33% for distance education students and 64.29% for traditional students. This result is interesting considering the trend shown here that distance education students feel they have been given more study skills advice *and* advice on how to plan their study time than traditional students, but still had problems planning their study time. In fact, slightly more had problems in planning their study time. Although these results do not appear to be statistically significant, they do show a distinct trend. However, it should always be borne in mind that this was a small study.

Of the 4 distance education students who did not have problems in planning their time, 3 of these had felt they *had* been given sufficient advice on how to plan their time. Both traditional students who had no problems in planning their study time were very confident about their study skills.

In terms of the study skills students wished to improve, there were a variety of responses. Most distance education students wished to improve reading and writing skills and were mainly assignment (TMA's and exams) driven in their responses. Time management was also mentioned. Traditional students responses were dominated by issues of time management. Issues relating to searching for material, prioritising and reading relevant material were also common.

Study Guides

There was a significant difference ($\chi^2 = 5.78$, $p < 0.02$) in the number of distance education students who had used a study guide before, 80%, compared with 28.57% of traditional students. All students who had used a study guide had used one in a book format. All had found it helpful, with the exception of one distance education student who was unsure or did not know.

A variety of reasons were given for liking these study guides. Distance education students liked the clarity and manner in which the information was summarised with the main points

being highlighted. The advice concerning essays and exams was also found to be useful, as well as the fact that it linked parts of the course together and gave a plan for each week so you knew what you had to achieve. Traditional students liked that the study guides gave specific points to focus on for different types of work, that they contained lots of useful information, that it was comforting to recognise some of the problems mentioned and that step by step examples followed by questions were given.

Distance education students did not like them as they could be slightly patronising. Sometimes there was not enough information and they were not interactive enough. Traditional students thought that they could place an extra workload onto an already stressful situation and that they did not always contain all the information you needed.

More distance education students would have liked to have had a study guide for their current course, 73.33%, compared with 50% of traditional students.

The ranking of the features of a study guide show a lot of consistency between distance education and traditional students. Both groups ranked 'summaries of each section', 'aims and objectives of each section stated', 'self-assessed questions' and 'study skills advice' as their top four choices. In fact, they were ranked in this order except the distance education students ranked 'aims and objectives' before 'summaries', although the mean and variances were very similar. The rest of the features were also similarly ranked. The only exception was a 'wide margin to write own notes in,' which was ranked quite highly by the distance education students, but last by the traditional students.

On-line Study Guide

Distance education and traditional students had almost identical views on whether an on-line study guide would be helpful to them - 46.67% of distance education students and 42.86% of traditional students thought it would be helpful. However, slightly more distance education students, 33.33%, thought it would be more helpful than a paper-based guide as opposed to 21.43% of traditional students. Perhaps reflecting the different subjects studied, psychology as opposed to mainly computing.

The ranking of the features of an on-line study guide were not as consistent as the previous rankings. Both rated 'study skills advice', 'key word search function', 'self-assessed questions' and 'to be interactive' among the top six. Distance education students ranked 'to be interactive' and 'interactive diagrams' more highly than traditional students. 'Quizzes' and 'space to add notes to existing page' were also ranked higher by distance

education students. Both groups ranked 'tick things off' last.

The number of people who said they would use an on-line study guide was very similar, 46.6% for distance education students and 50% for traditional students. However, 40% of distance education students and 42.86% of traditional students were unsure or did not know whether they would use one.

A variety of comments were made at the end of the questionnaire. Distance education students commented on their lack of computer knowledge and uncertainty as to what some of the terms, particularly 'on-line,' meant. One person commented on how useful written study guides, especially Open University ones were. Traditional students commented on a wide range of issues, including the cost of being on-line to a remote server in comparison to the cost of a book, the fact that study guides should be written in plain English, and some confusion over how to rank the features in the questionnaire.

Summary

Both distance education and traditional students had many different reasons for choosing to study. All their reasons fell into one of four categories concerning orientations to education: vocational, academic, personal and social (Morgan, 1993). Distance education students were either vocationally or academically oriented with one being personally oriented. Traditional students showed more variety in their orientations: academic or vocational orientations were the most common with personal and social orientation also being shown. It is heartening that the students participating in this study had a strong interest in their subject and clear reasons for their choice of study.

Very few, however, were really confident about their study skills. Distance education students felt that their course had given them more study skills advice and more advice on how to plan their study time than traditional students. However, they felt they had slightly more problems in planning their study time, although the majority of students in both groups had problems in planning their study time.

Distance education students seemed to be more assignment driven when it came to expressing which study skills they wished to improve. Time management was certainly the most pressing topic for traditional students.

There was a statistically significant difference between the number of distance education students and traditional students who had used a study guide.

Both groups were in clear and consistent agreement about 4 features which are important for a good study guide: 'summaries of each section', 'aims and objectives of each section stated', 'self-assessed questions' and 'study skills advice'.

There were not many students in either group who felt an on-line study guide would not be helpful to them, though many were unsure.

There was disagreement as to which features of an on-line study guide would be useful, however, both groups ranked 'study skills advice', 'key word search function', 'self-assessed questions' and 'to be interactive' highly. Distance education students saw interactive features as being more helpful than traditional students viewed them.

6. Requirements Specification

Introduction

The user study has identified a range of difficulties where distance education students need support when studying. These fall into three main areas: progress, time management and study skills advice. Therefore, the design of the prototype on-line study guide will concentrate on resolving these difficulties.

Due to the time constraints of this project only one of these areas will initially be looked at in detail, although issues concerning the other two areas may influence the design process where necessary. It was decided to look at the area of progress. Issues to do with progress are important in pacing a distance education student. We have already looked at the suggestion that courses which have a complex mix of media, such as M206, need a higher level of pacing. A student working mainly on their own needs direction and support to guide them through such a course.

The aim of considering this area was to design features of an on-line study guide which would allow students to have a better understanding of how they were progressing through the course by giving appropriate and tailored feedback. Students would be helped to reflect on their own learning, thereby making them an active participant in this process. Feedback would be available at any time the student requested it, therefore alleviating the problem of the lack of immediate feedback in distance education. The aim in providing this would be to enhance any existing support systems available to the student, not to replace systems such as formal assignment feedback and informal feedback from tutor contact.

Such advice will also aid a student's pacing and time management as they will be better informed as to how they are doing and where to target their study, thus (hopefully) reducing any wasted study time. For example, help could be given by pinpointing the area in which the student was having difficulty and this could be pointed out to them, allowing them to direct their studying in a more productive manner.

This feedback and advice would be given by an advisor, the Progress Advisor, whom students could 'consult' whenever they wished. Similar advisors will be considered for the other two areas, should this feature prove useful and effective. In this event, a Time Management Advisor and a Study Skills Advisor will be designed.

As a major aim of this project was to look at how new technologies could be used as a solution, this project has concentrated on which features of an on-line study guide would benefit distance education students. This project, and the resulting prototype, does not concern itself directly with the course material as this is a matter for the course team. However, draft material from the course will be presented in the prototype to give an indication of how these features might fit in with the overall course material.

Progress Advisor Specification

General

- Students will be offered advice on their progress through the course.
- This advice will be on request of the student.
- The advice will be generated from information the student provides.
- Advice will be given for each chapter as well as for overall progress through the course.
- A summary of the students progress will be kept.
- There will be an 'at a glance' representation of progress.
- Information will be for the students own personal benefit and will not be made available to the tutor unless the student wishes.

Knowledge Representation

- The system will have a representation of the structure of the course. This will include which chapters and texts are prerequisite reading for later chapters.

Advice

- Advice given by the system will highlight areas where the student does not feel they understand the subject material and will direct the student appropriately.

Usability

- The student should be able to use the system confidently after taking the 'Study Guide Tour'.
- Navigation should be clear and intuitive.

This initial requirements specification may, at first glance, seem not as detailed as would usually be the case. However, this is inevitable given the lack of research in this area.

7. The Prototype

In order to construct a prototype, a suitable prototyping environment had to be chosen. SuperCard (Allegiant SuperCard, 1994) was chosen as it facilitates the process of rapid prototyping: interfaces can be quickly constructed and modified enabling the suitability of possible designs to be presented to the users and further information collected on requirements. Storyboarding was used to explore ideas for presenting the features and information of the on-line study guide and the storyboards (see Appendix 6) can then be easily translated into an on-screen interface using this tool. SuperCard offers a variety of tools for the construction of interactive multimedia systems and contains a scripting language, SuperTalk, a high level, yet simple, language which can still achieve powerful results.

A typical user scenario will follow and an explanation of the interface will be given. This scenario follows the one given during the evaluation and aims to give a feel for what it might be like to be using this study guide as part of the M206 course. The screen shots can be seen in Appendix 7.

Screen shot 1

The on-line study guide is accessed through the front page of the Course Map, by clicking on the 'Study Guide' hypertext link of the Course Resources.

Screen shot 2

The overall design of the interface was kept as close to the design of the Course Map as possible to enhance overall consistency. Evaluators of the Course Map liked its look and layout (Appendix 14). The blocks and tour are presented in the same style and place and the same colouring and font (Tekton) used throughout. The idea of the tour was retained from the Course Map as, again, evaluators found this function useful (Appendix 14). Where the Course Map listed the course's resources, these were replaced in the study guide by buttons to access the three advisors. The study guide information for each block is accessed by clicking on the block button.

Screen shot 3

Each transition to the next screen is presented using a 'dissolve' effect. Clicking on the Block 1 button reveals this screen which contains an overview of the material in the block.

To the right of this the blocks' study weeks are listed with their corresponding chapters. These chapters are accessed by clicking on the text which 'greys out' afterwards to show the chapter has been visited. Pressing the mouse down and holding it down, changes the colour of the text to indicate that it is a hypertext link.

Screen shot 4

Clicking on Chapter 1 takes you to this screen. Only a small amount of course material is presented here since that is all currently available from the course team. However, the aim is that this area would provide all the relevant study guide information associated with this chapter. At the end is a list of tasks required for this chapter. Currently, only a list of tasks is shown, but as the course is developed this could include the key concepts of the chapter.

Screen shot 5

Clicking on the boxes to the left of each task will bring up this dialogue box which asks the student to type in their estimated number of hours taken to complete this task and to consider how well they have understood this particular task.

Screen shot 6

The student then types in and clicks the appropriate replies.

Screen shot 7

Once the student has completed this and clicked on 'OK', a tick is put in the box to indicate the task has been completed. The student can do this for the rest of the tasks when they have been completed.

Screen shot 8

In this scenario the student has ticked them all off except Parsons and Oja. The student can then go back to the 'overview' page by clicking on the 'back' arrow.

Screen shot 9

They can then access the Chapter 2 hypertext link by clicking on it in the same way they did for Chapter 1.

Screen shot 10

The Progress Advisor has recognised that they have not ticked off one of Chapter 1's tasks and presents this screen to them. The student, who has merely forgotten to tick it off, can then go back to Chapter 1 by clicking on the button.

Screen shot 11

The student can then click on the box next to Parsons and Oja to tick it off.

Screen shot 12

This dialogue can then be filled in.

Screen shot 13

All the tasks have been completed and the student decides to return to the 'home page' of the study guide by clicking on the 'home' icon.

Screen shot 14

The student can access the Progress Advisor by clicking on its button on the Study Guide Home Page.

Screen shot 15

The Progress Advisor currently displays the last chapter completed and shows textual and colour representations of how well the student feels they are doing.

Screen shot 16

Clicking on the 'Advice' button will reveal this box where the Progress Advisor offers individually tailored advice based on the information it has recorded. The student can click on the box to close it and move to other chapters to review progress.

8. Evaluation

As previously stated, the evaluation of the prototype was considered to be a key stage of this project, allowing distance education students to use the system and comment on it. The feedback from these students was essential to how the project and prototype design would progress.

The goal of this evaluation was four-fold: firstly, to see what students thought of the Progress Advisor and its features; second, whether it might be helpful to them; third, whether they thought the other two advisors, the Time Management Advisor and the Study Skills Advisor, might be considered helpful; and finally, to find out whether the system was easy to use and understand.

Procedure

Open University students attending the D309 Cognitive Psychology Summer School at the University of Sussex were chosen to evaluate this prototype. This decision was taken as M206 is not due to start until 1998 and students at Summer School were more readily available than other distance education students. At this particular Summer School, students engage in a number of experiments with fellow students as their subjects, consequently there is a 'subject pool' of students available for experiments at certain times. On permission of this school's Course Director to conduct the evaluation, 5 students were chosen randomly from this pool to be evaluators.

In order to gather this information a scenario and task was devised which can be seen in Appendix 8. The scenario was given to students to help them see more of a purpose in what they were doing, to see how a typical user might use the on-line study guide. All task instructions were given verbally. Each session was audio-taped and all students were happy for this to be done (see Appendix 10 for taped comments). Following completion of the evaluation task, students were given a short questionnaire to fill in (Appendix 9).

Questionnaire Results

Personal Information

All 5 evaluators were female students between the ages of 30 to 40, in their 3rd, 4th or 6th year of part-time study. Most had some experience of using computers.

On-line Study Guide Progress Advisor

They all found it helpful to be able to tick things off, with 1 student finding it very helpful and 4 finding it fairly helpful. One student liked it a lot that she was asked to input her estimated hours and level of understanding, although 4 were not bothered. Students found the reminder feature helpful with 3 finding it very helpful and 1 fairly helpful. One student did not find it helpful and commented that she usually knew when she had not completed something. The way the information was presented was also liked: 2 liked it a lot, 2 quite liked it and only 1 did not like it. Students liked the colour scheme and the fact that the Progress Advisor gave a rationale behind the actual advice as well as giving a positive comment for the areas that were understood well. What was not liked about it was the advice to re-read the material not understood: students clearly wanted additional support such as an overview of the key concepts, something that was more concrete than simply being told to 're-read' it. One student found the font made it difficult to read. Students said they would find using the Progress Advisor helpful: 2 found it very helpful, 2 fairly helpful and 1 was not sure. Students gave a variety of replies in response to being asked how often they would consult a Progress Advisor. One said she would consult the advisor every week, one said after each unit/block, one said before a TMA or if she had a problem, another also said before a TMA, and one said she would consult it every 2-3 weeks when she reviewed her work. Only 1 student thought an on-line study guide with advisors would be more helpful to computing students than non-computing students. Three thought there was no difference and 1 was unsure. When asked what information they would like to see in the Progress Advisor, most students wished to see the addition of summaries of key concepts. One suggestion was to provide links to other parts of the course where the issues were considered again. The linking of key concepts between blocks was also mentioned by another student. One wished to be praised if all was going well and directed to further reading. Comments made at the end included that the Progress Advisor was a good idea for all courses not just computer based ones and that it could act as a useful motivating guide.

Other Advisors

Although 2 students would find a Time Management Advisor fairly helpful, 2 did not think it would be helpful and one person was unsure. However, 2 students would find a Study Skills Advisor very helpful and 3 would find it fairly helpful, so there does seem to be a demand for the Study Skills Advisor.

General Comments

Some comments covered difficulties with the interface such as navigation difficulties and uncertainty concerning the function of the icons. One person felt study skills advice would be more helpful as time management is difficult since she works full-time and has to cram her study into the little time she has. Another thought that the advice should not be critical of lack of progress and time spent studying, as this may make people feel worse - personal circumstances dictate what people can do and people feel guilty enough for not being able to do more.

Summary of Taped Comments

Most of the taped comments (see Appendix 10) concerned navigation and other interface difficulties. Some students had difficulty in going back to various points, with many mistakenly going back to the Map. As students were not familiar with the Course Map, it may have been that a button marked 'Map' was misleading them into thinking that this would provide a map of the Study Guide. Some were a little hesitant at using the arrows to go back.

When the dialogue box appeared to type in the hours and level of understanding, some students started to type in without first clicking on the field to make it active, though on all subsequent uses of this box they used it correctly.

Some clicked on 'Study week 1' instead of Chapter 1. All knew that they had to click on the box to tick the task off even though there was no additional information on-screen or given verbally to indicate this.

All expressed a clear understanding of the use of colours and when asked to explain what the colours meant gave positive and appropriate explanations.

Only 1 student knew how to close the advice box, 1 tried to click away from it, 1 was unsure and 2 wanted to click on the 'Map' button. The Map button certainly gained students' attention as an expected solution. It is not clear why students wished to go to this button.

Students generally expressed the same comments concerning the advice given as they wrote in their questionnaires: that they wished to have the key concepts highlighted.

One student wondered if the information she was typing in would appear in summary form next to the tick. Another asked if the information went back to your tutor or if it was solely for your own purposes. One wondered whether the Progress Advisor was going to talk to her.

Discussion

It is interesting that ticking things off was felt to be so helpful since both distance education and traditional students had ranked ticking things off last in the user study. It would seem that thinking about features and actually using them (albeit in a very false manner) could lead to differing opinions. As was stated in the user study, it is difficult to rank the features since their presentation makes a big difference to their effectiveness.

Students did not appear to be particularly enthusiastic about typing in information. However, the estimated hours information was not used in the evaluation. It was merely included in the dialogue box so that it could be used by the Time Management Advisor when it was built. One commented that the level of understanding was more important to her as it makes her reflect more on her learning than how many hours she has taken to complete a task.

Students appeared to like the way the information was presented to them in the Progress Advisor. They all found the colour representation clear and easy to understand as well as a helpful representation. They were consistent in what they disliked about it: a suggestion to re-read is often not a viable option to distance education students who have pressing time constraints. More support is needed here by offering summaries of key concepts.

Students timings in consulting the Progress Advisor appear to reflect the many differing study patterns of the students as there was a wide variety in how often they would consult it. This wide variety of timings was not clear before this study.

Students were clear and consistent about what support they needed in a Progress Advisor

and what an advisor would mean to them. It is interesting that one student thought it would be a useful motivating guide. This was not something that was initially thought about at the beginning of the project and this is something worth bearing in mind for the rest of the project.

Although time management issues do appear, from the user study, to be a large area which needs to be addressed, the option of a Time Management Advisor was not well received, though the Study Skills Advisor was. Students did not have an opportunity to actually use a Time Management Advisor so this may have influenced their decision. However, it is worth rethinking issues concerning time management to see if there is another approach that can be taken to support students in this area.

The evaluation scenario and procedure is one that worked well: students were clear about their role as an evaluator and gave well thought out and constructive feedback. Now that the data has been analysed there are a few points that could be worth following up, such as the use of this guide as a motivating tool, why they were not so keen on a Time Management Advisor, why they felt it would be equally helpful to computing and non-computing students, how the navigation would have been made easier, why they kept wanting to click on the Map button, and so on. It would have been useful to have arranged a follow up structured interview with the evaluators to expand on these issues. However, due to this project's, and the evaluators, limited time constraints this was not possible. It is worth bearing in mind, for future work, that many 'loose ends' arise following the analysis of data and it would seem worthwhile routinely building a follow-up procedure into evaluations and user studies to clarify some of these issues with the same set of participants. This is not something that is mentioned in design methodologies and evidence from this project suggests it is worth including as it would provide much richer data.

This evaluation has given a positive message concerning the future of the Progress Advisor and advisors in general. Students were, overall, positive about it and their comments were helpful and constructive. It would appear then, that the idea of advisors, in particular the Progress Advisor, is a valid one and well worth continuing. The Study Skills Advisor also appears to be worth implementing.

9. Work In Progress

The evaluation of the prototype highlighted 2 main areas which required modification. The first concerned the type of advice the Progress Advisor gave the student, and the second concerned the clarity of the interface. It was decided to concentrate on these areas when making modifications to the prototype during the second iteration of the design process.

Advice

Appendix 12, Figure 1, shows the advice given to the students during the evaluation. Figure 2 of this appendix shows the advice given, for the same data, after revision of the prototype following suggestions made by the students. As can be seen, the new advice summarises the key concepts of the material they had difficulty with. The font for the advice has been changed because one of the students had trouble reading it. Although only one student expressed this difficulty, it was felt that since this advice is so important, it should be clear to read, and changing the font will reduce any further problems students may encounter. Another reason for doing this is to make the advice from the Progress Advisor distinct from the rest of the course material by using a different font. The validity of this approach will be tested during the next evaluation.

Interface

There were a number of problems concerning the clarity of the interface and following a suggestion from one of the students a possible solution to this was chosen: a toolbar was constructed (see Appendix 12, Figure 3)

One of the main differences now is that each button has an icon and a text explanation of what its function is, to alleviate any confusion. The buttons were made large so the icons and text would both be clear and readable. This toolbar remains on the screen at all times while the student is using the on-line study guide so the student should become familiar with it and quickly learn how to use it. An additional button, not included in the initial prototype, is the print button. This was not originally included as there did not appear to be an appropriate place to put it, however, the use of a toolbar has led to its inclusion now being possible. Now the student has all the main functions together in one place which it is hoped will ease the problems encountered during the evaluation. Whether this is the case will be

seen at the next evaluation. Currently the toolbar is being made fully functional and the prototype will be ready for its second evaluation shortly.

Other Changes

There are a few other changes being considered for this system. One is the suggestion from an evaluator who wondered whether the information she was typing in would appear in summary form next to the task. This would provide immediate visual feedback to the student. Also, the information typed in concerning the time taken to complete the task is not used as this was intended for the Time Management Advisor. This project has raised a query over the future of this advisor and it may be worth merging the Time Management Advisor with the Progress Advisor as time and progress are so intrinsically linked. The information presented to the student could then be supplemented by showing the actual time taken to complete the task and the corresponding suggested time. The Progress Advisor would then include this information in providing its tailored advice

The results from this evaluation do not really change the initial requirements specification, but they do clarify it. Two areas which were vague in the initial requirements specification can now be much more fully defined, namely the actual structure and content of the progress advice and the kind of navigation issues that concern this on-line study guide. From these results, a revised and more complete requirements specification has been produced (Appendix 13). This may be further revised.

10. Future Work

One of the main areas for future work arising from this study is the area of on-line study guides in general. Little research has been conducted in this area and it is already clear that more research is needed. This project will continue that research. There are very few existing on-line study guides which are fully integrated with the subject matter of the course as was intended in this project. Of those reviewed earlier, one merely uses hypertext links and does not appear to fully exploit new technology. The other one does appear to be integrated with course materials and uses new technology to enhance them. It appears that there is a potential for new technologies to be successfully applied in supporting the study of distance education students. This project will continue to look for further examples of, and research concerning, on-line study guides, although to date, this project's prototype on-line study guide appears to be the only one of its kind: exploiting new technology in its use of advisors (agents) to offer immediate and individual support to students.

It is to be hoped that the preliminary research in this area that this project has carried out will contribute to the wider research of on-line study guides, which appears to be a new and exciting way of exploiting technology in the area of education.

This project will carry out more detailed research into students' 'approaches to studying', briefly mentioned earlier. Morgan (1993) points out that students should be encouraged to adopt a 'deep' approach to learning and just how this can be accomplished using an on-line study guide will be considered.

The prototype was aimed at distance education students, however, it would be interesting to find out what traditional students thought about it: whether the use of 'advisors' would also be beneficial to them. This could easily be established by running the same evaluation procedure with traditional students.

Although small, this project has thrown light on the difficulties students, both distance education and traditional, face when studying. These difficulties are quite far reaching and may substantially hinder the student in their learning. The fact that so many students were experiencing problems is one area for future work highlighted by this study. The distance education students had been studying for several years and had experience of study guides, yet many still felt they had problems. The influence of study guides on distance education students is an area which could yield promising results. Are students with experience of using study guides being equipped with better study skills than those not using them, or are study guides having little impact in developing study skills? There was not sufficient data

from this study to make any informed comments on this.

The traditional students, mainly postgraduates, also had many problems despite the fact that they were at postgraduate level. A major problem experienced by these students was time management. It is worth investigating further why traditional students are still feeling that they have basic study problems despite years of previous study. It would appear that traditional university education, at undergraduate level, is not providing students with the skills they need and, according to this study, want. Further research in this area would help to clarify this and hopefully offer ways of enabling the development of study skills in students at undergraduate level. This could suggest that such skills may need to be taught or developed at an earlier age, perhaps during school education. Is there an optimum age or time for developing these skills? Research in this area could have important consequences for education.

As stated above, the traditional students mentioned time management many times as being a skill they wished to improve, however, few distance education students mentioned this. As most of the distance education students had previously used study guides, which contain pacing information, it would be useful to find out whether the information and structure of these guides has influenced time management, in a beneficial manner, for distance education students.

There is also a problem with what students actually meant by 'time management', which could be a very specific area for further work. Did students who mentioned problems with time management mean they had problems managing their time or that they had a problem due to *lack* of time. Time is becoming a precious commodity in the modern world and further research into the difficulties students are experiencing in this area could offer ways of changing and improving the way we teach students, as well as providing more detailed information as to exactly what problems they are experiencing with time management.

Another area for further investigation is a comparison of students of this country (England) and other countries, particularly the other UK and European countries. This arises from the fact that one of the traditional students was on placement here from Holland and had few problems with studying. In fact, she appeared to be very sure of her study skills and was positive about her experience of study in Holland. A comparison of the way other countries approach the teaching of study skills to students or incorporate supporting features/material into their courses could identify methods of great benefit to students in this country.

There appeared to be a trend in this study for distance education students to be more aware of the study skills they needed to improve. The skills they wished to improve were more

specific than the traditional students and more assignment oriented. A comparative study with a larger number of students would be useful to clarify whether this was indeed the case, or simply an anomaly due to the small number of this study.

11. Discussion

To conclude this report a number of issues arising from the project will now be discussed.

There are important lessons to be learnt from this study concerning the effectiveness of particular features of study guides. Both groups of students were clear that ‘summaries’, ‘aims and objectives’, ‘self-assessed questions’ and ‘study skills advice’ were needed in a good study guide. If we look at a typical paper-based study guide produced by the Open University for the course ‘DM871 Intelligent Systems: Analysis and Design’, we can see that it contains objectives for each unit, summaries, aims of the course and self-assessed questions as well as a variety of other features. From reviewing some of the Open University’s study guides and from what students have said about them, it would appear that the Open University’s study guides should serve as a model for other guides.

The results from the user study are in keeping with the study of distance education students conducted by Dekkers et al (1993), previously discussed, who also found that when students were asked to evaluate the effectiveness of features of a study guide, ‘summaries and conclusions’ were rated the highest. Their corresponding categories for aims and objectives and self-assessed questions were also rated highly. Dekkers et al’s study showed that distance education students ranked wide margins last and this was also the case with the traditional students in this study. However, in this study, distance education students ranked it much higher. Dekkers et al suggest that their result may have been due to the study packages used in their study not providing students with information on the use of the feature. The students in this study may have been given information on how to use this feature in the study guides they had used previously, hence this result. This study also gives some support to Dekkers et al who found that diagrams were rated fairly highly and they suggest that learners have a preference for visual teaching and that instructional packages should exploit this. This survey also found that diagrams were rated quite highly with a fairly low variance, in fact, distance education students considered interactive diagrams to be very important in an on-line study guide.

The features which were ranked highly are all those which can act as successful revision aids and this was also noted in Dekkers et al’s (1993) study. The use of the M206 Course Map as a revision aid was mentioned during its evaluation (see Appendix 14) and the data from this project would suggest that distance education students are assignment driven in their study patterns. Indeed, it is very likely that the students taking M206 will be as assignment driven as their counterparts on M205 (Morgan, 1989). As students seek out strategies which will help them with their studies, in particular revision, the use of such

systems as revision aids should be noted and maximised.

Students participating in the evaluation were consistent about what form of support they needed. The initial advice to simply re-read the material was not helpful. Students wanted further direction if they were having trouble understanding material, such as having the key concepts underlying the material pointed out to them. This shows the level of insight that these distance education students had concerning their study needs and shows the importance of consulting the user in projects like this. These students came up with a number of constructive comments regarding the Progress Advisor and on-line study guides in general, despite no previous contact with such systems.

On-line study guides should not be seen as being solely appropriate for computing based courses. Distance education students completing a psychology course (the evaluators) thought an on-line study guide would be appropriate for all. Computers are becoming more widespread and more people are becoming experienced in using them. They are being extensively used in primary schools and a whole new generation is being brought up with them. On-line study guides, one day, could become the norm, an intrinsic part of a student's learning experience.

This project concerned itself with the issue of how an on-line study guide could help a distance education student with the difficulties they face while studying. The approach taken by this project is to use 'advisors' to provide this support. These advisors are envisioned to be intelligent agents, however, this project has focussed on the issues at hand and has not concerned itself with the wider issues and implications of agents (Laurel, 1991). Agents are already being used in the field of education (Masterton, 1997) and their use is becoming more widespread elsewhere (Maes, 1994). The use of agents as advisors to support distance education students through their course is a new and exciting area.

The design of this prototype has demonstrated the benefits of a Progress Advisor to distance education students and it is worth considering the benefits of such support systems for traditional students as well. Although aimed at distance education students with their specific needs, there is no reason why similar systems should not be developed for traditional education students. They too have said they would like support with their studies, in particular, with time management.

Traditional students are rarely offered study guides to support their learning and anecdotal evidence suggests that little study support is given to these students. Traditional teaching of students is increasingly moving to something more like a distance education approach (Hall, 1997): students are receiving less direct teaching and tutor time as small group tutorials

appear to be phased out and larger seminars become the norm; teach files are being used instead of lab-based sessions; and so on. The increasing pressure on higher education is changing the way it is being taught and distance education is also sure to change as it becomes an alternative and more affordable way to obtain a degree. In the changing face of higher education there may be an increasing need for support systems such as study guides and on-line study guides.

This study has revealed a difficulty with terminology. There was a difference of opinion concerning what 'on-line' actually meant. As the traditional students were mainly from a computing background assumptions were made that on-line meant being attached to some remote server. The distance education students, who were from a psychology background, were unsure as to what on-line actually meant. The term 'on-line', then, may best be used with caution - perhaps 'interactive study guide' might be a better way of describing such study guides.

On-line study guides (or interactive study guides) are a new area, and there has been very little research on them. Even though this work is still in its preliminary stages, there are some areas of clear promise which may help to offer a new generation of study guides to both distance education and traditional students. This project shows just how important this work might be.

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**Appendix 1
Program Code**

**Appendix 2
User Study Questionnaire**

**Appendix 3
User Study Questionnaire HTML Code**

**Appendix 4
User Study Questionnaire Raw Data**

**Appendix 5
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**Appendix 6
Storyboards**

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**Appendix 8
Evaluation Procedure**

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**Appendix 12
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**Appendix 13
Modified Requirements Specification**

**Appendix 14
Summary of M206 Map Developmental Testing**

**Appendix 15
Summary of Interviews with M206 Developmental Testers
(Comments relevant to study guide)**

Appendix 1. Program Code

Project Script

```
on openProject
    set cursor to "Watch"
    set textArrows to true

    set the backDrop to white
    insert menu "Apple"

    Global
    link1,link2,link3,link4,link5,link6,link7,link8,link9,link10,link11,link12

    -- Assigns given colour number to these variables so the 'hypertext' link
    -- colours work when accessing the chapter information.
    put 187 into link1
    put 187 into link2
    put 187 into link3
    put 187 into link4
    put 187 into link5
    put 187 into link6
    put 187 into link7
    put 187 into link8
    put 205 into link9
    put 205 into link10
    put 205 into link11
    put 205 into link12

    -- Sets stated fields to the given colour so that the chapter hypertext
    -- links are reset to their 'unaccessed' colour.
    set textColor of cd fld 7 of cd 2 of wd 2 to 187
    set textColor of cd fld 8 of cd 2 of wd 2 to 187
    set textColor of cd fld 9 of cd 2 of wd 2 to 187
    set textColor of cd fld 10 of cd 2 of wd 2 to 187
    set textColor of cd fld 11 of cd 2 of wd 2 to 187
    set textColor of cd fld 12 of cd 2 of wd 2 to 187
    set textColor of cd fld 13 of cd 2 of wd 2 to 187
    set textColor of cd fld 14 of cd 2 of wd 2 to 187

    set textColor of cd fld 5 of cd 11 of wd 2 to 205
    set textColor of cd fld 8 of cd 11 of wd 2 to 205
    set textColor of cd fld 9 of cd 11 of wd 2 to 205
    set textColor of cd fld 10 of cd 11 of wd 2 to 205

end openProject

on closeProject

    -- Hide the 'tick' fields to 'reset' Study Guide.
    hide cd fld 3 of cd 3 of wd 2
    hide cd fld 4 of cd 3 of wd 2
    hide cd fld 5 of cd 3 of wd 2
    hide cd fld 6 of cd 3 of wd 2
    hide cd fld 7 of cd 3 of wd 2
```

```

hide cd fld 3 of cd 4 of wd 2
hide cd fld 4 of cd 4 of wd 2
hide cd fld 5 of cd 4 of wd 2
hide cd fld 3 of cd 5 of wd 2
hide cd fld 4 of cd 5 of wd 2
hide cd fld 3 of cd 6 of wd 2
hide cd fld 4 of cd 6 of wd 2
hide cd fld 3 of cd 7 of wd 2
hide cd fld 4 of cd 7 of wd 2
hide cd fld 3 of cd 8 of wd 2
hide cd fld 4 of cd 8 of wd 2
hide cd fld 3 of cd 9 of wd 2
hide cd fld 4 of cd 9 of wd 2
hide cd fld 3 of cd 10 of wd 2
hide cd fld 4 of cd 10 of wd 2
hide cd fld 5 of cd 10 of wd 2
hide cd fld 3 of cd 12 of wd 2
hide cd fld 4 of cd 12 of wd 2
hide cd fld 5 of cd 12 of wd 2
hide cd fld 3 of cd 13 of wd 2
hide cd fld 4 of cd 13 of wd 2
hide cd fld 3 of cd 14 of wd 2
hide cd fld 4 of cd 14 of wd 2
hide cd fld 3 of cd 15 of wd 2
hide cd fld 4 of cd 15 of wd 2
hide cd fld 5 of cd 15 of wd 2
hide cd fld ID 150 of cd 1 of wd 3

```

```

-- Empty the text from these fields in the Progress Advisor so Study Guide
-- is reset.

```

```

put empty into cd fld ID 113 of cd 1 of wd 3
put empty into cd fld ID 114 of cd 1 of wd 3
put empty into cd fld ID 115 of cd 1 of wd 3
put empty into cd fld ID 116 of cd 1 of wd 3
put empty into cd fld ID 117 of cd 1 of wd 3
put empty into cd fld ID 159 of cd 2 of wd 3
put empty into cd fld ID 160 of cd 2 of wd 3
put empty into cd fld ID 161 of cd 2 of wd 3

```

```

-- Set the background of these fields in the Progress Advisor to 'white'
-- so Study Guide is reset

```

```

set the fillFore of cd fld ID 113 of cd 1 of wd 3 to 1
set the fillFore of cd fld ID 114 of cd 1 of wd 3 to 1
set the fillFore of cd fld ID 115 of cd 1 of wd 3 to 1
set the fillFore of cd fld ID 116 of cd 1 of wd 3 to 1
set the fillFore of cd fld ID 117 of cd 1 of wd 3 to 1
set the fillFore of cd fld ID 159 of cd 2 of wd 3 to 1
set the fillFore of cd fld ID 160 of cd 2 of wd 3 to 1
set the fillFore of cd fld ID 161 of cd 2 of wd 3 to 1

```

```

end closeProject

```

```

on RadioScript1 -- Ensures successful highlighting of the radio buttons.

```

```

-- Put the number of the selected button into this variable.
put the short id of the target into targetID
-- Put all the radio button numbers into a list.
put "107,108,109" into radioList
-- Go through the list and put each item into this variable.
repeat with i = 1 to the number of items of radioList
    put item i of radioList into thisRadio

```

```

        -- Set the highlight of the button to true (highlighted) or false (not
        -- highlighted) according to whether it has the same number as the
        -- selected button.
        set hilite of btn id thisRadio to (thisRadio = targetID)
    end repeat
end RadioScript1

on adviseStudent
-- Checks which fields are empty and puts appropriate message into the
-- 'reminder' card when moving to Chapter 2.
    if cd fld ID 113 of cd 1 of wd 3 = empty then
        put "M205 Course Map CD-ROM" into line 1 of cd fld ID 158 of cd 1 of wd 6
    end if

    if cd fld ID 114 of cd 1 of wd 3 = empty then
        put "Chapter 1:Printed Text" into line 2 of cd fld ID 158 of cd 1 of wd 6
    end if

    if cd fld ID 115 of cd 1 of wd 3 = empty then
        put "LearningBook" into line 3 of cd fld ID 158 of cd 1 of wd 6
    end if

    if cd fld ID 116 of cd 1 of wd 3 = empty then
        put "Parsons and Oja: Chapters 1 & 2" into line 4 of cd fld ID 158 of cd 1
        of wd 6
    end if

    if cd fld ID 117 of cd 1 of wd 3 = empty then
        put "Email" into line 5 of cd fld ID 158 of cd 1 of wd 6
    end if

    lock screen
    beep -- Beeps to get user's attention.
    open cd 1 of wd 6 -- Opens the 'reminder' card.
    unlock screen with visual "iris open" slowly
end adviseStudent

```

Window 1 ID 100 - Map

Card 1 ID 101 - Map link

Field 1 ID 105 - Study Guide

```

on mouseDown
-- While the mouse is down, change colour of text to yellow.
    repeat while the mouse is down
        set textColor of cd fld ID 105 of cd 1 of wd 1 to 48
    end repeat
-- When mouse no longer down, reset to original colour
    set textColor of cd fld ID 105 of cd 1 of wd 1 to 243
end mouseDown

on mouseUp -- When clicked on go to the study guide
    lock screen -- 'front page' with the stated visual effect.
    go card 1 of window 2
    unlock screen with visual "dissolve" very slowly
end mouseUp

```

Window 2 ID 102 - Study Guide

Background

Button 1 ID 108 - Map

```
on mouseUp          -- When clicked on go to the map screen with
  lock screen       -- the stated visual effect.
  go card 1 of wd 1
  unlock screen with visual "dissolve" very slowly
end mouseUp
```

Button 2 ID 109 - Help

```
on mouseUp
  lock screen          -- When clicked on, show 'not written yet' card.
  open card 1 of window 4
  unlock screen with visual "dissolve" very slowly
end mouseUp
```

Card 1 ID 102 - Study Guide

Button 11 ID 135 - Study Guide Tour

```
on mouseUp
  lock screen          -- When clicked on, show 'not written yet' card.
  open cd 1 of wd 4
  unlock screen with visual "dissolve" very slowly
end mouseUp
```

Button 3 ID 121 - Progress Advisor

```
on mouseUp          -- When clicked, go to 'Progress Advisor'
  lock screen       -- card with stated visual effect.
  go card 1 of window 3
  unlock screen with visual "dissolve" very slowly
end mouseUp
```

Button 2 ID 120 - Time Management Advisor

```
on mouseUp
  lock screen          -- When clicked on, show 'not written yet' card.
  open card 1 of window 4
  unlock screen with visual "dissolve" very slowly
end mouseUp
```

Button 4 ID 122 - Study Skills Advisor

```
on mouseUp
  lock screen          -- When clicked on, show 'not written yet' card.
  open card 1 of window 4
  unlock screen with visual "dissolve" very slowly
end mouseUp
```

Button 1 ID 113 - Block 1

```
on mouseUp                                -- When clicked, go to 'Block 1' card with
  visual "dissolve" very slowly           -- stated effect.
  go card 2
end mouseUp
```

Button 5 ID 129 - Block 2

```
on mouseUp                                -- When clicked, to to 'Block 2' card
  visual "dissolve" very slowly           -- with stated effect.
  go card 11
end mouseUp
```

Button 6 ID 130 - Block 3

```
on mouseUp
  lock screen                             -- When clicked on, show 'not written yet' card.
  open card 1 of window 4
  unlock screen with visual "dissolve" very slowly
end mouseUp
```

Button 7 ID 131 - Block 4

```
on mouseUp
  lock screen                             -- When clicked on, show 'not written yet' card.
  open card 1 of window 4
  unlock screen with visual "dissolve" very slowly
end mouseUp
```

Button 8 ID 132 - Block 5

```
on mouseUp
  lock screen                             -- When clicked on, show 'not written yet' card.
  open card 1 of window 4
  unlock screen with visual "dissolve" very slowly
end mouseUp
```

Button 9 ID 133 - Block 6

```
on mouseUp
  lock screen                             -- When clicked on, show 'not written yet' card.
  open card 1 of window 4
  unlock screen with visual "dissolve" very slowly
end mouseUp
```

Button 10 ID 134 - Block 7

```
on mouseUp
  lock screen                             -- When clicked on, show 'not written yet' card.
  open card 1 of window 4
  unlock screen with visual "dissolve" very slowly
end mouseUp
```

Card 2 ID 104 - Block 1

Field 7 ID 133 - Chapter 1

```
on mouseDown
  Global link1
  -- While the mouse is down set the text colour to yellow.
  repeat while the mouse is down
    set textColor of card field 7 to 48
  end repeat
  -- Set text colour to the colour number assigned to the variable 'link1'.
  set textColor of card field 7 to link1
end mouseDown
```

```
on mouseUp
  Global link1
  -- When clicked on, set the text colour to grey.
  set textColor of card field 7 to 250
  visual "dissolve" very slowly
  -- Go to the Chapter 1 card with stated visual effect.
  go card 3
  -- Assign 250 (i.e. grey) to variable 'link1'
  put 250 into link1
end mouseUp
```

Field 8 ID 135 - Chapter 2

```
on mouseDown
  Global link2
  -- While the mouse is down set the text colour to yellow.
  repeat while the mouse is down
    set textColor of card field 8 to 48
  end repeat
  -- Set text colour to the colour number assigned to the variable 'link2'.
  set textColor of card field 8 to link2

end mouseDown
```

```
on mouseUp
  Global link2
  -- When clicked on, set the text colour to grey.
  set textColor of card field 8 to 250
  visual "dissolve" very slowly
  -- Go to the Chapter 2 card with stated visual effect.
  go card 4
  -- Assign 250 (i.e. grey) to variable 'link2'.
  put 250 into link2
end mouseUp
```

Field 9 ID 136 - Chapter 3

```
on mouseDown
  Global link3
```

```

-- While the mouse is down set the text colour to yellow.
repeat while the mouse is down
  set textColor of card field 9 to 48
end repeat
-- Set text colour to the colour number assigned to the variable 'link3'.
set textColor of card field 9 to link3
end mouseDown

```

```

on mouseUp
  Global link3
  -- When clicked on, set the text colour to grey.
  set textColor of card field 9 to 250
  visual "dissolve" very slowly
  -- Go to the Chapter 3 card with stated visual effect.
  go card 5
  -- Assign 250 (i.e. grey) to variable 'link3'.
  put 250 into link3
end mouseUp

```

Field 10 ID 137 - Block 4

```

on mouseDown
  Global link4
  -- While the mouse is down set the text colour to yellow.
  repeat while the mouse is down
    set textColor of card field 10 to 48
  end repeat
  -- Set text colour to the colour number assigned to the variable 'link4'.
  set textColor of card field 10 to link4
end mouseDown

```

```

on mouseUp
  Global link4
  -- When clicked on, set the text colour to grey.
  set textColor of card field 10 to 250
  visual "dissolve" very slowly
  -- Go to the Chapter 4 card with stated visual effect.
  go card 6
  -- Assign 250 (i.e. grey) to variable 'link4'.
  put 250 into link4
end mouseUp

```

Field 11 ID 138 - Chapter 5

```

on mouseDown
  Global link5
  -- While the mouse is down set the text colour to yellow.
  repeat while the mouse is down
    set textColor of card field 11 to 48
  end repeat
  -- Set text colour to the colour number assigned to the variable 'link5'.
  set textColor of card field 11 to link5
end mouseDown

```

```

on mouseUp
  Global link5
  -- When clicked on, set the text colour to grey.

```

```

set textColor of card field 11 to 250
visual "dissolve" very slowly
-- Go to the Chapter 5 card with stated visual effect.
go card 7
-- Assign 250 (i.e. grey) to variable 'link5'.
put 250 into link5
end mouseUp

```

Field 12 ID 139 - Chapter 6

```

on mouseDown
  Global link6
  -- While the mouse is down set the text colour to yellow.
  repeat while the mouse is down
    set textColor of card field 12 to 48
  end repeat
  -- Set text colour to the colour number assigned to the variable 'link6'.
  set textColor of card field 12 to link6
end mouseDown

```

```

on mouseUp
  Global link6
  -- When clicked on, set the text colour to grey.
  set textColor of card field 12 to 250
  visual "dissolve" very slowly
  -- Go to the Chapter 6 card with stated visual effect.
  go card 8
  -- Assign 250 (i.e. grey) to variable 'link6'.
  put 250 into link6
end mouseUp

```

Field 13 ID 140 - Chapter 7

```

on mouseDown
  Global link7
  -- While the mouse is down set the text colour to yellow.
  repeat while the mouse is down
    set textColor of card field 13 to 48
  end repeat
  -- Set text colour to the colour number assigned to the variable 'link7'.
  set textColor of card field 13 to link7
end mouseDown

```

```

on mouseUp
  Global link7
  -- When clicked on, set the text colour to grey.
  set textColor of card field 13 to 250
  visual "dissolve" very slowly
  -- Go to the Chapter 7 card with stated visual effect.
  go card 9
  -- Assign 250 (i.e. grey) to variable 'link7'.
  put 250 into link7
end mouseUp

```

Field 14 ID 141 - Chapter 8


```

on mouseDown
  Global link8
  -- While the mouse is down set the text colour to yellow.
  repeat while the mouse is down
    set textColor of card field 14 to 48
  end repeat
  -- Set text colour to the colour number assigned to the variable 'link8'.
  set textColor of card field 14 to link8
end mouseDown

```

```

on mouseUp
  Global link8
  -- When clicked on, set the text colour to grey.
  set textColor of card field 14 to 250
  visual "dissolve" very slowly
  -- Go to the Chapter 8 card with stated visual effect.
  go card 10
  -- Assign 250 (i.e. grey) to variable 'link8'.
  put 250 into link8
end mouseUp

```

Button 1 ID 144 - Study Guide Home Page

```

on mouseUp
  -- When clicked, go to the Study Guide 'home page'
  visual "dissolve" very slowly -- with the stated effect.
  go card 1
end mouseUp

```

Card 3 ID 105 - Chapter 1

Button 1 ID 132 - Tick off M205 Course Map

```

on mouseUp
  Global whatfield, whatcard, tick
  lock screen
  -- Put ID of field & card in the Progress Advisor where info is to be put
  -- about this task into these variables.
  put 113 into whatfield
  put 1 into whatcard
  put 133 into tick -- Put ID of field showing tick into this variable.
  open card 1 of window 5 -- Open dialogue window.
  unlock screen with visual "dissolve" very slowly
end mouseUp

```

Button 2 ID 138 - Tick off Chapter 1

```

on mouseUp
  Global whatfield, whatcard, tick
  lock screen
  -- Put ID of field and card in the Progress Advisor where info is to be put
  -- about this task into these variables.
  put 114 into whatfield
  put 1 into whatcard
  put 134 into tick -- Put ID of field showing tick into this variable.
  open card 1 of window 5 -- Open dialogue window.

```

```
unlock screen with visual "dissolve" very slowly
end mouseUp
```

Button 3 ID 139 - Tick off LearningBook

```
on mouseUp
  Global whatfield, whatcard, tick
  lock screen
  -- Put ID of field and card in the Progress Advisor where info is to be put
  -- about this task into these variables.
  put 115 into whatfield
  put 1 into whatcard
  put 135 into tick      -- Put ID of field showing tick into this variable.
  open card 1 of window 5 -- Open dialogue window.
  unlock screen with visual "dissolve" very slowly
end mouseUp
```

Button 4 ID 140 - Tick off Parsons and Oja

```
on mouseUp
  Global whatfield, whatcard, tick
  lock screen
  -- Put ID of field and card in the Progress Advisor where info is to be put
  -- about this task into these variables.
  put 116 into whatfield
  put 1 into whatcard
  put 136 into tick      -- Put ID of field showing tick into this variable.
  open card 1 of window 5 -- Open dialogue window.
  unlock screen with visual "dissolve" very slowly
end mouseUp
```

Button 5 ID 141 - Tick off Email

```
on mouseUp
  Global whatfield, whatcard, tick
  lock screen
  -- Put ID of field and card in the Progress Advisor where info is to be put
  -- about this task into these variables.
  put 117 into whatfield
  put 1 into whatcard
  put 137 into tick      -- Put ID of field showing tick into this variable.
  open card 1 of window 5 -- Open dialogue window.
  unlock screen with visual "dissolve" very slowly
end mouseUp
```

Button 7 ID 143 - Study Guide Home Page

```
on mouseUp      -- When clicked, go to the Study Guide 'Home page'
  visual "dissolve" very slowly -- with the stated effect.
  go card 1
end mouseUp
```

Button 6 ID 142 - Back

```
on mouseUp -- When clicked go back to the 'overview' page.
  visual "dissolve" very slowly
  go card 2
end mouseUp
```

Card 4 ID 106 - Chapter 2

Card Script

```
on openCard

  -- Check if any of these fields are empty (student has not done a task), if
  -- so, call 'adviseStudent'.
  if cd fld ID 113 of cd 1 of wd 3 = empty then
    adviseStudent
  else if cd fld ID 114 of cd 1 of wd 3 = empty then
    adviseStudent
  else if cd fld ID 115 of cd 1 of wd 3 = empty then
    adviseStudent
  else if cd fld ID 116 of cd 1 of wd 3 = empty then
    adviseStudent
  else if cd fld ID 117 of cd 1 of wd 3 = empty then
    adviseStudent
  end if
end openCard
```

Button 2 ID 137 - Tick off Chapter 2

```
on mouseUp
  Global whatfield, whatcard, tick
  lock screen
  -- Put ID of field and card in the Progress Advisor where info is to be put
  -- about this task into these variables.
  put 159 into whatfield
  put 2 into whatcard
  put 134 into tick -- Put ID of field showing tick into this variable.
  open card 1 of window 5 -- Open dialogue window.
  unlock screen with visual "dissolve" very slowly
end mouseUp
```

Button 3 ID 138 - Tick off TV

```
on mouseUp
  Global whatfield, whatcard, tick
  lock screen
  -- Put ID of field and card in the Progress Advisor where info is to be put
  -- about this task into these variables.
  put 160 into whatfield
  put 2 into whatcard
  put 136 into tick -- Put ID of field showing tick into this variable.
  open card 1 of window 5 -- Open dialogue window.
  unlock screen with visual "dissolve" very slowly
end mouseUp
```

Button 4 ID 140 - Tick off Parsons and Oja 7

```

on mouseUp
  Global whatfield, whatcard, tick
  lock screen
  -- Put ID of field and card in the Progress Advisor where info is to be put
  -- about this task into these variables.
  put 161 into whatfield
  put 2 into whatcard
  put 139 into tick      -- Put ID of field showing tick into this variable.
  open card 1 of window 5 -- Open dialogue window.
  unlock screen with visual "dissolve" very slowly
end mouseUp

```

Button 6 ID 145 - Study Guide Home Page

```

on mouseUp      -- When clicked, go to the Study Guide 'home page'
  visual "dissolve" very slowly -- with the stated effect.
  go card 1
end mouseUp

```

Button 5 ID 144 - Back

```

on mouseUp      -- When clicked go back to the 'overview' page.
  visual "dissolve" very slowly
  go card 2
end mouseUp

```

Window 3 ID 104 - Progress

Card 1 ID 101 - Chapter 1

Button 3 ID 149 - Advice

```

on mouseUp      -- When clicked on, show invisible field with stated effect.
  lock screen
  show card field ID 150
  unlock screen with visual "iris open" slowly
end mouseUp

```

Button 1 ID 146 - Study Guide Home Page

```

on mouseUp      -- When clicked, go to the Study Guide 'Home Page'
                -- with stated effect.
  lock screen
  go cd 1 of wd 2
  unlock screen with visual "dissolve" very slowly
end mouseUp

```

Button 2 ID 147 - Next

```

on mouseUp
  -- When clicked, go to the next card, which is the next chapter, with the
  -- stated effect.

```

```
    visual "dissolve" very slowly
    go next card
end mouseUp
```

Field 5 ID 150 - The Advice

```
on mouseUp
    lock screen      -- When clicked on, hide the field with the stated effect.
    hide me
    unlock screen with visual "iris close"  slowly
end mouseUp
```

Card 2 ID 103 - Chapter 2

Button 4 ID 164 - Advice

```
on mouseUp      -- When clicked on, show invisible field with stated effect.
    lock screen
    show card field ID 165
    unlock screen with visual "iris open" slowly
end mouseUp
```

Button 1 ID 151 - Study Guide Home Page

```
on mouseUp
    -- When clicked, go to the the Study Guide 'Home Page' with stated effect.
    lock screen
    go cd 1 of wd 2
    unlock screen with visual "dissolve" very slowly
end mouseUp
```

Button 2 ID 152 - Next

```
on mouseUp
    -- When clicked, go to the next card, which is the next chapter, with the
    -- stated effect.
    visual "dissolve" very slowly
    go next card
end mouseUp
```

Button 3 ID 163 - Previous

```
on mouseUp
    -- When clicked, go to previous card, which is the previous chapter, with
    -- the stated effect.
    visual "dissolve" very slowly
    go previous card
end mouseUp
```

Field 12 ID 165 - The Advice

```
on mouseUp
    lock screen      -- When clicked on, hide the field with the stated effect.
```

```
hide me
unlock screen with visual "iris close" slowly
end mouseUp
```

Window 4 ID 107 - Not Written

Window Script

```
on mouseUp          -- When this window is clicked on by the mouse,
  close me          -- close it.
end mouseUp
```

Window 5 ID 108 - Rating

Card 1 ID 101 - Rating

Card Script

```
on closeCard
  -- When card is closed, empty the field of any text.
  put empty into cd fld ID 104
  -- Ensure none of the radio buttons are highlighted.
  set the hilite of btn ID 107 to false
  set the hilite of btn ID 108 to false
  set the hilite of btn ID 109 to false
end closeCard
```

Button 3 ID 107 - Very Well

```
on mouseUp
  'RadioScript1'          -- When clicked, call the handler
  RadioScript1 short id of me -- and get the id number of the button.
end mouseUp
```

Button 5 ID 109 - Quite Well

```
on mouseUp
  'RadioScript1'          -- When clicked, call the handler
  RadioScript1 short id of me -- and get the id number of the button.
end mouseUp
```

Button 4 ID 108 - Not Very

```
on mouseUp
  'RadioScript1'          -- When clicked, call the handler
  RadioScript1 short id of me -- and get the id number of the button.
end mouseUp
```

Button 1 ID 101 - Cancel

```
on mouseUp          -- When clicked, close the window.
  close wd
```

```
end mouseUp
```

Button 2 ID 102 - OK

```
on mouseUp
  Global hours, understanding, whatfield, whatcard, tick
  -- Put users estimated hours into 'hours' variable.
  put line 1 of card field 2 into hours
  -- Find the radio button which is highlighted.
  if (hilite of btn id 107) then
    -- Put appropriate text into 'understanding' variable.
    put "I understood this very well" into understanding
    -- Set the appropriate field of the Progress Advisor to appropriate colour
    set the fillFore of cd fld ID whatfield of cd whatcard of wd 3 to 227
  end if
  if (hilite of btn id 109) then
    put "I understood this quite well" into understanding
    set the fillFore of cd fld ID whatfield of cd whatcard of wd 3 to 6
  end if
  if (hilite of btn id 108) then
    put "I did not understand this very well" into understanding
    set the fillFore of cd fld ID whatfield of cd whatcard of wd 3 to 36
  end if
  -- Put this text into the appropriate field of the Progress Advisor.
  put understanding into cd fld ID whatfield of cd whatcard of wd 3
  -- Put tick in box to show task done and close the window.
  show card field ID tick of wd 2
  close wd
end mouseUp
```

Window 6 ID 109 - Reminder

Card 1 ID 101 - Chpt 1

Card Script

```
on closeCard
  -- When card is close, empty this field.
  put empty into cd fld ID 158 of cd 1 of wd 6
end closeCard
```

Button 3 ID 161 - Chapter 1

```
on mouseUp
  lock screen    -- When clicked, go to the Chapter 1 card with stated effect.
  go to cd 3 of wd 2
  unlock screen with visual "dissolve" very slowly
end mouseUp
```

Button 1 ID 159 - Don't remind me again

```
on mouseUp
  lock screen    -- When clicked, close window with stated effect.
  close wd
  unlock screen with visual "iris close" slowly
```

```
end mouseUp
```

Button 2 ID 160 - OK

```
on mouseUp
  lock screen          -- When clicked, close window with stated effect.
  close wd
  unlock screen with visual "iris close" slowly
end mouseUp
```

Window 7 ID 110 - About Study Guide

Window Script

```
on mouseUp    -- When clicked, close window.
  close me
end mouseUp
```

Menu 1 ID 100 - Apple

Item 1 ID 100 - About Study Guide.....

Item Script

```
on itemSelect  -- When item is selected, open 'About Study Guide' window.
  open wd 7
end itemSelect
```


Appendix 2. User Study Questionnaire

Study Guide Questionnaire

Thank you for agreeing to fill in this questionnaire. For my MSc dissertation I am looking at the use of study guides and, in particular, on-line study guides.

I am interested in your personal experience of studying and study guides, and in your views on what would make a good study guide.

The questionnaire consists of questions which ask you to fill in the text boxes provided, to check the appropriate box, or to rank given features. You can change your answers at any time before sending the questionnaire. It should only take around 10 minutes to fill in. To send me your completed questionnaire, please press the "Submit" button at the end. If you want to start again press the "Reset" button at the end; this will completely clear all your answers. Your answers are anonymous and will be treated confidentially.

Should you have any queries, please do not hesitate to email me.

Chris McKillop
Email: chrism@cogs.susx.ac.uk
MSc Human-Centred Computer Systems
School of Cognitive and Computing Sciences
University of Sussex

Personal Information

1. Age:

2. Sex: Female Male

3. Level of study: Undergraduate Postgraduate

4. Year of study:

5. Degree/area of research:

6. Please list the main reason(s) for your choice of study:

⬅ ⏪ ⏩ ➡

Study Skills

7. How confident do you feel about your study skills?

Very confident Fairly confident Not confident Unsure/don't know

8. Do you feel you have been given sufficient study skills advice on your course?

Yes No Unsure/don't know

9. Do you feel you have been given sufficient advice on how to plan your study time on your course?

Yes No Unsure/don't know

10. Do you sometimes have problems in planning your study time?

Yes No Unsure/don't know

11. What study skill(s) would you most like to improve?

Study Guides

12. Have you ever used a study guide before?

Yes No

If yes, please continue.






If no, go to question 17.

13. What form was it, e.g., on-line, book, etc?






14. Did you find it helpful?

Yes No Unsure/don't know

15. What did you like about it?

16. What did you dislike about it?

17. Would you have liked to have had a study guide for your current course?

Yes No Unsure/don't know Already use one

18. Which of the following features would you find helpful in a study guide? Please rank the ones you think helpful in order of importance from 1 upwards, with 1 being the most important.

- Wide margin to write own notes in
 - Diagrams
 - Self-assessed questions
 - Quizzes
 - Study skills advice
 - Glossary of key/technical terms
 - Aims and objectives of each section stated
 - Summaries of each section
 - Suggested activities
 - Suggested further reading
-

On-line Study Guide

19. Do you think an on-line study guide would be helpful to you?

Yes No Unsure/don't know

20. Do you think it would be more helpful than a paper-based study guide?

Yes No Unsure/don't know

21. Which of the following features would you find helpful in an on-line study guide? Please rank the ones you think helpful in order of importance from 1 upwards, with 1 being the most important.

- Separate 'journal' for own notes
- Space to add notes to existing page
- Interactive diagrams
- Self-assessed questions
- Quizzes
- Print pages
- Active reminders of assignment deadlines
- Tool bar for features
- Mark text by highlighting, underlining etc.
- Study skills advice
- Indicator to show progress through study guide
- To be interactive
- Tick things off
- Bookmarks
- Key word search function

- Interactive calendar with times and details of assignments and study tasks
- Hypertext (hotlinks)

22. Would you use an on-line study guide?

Yes No Unsure/don't know

23. Please use the space below to add any further comments you may have on any of the above sections:

↑

↓

←

→

Thank you!

Thank you very much for taking the time to fill in this questionnaire. Your views will be very helpful to my dissertation. To send me your completed questionnaire, please press the "Submit" button. After sending your questionnaire a notice confirming it has been received will appear.

Press the "Submit" button to send your completed questionnaire:

Press the Reset button if you want to completely clear all your answers:

*Chris McKillop
Email: chrism@cogs.susx.ac.uk
MSc Human-Centred Computer Systems
School of Cognitive and Computing Sciences
University of Sussex*

TYPE="radio" VALUE="yes" NAME="q12"> No <INPUT
TYPE="radio" VALUE="no" NAME="q12">

<CITE>If yes, please continue.

</CITE>

<CITE>If no, go to question 17.

</CITE>

13. What form was it, e.g., on-line, book, etc? <INPUT NAME="q13"
TYPE="text" SIZE="30">

14. Did you find it helpful?

 Yes <INPUT TYPE="radio"
VALUE="yes" NAME="q14"> No <INPUT TYPE="radio"
VALUE="no" NAME="q14"> Unsure/don't know <INPUT
TYPE="radio" VALUE="unsure/dont" NAME="q14">

15. What did you like about it?

<TEXTAREA NAME="q15" ROWS="6" COLS="60"></TEXTAREA>

16. What did you dislike about it?

<TEXTAREA NAME="q16" ROWS="6" COLS="60"></TEXTAREA>

17. Would you have liked to have had a study guide for your current
course?

 Yes <INPUT TYPE="radio" VALUE="yes"
NAME="q17"> No <INPUT TYPE="radio" VALUE="no"
NAME="q17"> Unsure/don't know <INPUT TYPE="radio"
VALUE="unsure/dont" NAME="q17"> Already use one <INPUT
TYPE="radio" VALUE="already" NAME="q17">

18. Which of the following features would you find helpful in a study guide? Please
rank the ones you think helpful in order of importance from 1 upwards, with 1 being
the most important.

 <INPUT NAME="q18widemargin" TYPE="text"
SIZE="3"> Wide margin to write own notes in

 <INPUT NAME="q18diagrams" TYPE="text"
SIZE="3"> Diagrams

 <INPUT NAME="q18saqs" TYPE="text" SIZE="3"> Self-
assessed questions

 <INPUT NAME="q18quizzes" TYPE="text"
SIZE="3"> Quizzes

 <INPUT NAME="q18advice" TYPE="text" SIZE="3"> Study
skills advice

 <INPUT NAME="q18glossary" TYPE="text"
SIZE="3"> Glossary of key/technical terms

 <INPUT NAME="q18aims" TYPE="text" SIZE="3"> Aims and
objectives of each section stated

 <INPUT NAME="q18summaries" TYPE="text"
SIZE="3"> Summaries of each section

 <INPUT NAME="q18activities" TYPE="text"
SIZE="3"> Suggested activities

 <INPUT NAME="q18readings" TYPE="text" SIZE="3">

 <HR>

<H3>On-line Study Guide</H3>

19. Do you think an on-line study guide would be helpful to you?

 <INPUT TYPE="radio" VALUE="yes" NAME="q19"> <INPUT TYPE="radio" VALUE="no" NAME="q19"> <INPUT TYPE="radio" VALUE="unsure/dont" NAME="q19">

20. Do you think it would be more helpful than a paper-based study guide?

 <INPUT TYPE="radio" VALUE="yes" NAME="q20"> <INPUT TYPE="radio" VALUE="no" NAME="q20"> <INPUT TYPE="radio" VALUE="unsure/dont" NAME="q20">

21. Which of the following features would you find helpful in an on-line study guide?
Please rank the ones you think helpful in order of importance from 1 upwards, with 1 being the most important.

 <INPUT NAME="q21journal" TYPE="text" SIZE="3"> Separate 'journal' for own notes

 <INPUT NAME="q21notes" TYPE="text" SIZE="3"> Space to add notes to existing page

 <INPUT NAME="q21diagrams" TYPE="text" SIZE="3"> Interactive diagrams

 <INPUT NAME="q21saqs" TYPE="text" SIZE="3"> Self-assessed questions

 <INPUT NAME="q21quizzes" TYPE="text" SIZE="3"> Quizzes

 <INPUT NAME="q21print" TYPE="text" SIZE="3"> Print pages

 <INPUT NAME="q21reminders" TYPE="text" SIZE="3"> Active reminders of assignment deadlines

 <INPUT NAME="q21toolbar" TYPE="text" SIZE="3"> Tool bar for features

 <INPUT NAME="q21mark" TYPE="text" SIZE="3"> Mark text by highlighting, underlining etc.

 <INPUT NAME="q21advice" TYPE="text" SIZE="3"> Study skills advice

 <INPUT NAME="q21progress" TYPE="text" SIZE="3"> Indicator to show progress through study guide

 <INPUT NAME="q21interactive" TYPE="text" SIZE="3"> To be interactive

 <INPUT NAME="q21tick" TYPE="text" SIZE="3"> Tick things off

 <INPUT NAME="q21bookmarks" TYPE="text" SIZE="3"> Bookmarks

 <INPUT NAME="q21search" TYPE="text" SIZE="3"> Key

Response Notice

<HTML>
<HEAD>
<TITLE>Thank you</TITLE>
</HEAD>
<BODY>

<H3>Thank you for your participation!</H3>

Your responses have now been recorded. Thank you very much for your time and contribution.<P>

Chris McKillop

Email: chrism@cogs.susx.ac.uk

MSc Human-Centred Computer Systems

School of Cognitive and Computing Sciences

University of Sussex

</BODY>

</HTML>

Appendix 4. User Study Questionnaire Raw Data

STUDY GUIDE QUESTIONNAIRE - TRADITIONAL STUDENTS

14 Replies

Personal Information

1. Age

Range 20-35

20-25: 7
26-30: 2
31-35: 5

2. Sex

M - 11 F - 3

3. Level of study

UG - 3 PG - 11

4. Year of study

1st - 11 2nd - 3

5. Degree/area of research

UG

Computing - 2
Electronics - 1

PG

MSc EASY - 1 }
MSc KBS - 1 }
MSc HCCS - 5 }
MA Philosophy - 1 }
PhD - 3 }

Masters - 8
PhD - 3

6. Please list the main reason(s) for your choice of study

3 Personal interest career aspiration

4 It looked good. Opportunity to get pissed and get paid for it

5 Interest in computer vision techniques

6 Interest in multimedia

7 I did psychology as an undergrad. for which I used computers a bit. As I used them more I enjoyed it. Not for using pc as a way of getting out of using pen and paper but for what computers were capable of doing. Because of this interest I chose to do HCCS at COGS

8 Interest in the area. Need for Phd for academic career. Expertise from MA dissertation and undergraduate study

9 I am a student from Holland and I am doing some research work at COGS. At the university of Maastricht I wrote my final paper about the spider phobia and I got the chance to do some more research at the Sussex university for approximately three months and that is what I am doing right now.

10 I like the idea of how computers and poeple work together. Hoe and why they learn and how that learning can be investigated to help other people learn. The application of learning may assist those who are disabled either physically or mentally computers can be used as a patiet learning devise assuming the objects of what is to be learnt areclearly identified"

11 An interest in difficult problems worth caring about

13 Always been interested in computing from playing games to mucking around with system files etc.

14 Requisite to be a teacher at my university I have always liked computers and the AI field is really challenging.

15 Very interested in the subject. Pure pleasure of learning

Study Skills

7. Do you feel confident about your study skills?

Very confident - 2 (14.29%)

Fairly confident - 12 (85.71%)

Not confident

Unsure/don't know

8. Do you feel you have been given sufficient study skills advice on your course?

Yes - 2 (14.29%)

No - 8 (57.14%)

Unsure/don't know - 4 (28.57%)

9. Do you feel you have been given sufficient advice on how to plan your study time on your course?

Yes - 2 (14.29%)

No - 10 (71.43%)

Unsure/don't know - 1 (7.14%)
(1 blank)

10. Do you sometimes have problems in planning your study time?

Yes - 9 (64.29%)

No - 5 (35.71%)

Unsure/don't know

11. What study skill(s) would you most like to improve?

2 Stop procrastinating so much

4 Time management. Approach to essay dissertation writing and presentation. Scanning academic papers and only reading the relevant stuff.

5 Availability of additional text

6 Reading Planning my time

8 Time keeping motivation efficiency dealing with hardware and software problems arising as part of my study

9 Of course I learnt all my study skills at the University of Maastricht, Holland, but the reason that I am here right now is that I want to get more research experience."

10 I would really like to know how I am getting on. Wouldn't it be nice if some said yep your academically ok and you work hard and could you think about area x and area y"

11 Sustained concentration Time management, not to find myself getting under pressure with deadlines. Ability to avoid distractions, displacement activities.

12 Not terribly sure what a study skill is

13 To be able to find information quicker I tend to spend a lot of time in the library looking for a specific piece of information

14 reading for information and to study - searching for bibliography - planning"

15 My ability to focus for a given length of time. How to prioritise, and spell, the important and relevant information that I need to learn. "

Study Guides

12. Have you ever used a study guide before?

Yes - 4 (28.57%)

No - 10 (71.43%)

13. What form was it, e.g., on-line, book, etc?

Book - 4

14. Did you find it helpful?

Yes - 5 (!) (100%)

No

15. What did you like about it?

4 Gave specific points to focus on for different types of work."

9 "The study guide of the University of Maastricht contains a lot of important information for students and it is very accesible it's all in one book and in a systematic way."

11 Recognised some of the problems and difficulties mentioned. this was comforting."

13 Step by step examples followed by questions."

16. What did you dislike about it?

4 Placed extra workload onto an already stressful situation.

9 "Unfortunately it doesn't contain all the information you need as a student but I am afraid that is quite impossible to accomplish anyway."

11

13 Limited ability

17. Would you have liked to have had a study guide for your current course?

Yes - 7 (50%)

No - 2 (14.29%)

Unsure/don't know - 5 (35.71%)

18. Which of the following features would you find helpful in a study guide? Please rank the ones you think helpful in order of importance from 1 upwards, with 1 being the most important.

	Mean	Variance
Summaries of each section	2.91	1.49
Aims and objectives of each section stated	4.17	3.79
Self-assessed questions	4.36	7.45
Study skills advice	4.5	12.81
Diagrams	4.6	3.6
Glossary of key/technical terms	5.3	9.57
Suggested further reading	5.5	8.28
Suggested activities	6.25	6.57
Quizzes	7	8.67
Wide margin to write own notes in	8.2	5.29

On-line Study Guide

19. Do you think an on-line study guide would be helpful to you?

Yes - 6 (42.86%)

No - 2 (14.29%)

Unsure/don't know - 6 (42.86%)

20. Do you think it would be more helpful than a paper-based study guide?

Yes - 3 (21.43%)

No - 5 (35.71%)

Unsure/don't know - 6 (42.86%)

21. Which of the following features would you find helpful in an on-line study guide? Please rank the ones you think helpful in order of importance from 1 upwards, with 1 being the most important.

	Mean	Variance
Key word search function	6.11	19.86
Hypertext (hotlinks)	6.4	11.6
Study skills advice	6.67	31.5
Interactive calendar with times and details of assignments and study tasks	7	20
Self-assessed questions	7	25.14
To be interactive	7.4	37.82
Print pages	7.5	22.28
Interactive diagrams	7.67	8.5
Active reminders of assignment deadlines	7.67	27.75
Mark text by highlighting, underlining etc.	8.22	23.69
Indicator to show progress through study guide	8.6	24.04
Bookmarks	8.78	14.69
Space to add notes to existing page	9.75	17.93
Quizzes	9.78	30.44
Tool bar for features	10	25.75
Separate 'journal' for own notes	11	31.5
Tick things off	13.12	12.41

22. Would you use an on-line study guide?

Yes - 7 (50%)

No - 1 (7.14%)

12 - not sure what study skill is

Unsure/don't know - 6 (42.86%)

23. Please use the space below to add any further comments you may have on any of the above sections.

2 It would be next to impossible to produce a study guide for the types of things studied in my course. In terms of study skills that is the responsibility of the student not the instructors. "

4 On-line implies connected to some remote server to me and the main anti to this is the cost in time of the connection and the computing or other resources required to use it. By comparison a book is a fixed price and highly portable."

5 "I have used study guides for commercial products as guides and tutorials and have found that clear diagrams and use of simple english makes them easier to follow. As with most things a study guide needs to be aimed at a specific audience and this has an important bearing on the structure of the guide. eg. if the guide is to a GUI program I would expect to see diagrams etc if not then a summarised list of the steps necessary would suffice. "

7 "On-line study guides could only really be used in college and school. Realistically most people do not possess a computer and modem and dial-up accounts to access these things from home where they do most of their studying. I do not think that people students would spend endless hours in a computer lab studying when they could do it in the comfort of their home."

8 I really do not know until I have seen what it might involve"

9 "I don't know

10 Lost on the scales. 1 to what? I think the two areas I am interested in would be useful. Could you give example of what a study guide is"

15 Difficult to know how to mark questions. Was it from 1 to 10 or from 1 to 100? Not quite sure what some of your suggestions are. Hard to concentrate on filling this in in a noisy internet cafe! Hee Hee

STUDY GUIDE QUESTIONNAIRE - DISTANCE EDUCATION STUDENTS

15 Replies

Personal Information

1. Age

Range

30-35: 3
36-40: 4
41-45: 1
46-50: 3
51-55: 2
56-60: 2

2. Sex

M - 5 F - 10

3. Level of study

UG - 15 PG - 0

4. Year of study

1st - 2 3rd - 3 4th - 2 5th - 6 Final - 1 1997 - 1

5. Degree/area of research

Psychology

6. Please list the main reason(s) for your choice of study

2. Interest/career
3. To keep my job. Personal development. Area of interest.
4. Personal development. I work with 'special needs' clients (autistic etc.). Wish to understand myself and others
5. Relevance to work
6. Interest
7. Employment related
8. Understanding of human behavior and how minds works in solving problems.
9. Interest and job related.

10. Interested in social issues and issues that affect thought processes.
11. Psych level 3
12. Interest in psychology. Like learning. Wanted to get a degree
13. To convert BSc into BSc Hons - doing one psych course to make hons degree psych recognised.
15. Interest and career change.
16. Enjoyed studying it at D103 level and hope to use it in pastoral counselling in my church

Study Skills

7. Do you feel confident about your study skills?

Very confident - 4 (26.67%)

Fairly confident - 10 (66.67%)

Not confident - 1 (6.67%)

Unsure/don't know

8. Do you feel you have been given sufficient study skills advice on your course?

Yes - 6 (40%)

No - 7 (46.67%)

Unsure/don't know - 2 (13.33%)

9. Do you feel you have been given sufficient advice on how to plan your study time on your course?

Yes - 5 (33.33%)

No - 9 (60%)

Unsure/don't know - 1 (6.67%)

10. Do you sometimes have problems in planning your study time?

Yes - 11 (73.33%)

No - 4 (26.67%)

Unsure/don't know

11. What study skill(s) would you most like to improve?

2. Essay writing
3. Time management. Summarising methods.
4. Writing exam questions!
5. Note taking.
6. TMA writing.
7. Material organisaiton. Use of PC/Mac as study tool.
8. To be able to interpret the questions and statements.
9. Concentrations/memory.
10. Reading.
12. To read effectively and quickly. To link paragraphs better. To summarise and plan. To revise effectively.
13. Time management so as to be able to read large portions of text without interruption.
14. Realizing what has to be memorized verbatim and merely needs to be understood. Organization skills between components of course - cross referencing.
15. Legibility and speed of handwriting for the exam. If this counts as a study skill!
16. My motivation to actually get down to reading.

Study Guides

12. Have you ever used a study guide before?

Yes - 12 (80%)

No - 3 (20%)

13. What form was it, e.g., on-line, book, etc?

Book - 11 (1 didn't say)

14. Did you find it helpful?

Yes - 10 (90.91%)

No

Unsure/don't know - 1 (9.09%)

15. What did you like about it?

2. Specific advice re essay and exam.
3. Clear, step by step. Main points emphasized.
4. Format, contents, size.
5. It identified study skills and recommended a variety of techniques.
8. Clarity and explanation of detail and tact.
10. Logical.
11. Clearly written.
12. It summarises the main points - so you know what gave insight into reading from different angle. Plan - for each week. What you had to achieve.
15. Linked parts of the course together.

16. It was helpful with guidance on writing essays.

16. What did you dislike about it?

- 2. That it didn't write my essay! More seriously it was slightly patronising.
- 5. Non-interactive.
- 8. Written for an idiot.
- 10. Reading through it.
- 12. Sometimes not enough info.
- 15. Nothing.
- 16. Can't recall anything in particular.

17. Would you have liked to have had a study guide for your current course?

Yes - 11 (73.33%)

No -

Unsure/don't know - 1 (6.67%)

Already use one - 3 (20%)

18. Which of the following features would you find helpful in a study guide? Please rank the ones you think helpful in order of importance from 1 upwards, with 1 being the most important.

	Mean	Variance
Aims and objectives of each section stated	2.22	2.19
Summaries of each section	2.9	2.99
Self-assessed questions	4.33	4.25
Study skills advice	4.78	12.69
Glossary of key/technical terms	5.1	6.1
Wide margin to write own notes in	5.44	6.03
Diagrams	5.8	3.95
Quizzes	6.17	1.37
Suggested activities	6.43	5.25
Suggested further reading	8.33	13.07

On-line Study Guide

19. Do you think an on-line study guide would be helpful to you?

Yes - 7 (46.67%)

No - 2 (13.33%)

Unsure/don't know - 6 (40%)

20. Do you think it would be more helpful than a paper-based study guide?

Yes - 5 (33.33%)

No - 4 (26.67%)

Unsure/don't know - 6 (40%)

21. Which of the following features would you find helpful in an on-line study guide? Please rank the ones you think helpful in order of importance from 1 upwards, with 1 being the most important.

	Mean	Variance
Study skills advice	3.67	7.87
To be interactive	4.62	32.84
Interactive diagrams	4.87	10.7
Key word search function	4.87	11.84
Self-assessed questions	5	5
Space to add notes to existing page	5.71	10.24
Quizzes	5.8	9.2
Mark text by highlighting, underlining etc.	6	26.5
Print pages	6.17	3.77
Interactive calendar with times and details of assignments and study tasks	7.6	29.3

Tool bar for features	8.4	6.3
Separate 'journal' for own notes	8.75	6.92
Hypertext (hotlinks)	8.8	56.7
Indicator to show progress through study guide	8.83	21.77
Active reminders of assignment deadlines	9	9.5
Bookmarks	12.6	10.3
Tick things off	12.75	2.92

22. Would you use an on-line study guide?

Yes - 7 (46.67%)

No - 2 (13.33%)

Unsure/don't know - 6 (40%)

23. Please use the space below to add any further comments you may have on any of the above sections.

2. I was unsure of some of the terms. Also I hope I have answered as accurately as possible - but as I did this whilst in the subject pool, and consequently was taken off to experiments, I sometimes lost my train of thought, especially in the rating questions.

3. As I am (currently!) a technophobe I am unsure whether this would be useful to me personally.

4. I do not have access to a computer, but find written study guides, especially O.U. ones, very good.

5. Interactive diagrams need to be designed to help trigger recall.

6. Never had a computer so not sure of what 'ON-LINE' is.

11. Haven't answered 21 because value depends on how clearly presented.

14. Sorry I cannot answer no. 21 but I am totally unfamiliar with 'on-line' anything - I am ashamed to say - maybe I should include it in my studies.

Appendix 5. User Study Statistical Data

Chi-square data statistical test

7. Do you feel confident about your study skills?

	Very confident	Fairly confident	Not very confident	TOTAL
Traditional students	1 2	2 12	3 0	14
Distance education students	4 4	5 10	6 1	15
TOTAL	6	22	1	29

Expected frequency (E):-

$$\text{Cell 1: } E = \frac{6 \times 14}{29} = 2.9$$

$$\text{Cell 2: } E = \frac{22 \times 14}{29} = 10.6$$

$$\text{Cell 3: } E = \frac{1 \times 14}{29} = 0.48$$

$$\text{Cell 4: } E = \frac{6 \times 15}{29} = 3.1$$

$$\text{Cell 5: } E = \frac{22 \times 15}{29} = 11.38$$

$$\text{Cell 6: } E = \frac{1 \times 15}{29} = 0.52$$

However, as more than 20% of the expected frequencies (E) are less than 5, the chi-square test is unreliable and Fischer's Exact Test needs to be conducted on the data.

8. Do you feel you have been given sufficient study skills advice on your course?

	Yes	No	TOTAL
Traditional students	1 2	2 8	10
Distance education students	3 6	4 7	13
TOTAL	8	15	23

Expected frequency (E):-

Cell 1: $E = \frac{8 \times 10}{23} = 3.48$

Cell 2: $E = \frac{15 \times 10}{23} = 6.52$

Cell 3: $E = \frac{8 \times 13}{23} = 4.52$

Cell 4: $E = \frac{15 \times 13}{23} = 8.48$

However, as more than 20% of the expected frequencies (E) are less than 5, the chi-square test is unreliable and Fischer's Exact Test needs to be conducted on the data.

9. Do you feel you have been given sufficient advice on how to plan your study time on your course?

	Yes	No	TOTAL
Traditional students	1 2	2 10	12
Distance education students	3 5	4 9	14
TOTAL	7	19	26

Expected frequency (E):-

$$\text{Cell 1: } E = \frac{7 \times 12}{26} = 3.23$$

$$\text{Cell 2: } E = \frac{19 \times 12}{26} = 8.77$$

$$\text{Cell 3: } E = \frac{7 \times 14}{26} = 3.77$$

$$\text{Cell 4: } E = \frac{19 \times 14}{26} = 10.23$$

However, as more than 20% of the expected frequencies (E) are less than 5, the chi-square test is unreliable and Fischer's Exact Test needs to be conducted on the data.

10. Do you sometimes have problems in planning your study time?

	Yes	No	TOTAL
Traditional students	1 9	2 5	14
Distance education students	3 11	4 4	15
TOTAL	20	9	29

Expected frequency (E):-

Cell 1: $E = \frac{20 \times 14}{29} = 9.66$

Cell 2: $E = \frac{9 \times 14}{29} = 4.34$

Cell 3: $E = \frac{20 \times 15}{29} = 10.34$

Cell 4: $E = \frac{9 \times 15}{29} = 4.66$

However, as more than 20% of the expected frequencies (E) are less than 5, the chi-square test is unreliable and Fischer's Exact Test needs to be conducted on the data.

12. Have you every used a study guide before?

	Yes	No	TOTAL
Traditional students	1 4	2 10	14
Distance education students	3 12	4 3	15
TOTAL	16	13	29

Expected frequency (E):-

$$\text{Cell 1: } E = \frac{16 \times 14}{29} = 7.72$$

$$\text{Cell 2: } E = \frac{13 \times 14}{29} = 6.28$$

$$\text{Cell 3: } E = \frac{16 \times 15}{29} = 8.28$$

$$\text{Cell 4: } E = \frac{13 \times 15}{29} = 6.72$$

Degrees of freedom (df) = (r - 1)(c - 1)
 where r = number of rows in the table
 and c = number of columns in the table

As the degrees of freedom (df) = 1, we need to apply Yate's correction.

$$\text{Cell 1: } \text{Chi-square} = \frac{(|4 - 7.72| - 0.5)^2}{7.72} = 1.34$$

Cell 2: Chi-square = $\frac{(|10 - 6.28| - 0.5)^2}{6.28} = 1.65$

Cell 3: Chi-square = $\frac{(|12 - 8.28| - 0.5)^2}{8.28} = 1.25$

Cell 4: Chi-square = $\frac{(|3 - 6.72| - 0.5)^2}{6.72} = 1.54$

TOTAL = 5.78

Appendix 6. Storyboards

The storyboards have been omitted from this version of the report. For a paper copy which includes the storyboards, please contact the Knowledge Media Institute, Open University, Walton Hall, Milton Keynes, UK.

Appendix 7. Screen Shots

Screen Shot 1

M206 Computing : An Object-Oriented Approach

Course tour

Quit Print

Course Resources



- ▷ Smalltalk LearningBooks
- ▷ Printed Texts
- ▷ Set Book: Parsons and Oja
- ▷ Television Programmes
- ▷ CD-ROMs
- ▷ Conferencing
- ▷ E-mail
- ▷ World Wide Web
- ▷ Study Guide

Block I Foundations	Study Weeks 1 to 4
Block II Basic Smalltalk	Study Weeks 5 to 8
Block III Smalltalk Classes	Study Weeks 9 to 11
Block IV Collections	Study Weeks 12 to 17
Block V Object Analysis	Study Weeks 18 to 22
Block VI Object Design	Study Weeks 23 to 27
Block VII Complex Systems	Study Weeks 28 to 33

Screen Shot 2

The interface features a 'Map' button in the top-left corner and a question mark icon in the top-right corner. The main title 'Study Guide' is centered at the top. On the left side, there is a large box containing a 'Study Guide Tour' button, and below it are three smaller buttons: 'Progress Advisor', 'Time Management Advisor', and 'Study Skills Advisor'. On the right side, there is a vertical list of seven study blocks, each with a title and a corresponding study week range. The blocks are color-coded: Block I (blue), Block II (dark blue), Block III (purple), Block IV (light purple), Block V (pink), Block VI (red), and Block VII (dark red). A mouse cursor is positioned over the 'Block I Foundations' entry.

Block	Topic	Study Weeks
Block I	Foundations	1 to 4
Block II	Basic Smalltalk	5 to 8
Block III	Smalltalk Classes	9 to 11
Block IV	Collections	12 to 17
Block V	Object Analysis	18 to 22
Block VI	Object Design	23 to 27
Block VII	Complex Systems	28 to 33


 **Block 1** **Foundations** 

Overview

This first block will introduce you to fundamental concepts in object technology and computing in general.

Click on the chapters on the right for study information:-

Study Week 1: 7th February

- [Chapter 1 Computing: an Object-oriented Approach](#) 

Study Week 2: 14th February


- [Chapter 2 Object-oriented Computing](#)
- [Chapter 3 Using the Networks](#)

Study Week 3: 21st February



- [Chapter 4 Object-oriented Applications](#)
- [Chapter 5 Introduction to User Interfaces](#)

Study Week 4: 28th February

- [Chapter 6 Object Concepts](#)
- [Chapter 7 Review 1 'The Object Shop'](#)
- [Chapter 8 A Bank Account Class](#)



Screen Shot 4



 **Study Week 1 Chapter 1** 

Computing: an Object-oriented Approach

This chapter introduces you to the course and its major themes and components - which centre around the over-arching topics of object technology and network computing. The chapter discusses what is meant by object technology - the technology associated with viewing systems and programs as being made up of software components known as objects, which carry out work by responding to messages.

You will be introduced to the use of the LearningWorks programming environment - software that turns your actual computer into a virtual computer which knows about objects as implemented in the programming language Smalltalk. The chapter also introduces you to the set book that is used with the course, as well as the course map.

- M205 Course Map CD-ROM**
- Chapter 1: Printed text**
- LearningBook**
- Parsons and Oja: Chapters 1 and 2**
- Email**

Screen Shot 5

Map Study Week 1 Chapter 1 **?**

Computing: an Object-oriented Approach

This chapter introduces you to the course and its major themes and components - which centre around the overarching topics of object technology and network computing. The chapter discusses what is meant by object technology - the software components being made up of objects.

You will be introduced to the actual computer into a programming language Smalltalk. The course, as well as the course map.

M205 Course
 Chapter 1:
 Learning Boxes
 Parsons and
 Email



Estimated time to complete this task:-

hours

How well do you feel you understand the material covered in this task?

Very well Quite well Not very well

Cancel **OK**

Screen Shot 6

Map **Study Week 1 Chapter 1** ?

Computing: an Object-oriented Approach

This chapter introduces you to the course and its major themes and components - which centre around the over-arching topics of object technology and network computing. The chapter discusses what is meant by object technology - the software components being made up of

You will be introduced to an actual computer into a language Smalltalk. The course, as well as

software that turns your the programming

the course, as well as

Estimated time to complete this task:-

hours

How well do you feel you understand the material covered in this task?



Very well Quite well Not very well

Cancel OK

M205 Cour
 Chapter 1:
 LearningBo
 Parsons an
 Email

Home Back

Screen Shot 7



 **Study Week 1 Chapter 1** 

Computing: an Object-oriented Approach



This chapter introduces you to the course and its major themes and components - which centre around the over-arching topics of object technology and network computing. The chapter discusses what is meant by object technology - the technology associated with viewing systems and programs as being made up of software components known as objects, which carry out work by responding to messages.

You will be introduced to the use of the LearningWorks programming environment - software that turns your actual computer into a virtual computer which knows about objects as implemented in the programming language Smalltalk. The chapter also introduces you to the set book that is used with the course, as well as the course map.

- M205 Course Map CD-ROM**
- Chapter 1: Printed text**
- LearningBook**
- Parsons and Oja: Chapters 1 and 2**
- Email**

Screen Shot 8



 **Study Week 1 Chapter 1** 



Computing: an Object-oriented Approach

This chapter introduces you to the course and its major themes and components - which centre around the over-arching topics of object technology and network computing. The chapter discusses what is meant by object technology - the technology associated with viewing systems and programs as being made up of software components known as objects, which carry out work by responding to messages.

You will be introduced to the use of the LearningWorks programming environment - software that turns your actual computer into a virtual computer which knows about objects as implemented in the programming language Smalltalk. The chapter also introduces you to the set book that is used with the course, as well as the course map.

- M205 Course Map CD-ROM**
- Chapter 1: Printed text**
- LearningBook**
- Parsons and Oja: Chapters 1 and 2**
- Email**



Block 1 Foundations

Overview

This first block will introduce you to fundamental concepts in object technology and computing in general.

Click on the chapters on the right for study information:-

Study Week 1: 7th February

- Chapter 1 Computing: an Object-oriented Approach

Study Week 2: 14th February


- Chapter 2 Object-oriented Computing
- Chapter 3 Using the Networks

Study Week 3: 21st February

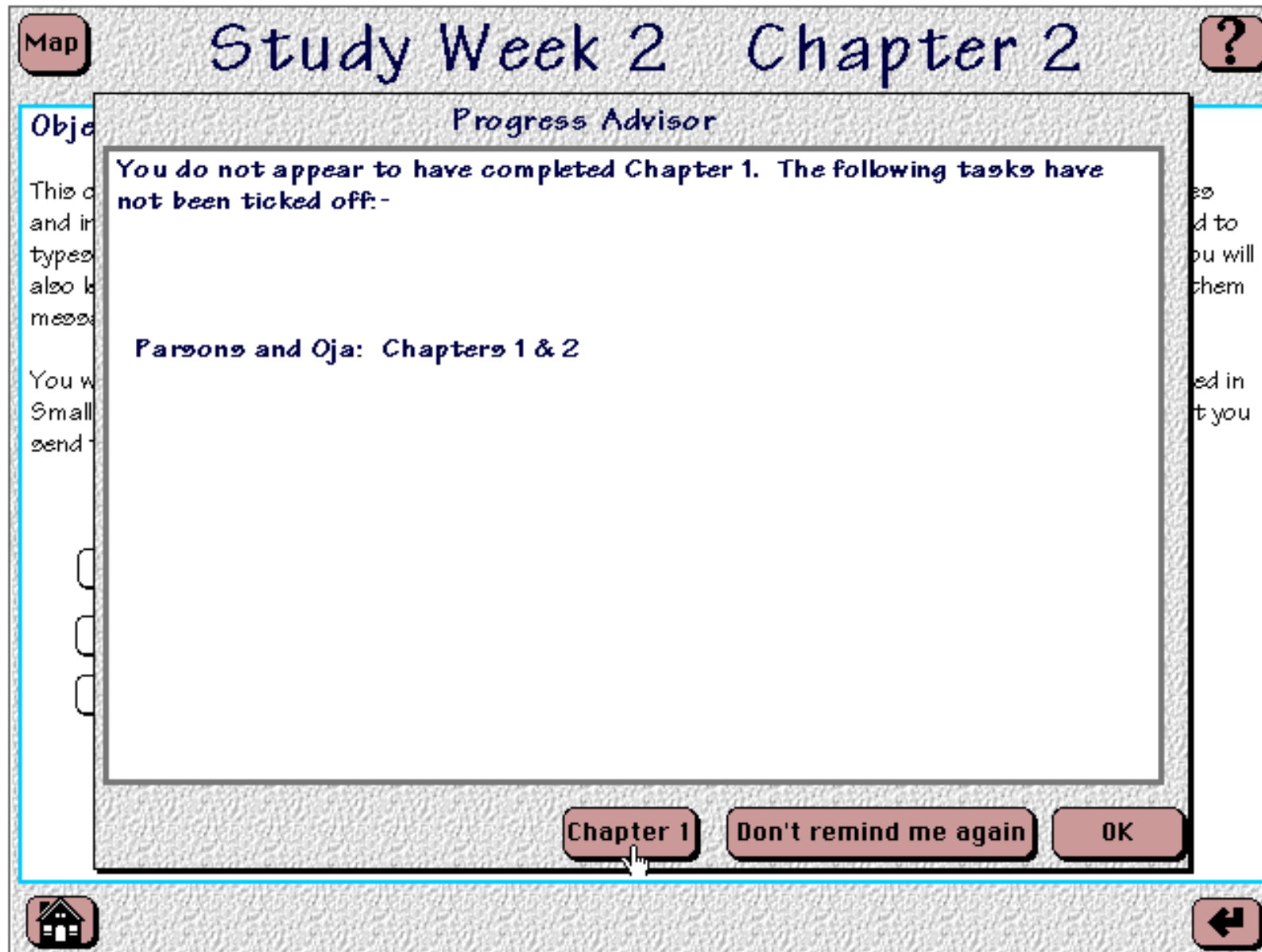
- Chapter 4 Object-oriented Applications
- Chapter 5 Introduction to User Interfaces



Study Week 4: 28th February

- Chapter 6 Object Concepts
- Chapter 7 Review 1 'The Object Shop'
- Chapter 8 A Bank Account Class



Screen Shot 10





 **Study Week 1 Chapter 1** 

Computing: an Object-oriented Approach

This chapter introduces you to the course and its major themes and components - which centre around the over-arching topics of object technology and network computing. The chapter discusses what is meant by object technology - the technology associated with viewing systems and programs as being made up of software components known as objects, which carry out work by responding to messages.

You will be introduced to the use of the LearningWorks programming environment - software that turns your actual computer into a virtual computer which knows about objects as implemented in the programming language Smalltalk. The chapter also introduces you to the set book that is used with the course, as well as the course map.

- M205 Course Map CD-ROM**
- Chapter 1: Printed text**
- LearningBook**
- Parsons and Oja: Chapters 1 and 2**
- Email**

Screen Shot 12

Map **Study Week 1 Chapter 1** ?

Computing: an Object-oriented Approach

This chapter introduces you to the course and its major themes and components - which centre around the over-arching topics of object technology and network computing. The chapter discusses what is meant by object technology - the software components being made up of objects.

You will be introduced to the actual computer into a programming language Smalltalk. The course, as well as the course map.

M205 Course
 Chapter 1:
 LearningBox
 Parsons and
 Email

Estimated time to complete this task:-

hours

How well do you feel you understand the material covered in this task?

Very well Quite well Not very well

Cancel OK

Home ←



Map **Study Week 1 Chapter 1** **?**

Computing: an Object-oriented Approach

This chapter introduces you to the course and its major themes and components - which centre around the over-arching topics of object technology and network computing. The chapter discusses what is meant by object technology - the technology associated with viewing systems and programs as being made up of software components known as objects, which carry out work by responding to messages.

You will be introduced to the use of the LearningWorks programming environment - software that turns your actual computer into a virtual computer which knows about objects as implemented in the programming language Smalltalk. The chapter also introduces you to the set book that is used with the course, as well as the course map.

- M205 Course Map CD-ROM**
- Chapter 1: Printed text**
- LearningBook**
- Parsons and Oja: Chapters 1 and 2**
- Email**

The interface features a 'Map' button in the top-left corner and a question mark icon in the top-right corner. The main title 'Study Guide' is centered at the top. On the left side, there is a large rectangular area containing a 'Study Guide Tour' button. Below this are three stacked buttons: 'Progress Advisor' (with a mouse cursor pointing to it), 'Time Management Advisor', and 'Study Skills Advisor'. On the right side, there is a vertical list of seven study blocks, each with a title and a corresponding study week range.

Block	Study Weeks
Block I Foundations	1 to 4
Block II Basic Smalltalk	5 to 8
Block III Smalltalk Classes	9 to 11
Block IV Collections	12 to 17
Block V Object Analysis	18 to 22
Block VI Object Design	23 to 27
Block VII Complex Systems	28 to 33

Map **?**



Progress Advisor

Block 1 Foundations

Chapter 1 Computing: an Object-oriented Approach

M205 Course Map CD-ROM	I understood this very well
Chapter 1: Printed text	I understood this very well
LearningBook	I understood this quite well
Parsons and Oja: Chapters 1 and 2	I did not understand this very well
Email	I understood this quite well

Advice

 Next chapter 

Map

Progress Advisor

?


Block 1 Foundations

Chapter 1 Computing: an Object-oriented Approach

M205 Course Map CD-ROM	I understood this very well
Chapter 1: Printed text	I understood this very well
LearningBook	I understood this quite well
Parsons and Oja: Chapters 1 and 2	I did not understand this very well
Email	I understood this quite well

It is good that you have a clear understanding of the Course Map and the first chapter of the printed text. These set out the structure of the course, and this is important for the rest of the Block.

However, Parsons and Oja is the set book for this course, and these chapters lay down important concepts which we will be expanding on in Chapter 2 of this Block. It would be a good idea to go through this material again to make sure you understand it more fully before continuing.



Appendix 8. Evaluation Procedure

Give a brief overview of the project and reassure student that it is the software being tested, not them, and that all resulting data will be anonymous and confidential.

Ask whether they would mind the session being audio-taped and then explain benefits and purpose of audio-taping such a session.

Ask student to think-aloud as they are carrying out the tasks and to ask questions at any time. Inform they will be asked to complete a short questionnaire at the end of the session.

Give scenario to help them see more of a purpose in what they were doing - imagine they are a computing student working their way through the study guide, but don't worry about any of the terminology or content as they will not be tested on any of this. All instructions will be given verbally.

Ask student to go to the Study Guide, then to Block 1 and then to go to Chapter 1. Give a short description of what should be on screen as course since in development and little material is on the screen.

Ask to tick off that they have completed the M206 Course Map and type in that this task took them 2 hours and that they understood the task very well.

Then tick off they have completed Chapter 1 of the printed text, that it took 2 hours and that they also understood this task very well.

Also tick off the Learning Book which took them 1 hour to complete and they understood the task quite well.

Finally, tick off Email, which took 1 hour and was understood quite well.

Ask students to go to Chapter 2 - don't give any instructions on how to do this unless asked.

When at Chapter 2, Progress Advisor will intervene. Ask them to return to Chapter 1 and tick this off as they had completed it, but had simply forgotten to tick it off - typing in that it took 4 hours and that they did not understand it very well.

Ask them to return to the main Study Guide page and to consult the Progress Advisor.

Ask if they understand what the box was telling them and ask to explain what the colours meant to them.

Ask for advice, and read and comment on the advice, then return to the main Study Guide page.

Give them the questionnaire to fill in.

Thank them for their participation!

Appendix 9. Evaluation Questionnaire

On-line Study Guide Evaluation Questionnaire

Thank you for agreeing to use this on-line study guide. Now that you have had the opportunity to view it, I would be very grateful, if you would fill in the following questionnaire. Some questions ask you to write in your response. Others ask you to choose from a number of different choices - please circle your choice. This questionnaire should take no more than 10 minutes to fill in. If you have any questions while filling it in, please do not hesitate to ask. Should you wish to look at the on-line study guide while filling it in, please do so.

Thank you very much for you time and help.

Personal Information

1. Age: _____

2. Sex: Female

Male

3. Year of study: _____

4. Course: _____

5. Computer experience

On-line Study Guide Progress Advisor

6. Would you find it helpful to be able to tick things off?

Very helpful

Fairly helpful

Not helpful

Unsure/don't know

7. Did you like it that you were asked to input your estimated hours and level of understanding?

Liked it a lot Not bothered Didn't like it Unsure/don't know

8. Would you find it helpful to have reminders that you haven't finished a chapter's task before moving to the next chapter?

Very helpful Fairly helpful Not helpful Unsure/don't know

9. Did you like the way the information was presented to you in the Progress Advisor?

Liked it a lot Quite liked it Not bothered Didn't like it

10. What did you **like** about it?

11. What did you **dislike** about it?

12. Would you find using a Progress Advisor like this helpful?

Very helpful Fairly helpful Not helpful Unsure/don't know

13. How often would you 'consult' a Progress Advisor?

After each completed task

Every week

After each unit/block

Before a TMA

Other (please specify) _____

14. Do you think on-line study guides with advisors would be more useful to students on computing courses than students on non-computing courses?

More useful No difference Less useful Unsure/don't know

15. What information would **you** like to see in a Progress Advisor?

16. Please use the space below if you have any other comments you would like to make about the Progress Advisor.

Other Advisors

Two other Advisors are planned, but not yet written.

The Time Management Advisor would offer scheduling advice for planning your study time and would keep track of the actual time spent on tasks and compare this with suggested times, offering you appropriate advice.

17. Would you find this type of advisor helpful?

Very helpful Fairly helpful Not helpful Unsure/don't know

18. The Study Skills Advisor would offer individually tailored study skills advice.

Would you find this type of advisor helpful?

Very helpful Fairly helpful Not helpful Unsure/don't know

Appendix 10. Evaluation Taped Comments

Student 1

“Does this go back to your tutor or is this just for your own purposes?”

Went back to Map instead of going back a page to select Chapter 2. Asked if there was a back arrow to take her back to the appropriate page, but had not realised it was there. She liked to have back, forward, previous and next in particular and home, just like on the Web as so many people now use the Web and you get so used to using them. “If it looks basically like a browser people will just pick it up and use it. Would like to have hypertext links. And would like on left hand side in a “little strip” a contents list. So you can always go wherever you want to. Click on left and go wherever you want to. Like them to be colour divided, so you can see at a glance where you are.

Knew she had to click on box to tick.

Wondered if when typed in the information, if you could have next to it a summary of it next to the tick.

When went back one page (to get to the main page of the study guide) wanted another arrow to take her back, for consistency. Thought home page was home page of Map.

Understood the colours. Green - “everything fine”, amber - “beware”, red - “problem, something to look out for”.

“It’s giving you good advice, but as an OU student you rarely have time to go back through things.” Wanted the key points to be summarised.

Tried to click away from advice box to close.

Student 2

Tried to click on triangle to get into study guide.

When ‘hours/understanding’ box came up, tried to type in hours without clicking on box first to ‘activate’ it. But no subsequent problems with this.

Wasn’t sure how to get back to go to Chapter 2. Then thought it might be the arrow which she tried.

Went back one page, was a bit hesitant then asked if it was the ‘home’ icon. Found it a bit confusing, wanted another arrow there.

Green - “fine and I can move on”, amber - “a bit unclear about”, red - “was a problem to me”. Clear what it meant.

Wanted a summary, in different words to the book, instead of re-reading the book which may not be helpful.

Didn’t know how to close box.

Student 3

Clicked on triangle to get into study guide.

Clicked on 'study week' instead of 'chapter 1'.

Asked if it was the arrow to get back.

Went back to map instead of main study guide page. Then wanted to take the course tour.

Red - "warning, look at this more closely", green - "go, go go"

Advice is giving a positive, but also explaining why it's important to go back over some bits. Nice if the important concepts were highlighted, gave a summary, explained them a bit.

Wanted to go back to Map when asked to close box. Wanted to click outside.

Student 4

Wasn't sure which bit to tick, but thought it was more intuitive to click on the box which she did.

Didn't click in the field, but when she got the alert noise she knew she had to click in the field before typing in the hours.

Asked how to get back to chapter 2, thought it was the arrow. Didn't necessarily want text next to it. Thought it was just a case of getting used to what things meant.

Was expecting another arrow after going back to main study guide page after going back from chapter 1 to overview page.

Red - "flagging things I ought to look at again, green - "I can cruise about... done them well"

Wondered if the Progress Advisor would speak to her.

Advice fine. But thought the first sentence could be thought of as patronising. Wanted this sentence rearranged as she knew it was good to have this clear understanding. Suggested something like "Your clear understanding of the Course Map and Chapter 1 of the printed text are going to help you follow the structure of the course because that is what they set out to do." Reminder as to why you should go back and reread is nicely worded. Important concept - would like stated which ones they were so could go back and check out the ones she did not understand.

Would want to close the advice box by clicking on the Map.

Thought the level of understanding input would be useful, but not the times. Didn't want to be constantly reminded of all the things she had to do, as she would know this and hates being reminded of this. No point saying you should have done this by now, knows she should have but where's she going to find the time to do it. Wanted more general help, such as look through a chapter and jot down the main points in an hour, see how the main concepts related, rather than a reminder.

Student 5

Asked if it was all mouse driven and if it was double click. Tried to click on the triangle.

Clicked on study week 1 instead of chapter 1.

Tried to type in hours without clicking.

Went to chapter 2 with no problems and no hesitation.

Not sure how to get back to main page, but thought she'd try the 'house' as it looked like it was the home page.

Green - "for go so it's happy with that", amber - "not too brilliant", red - "stop, go and read it again, get some advice, it's not happy with it."

Quite clear advice, but didn't like the text as it was hard to read, too small and a "funny shape". Preferred the text in the coloured bars as it was clear. Maybe suggest contacting your tutor to talk about what you didn't understand since you spent 4 hours reading it perhaps rereading it will not help. Could go through the basic points, point out the underlying structure.

Closed box correctly first time!

Wanted advisor to offer praise if you had done well. Difficult to comment on unless you have actually used they system for real.

Appendix 11. Evaluation Raw Data

Personal Information

1. Age

30 - 35: 3

36 - 40: 2

2. Sex

F - 5

3. Year of Study

3rd - 1 4th - 3 6th - 1

4. Course

D309

5. Computer Experience

1. Word for Windows, Excel, Fortran programmin
2. Not very much
3. I use a PC at home mainly for WP. I have taught myself through trial and error.
4. Varied, can use email, Internet and WP. Understanding of how it works is less than a childs.
5. Windows 95 - novice. Work - package on WordPerfect.

On-line Study Guide Progress Advisor

6. Would you find it helpful to be able to tick things of?

Very helpful - 1

Fairly helpful - 4

7. Did you like it that you were asked to input your estimated hours and level of understanding?

Liked it a lot - 1

Not bothered - 4 Comments - Level of understanding more important than hours, as it makes me reflect - did I actually understand. How many hours isn't important to me.

8. Would you find it helpful to have reminders that you haven't finished a chapter's task before moving to the next chapter?

Very helpful - 3

Fairly helpful - 1

Not helpful - 1 Comments - I usually know.

9. Did you like the way the information was presented to you in the Progress Advisor?

Liked it a lot - 2

Quite liked it - 2

Didn't like it - 1

10. What did you like about it?

1. Colour coding highlights areas which require further work, which is useful.
2. I liked it but would like more info. see below.
3. That it gave a positive and a rationale for why it was important to include information that had been missed.
4. Brevity.
5. Colour scheme easy to understand.

11. What did you dislike about it?

1. Suggestion that you should re-read - it's not particularly helpful as it is rarely possible given time constraints. Give v.v. short overview of key points, something that can be done quickly and easily.
2. Needed more precise info rather than 'read again'. I would like 'perhaps you found -----
- difficult - in summary this is -----.
3. I would have liked a more detailed account of rationale.
4. Font was difficult to read. More concrete help could be given.

12. Would you find using a Progress Advisor like this helpful?

Very helpful - 2

Fairly helpful - 2 Comments - if it gave you additional concise info as guidance

Unsure/don't know - 1

13. How often would you 'consult' a Progress Advisor?

Every week - 1

After each unit/block - 1

Before a TMA - 2 (1 plus other)
Other - 2 Once a fortnight/3 weeks when I review work to date
If I had a problem or took a long time

14. Do you think on-line study guides with advisors would be more useful to students on computing courses than students on non-computing courses?

More useful - 1 Comment - but only because more students are likely to have the know-how to use them
No difference - 3
Unsure/don't know - 1

15. What information would you like to see in a Progress Advisor?

1. Refer to 12. Plus maybe links to other relevant sections of the course where the issues are dealt with again.
2. See 11.
3. Key concepts linking across blocks i.e. comparable to course overview booklet.
4. Summaries, self-testing.
5. Praise if all going well, direct to further reading.

16. Please use the space below if you have any other comments you would like to make about the Progress Advisor.

2. This is a good idea for all courses not just computer courses.
4. it would be a useful motivating guide.

Other Advisors

Two other Advisors are planned, but not yet written.

The Time Management Advisor would offer scheduling advice for planning your study time and would keep track of the actual time spent on tasks and compare this with suggested times, offering you appropriate advice.

17. Would you find this type of advisor helpful?

Fairly helpful - 2
Not helpful - 2 Comments - Time management is not for me something I'd use on-line facilities for.

Unsure/don't know - 1

18. The Study Skills Advisor would offer individually tailored study skills advice

Would you find this type of advisor helpful?

Very helpful - 2 Comments - Tailored technical info I would definitely use.
Fairly helpful - 3

General Comments.

19. Please use the space below to make any further additional comments on any of the above:

1. I would make any interface consistent, so each page has a 'next page' 'previous page' 'home' 'help' in the same spot. Put a content list on LHS.
3. Individually tailored study skills advice would be more helpful - people like me who work full-time - and tend to cram in a lot of study in a concentrated time - I have never found it 'comfortable' to work at a steady pace as suggested - (I get bored!).
4. Icons not obvious as to function.
5. Hard to say without testing. Sometimes due to home circumstances etc. someone may not spend the time that they should. Any advice should not be critical of this as it would probably make people feel worse - we tend to know and feel guilty enough if we are not doing enough!

Appendix 12. Changes to Prototype Following Evaluation

Figure 1

Map **?**

Progress Advisor

Block 1 Foundations

Chapter 1 Computing: an Object-oriented Approach

M205 Course Map CD-ROM	I understood this very well
Chapter 1: Printed text	I understood this very well
LearningBook	I understood this quite well
Parsons and Oja: Chapters 1 and 2	I did not understand this very well
Email	I understood this quite well

It is good that you have a clear understanding of the Course Map and the first chapter of the printed text. These set out the structure of the course, and this is important for the rest of the Block.

However, Parsons and Oja is the set book for this course, and these chapters lay down important concepts which we will be expanding on in Chapter 2 of this Block. It would be a good idea to go through this material again to make sure you understand it more fully before continuing.

↖

Figure 2

Progress Advisor

Block 1 Foundations

Chapter 1 Computing: an Object-oriented Approach

M205 Course Map CD-ROM	I understood this very well
Chapter 1: Printed text	I understood this very well
LearningBook	I understood this quite well
Parsons and Oja: Chapters 1 and 2	I did not understand this very well
Email	I understood this quite well

It is good that you have a clear understanding of the Course Map and the first chapter of the printed text. These set out the structure of the course, and this is important for the rest of the Block.

However, Parsons and Oja is the set book for this course, and these chapters lay down important concepts which we will be expanding on in Chapter 2 of this Block. It would be a good idea to go through this material again to make sure you understand it more fully before continuing.

Summary of key concepts

object: a block of data bundled with **message handlers** that know how to change and use that data
message: a signal sent by one **object** to another, either asking it a question or to do something
message handler: a little bit of program that responds to a **message**
email: a way for people to send text messages to one another electronically, through the **Internet**

Close

Figure 3

Study Guide

Study Guide Tour

Progress Advisor

Study Skills Advisor

Block I Foundations	Study Weeks 1 to 4
Block II Basic Smalltalk	Study Weeks 5 to 8
Block III Smalltalk Classes	Study Weeks 9 to 11
Block IV Collections	Study Weeks 12 to 17
Block V Object Analysis	Study Weeks 18 to 22
Block VI Object Design	Study Weeks 23 to 27
Block VII Complex Systems	Study Weeks 28 to 33

Appendix 13. Modified Requirements Specification

Progress Advisor Specification

General

- Students will be offered advice on their progress through the course.
- This advice will be on request of the student.
- The advice will be generated from information the student provides.
- Advice will be given for each chapter as well as for overall progress through the course.
- If a student has not completed the prerequisite tasks/materials for a chapter, they will be reminded of this.
- A summary of the students progress will be kept.
- There will be an 'at a glance' representation of progress.
- Information will be for the students own personal benefit and will not be made available to the tutor unless the student wishes.

Knowledge Representation

- The system will have a representation of the structure of the course. This will include which chapters and texts are prerequisite reading for later chapters

Advice

- Advice should be given by an agent, the Progress Advisor.
- Advice given by the system will highlight areas where the student does not feel they understand the subject material and will direct the student appropriately.
- Advice should include summaries of key concepts. These key concepts should be linked to similar concepts in other blocks/chapters.
- Advice should allow the student to reflect on their level of understanding of the course materials.
- Advice should be positive.
- The ‘advisor’ should include the reasoning behind the advice.

Usability

- The student should be able to use the system confidently after taking the ‘Study Guide Tour’
- Navigation should be clear and intuitive.
- Navigation will be assisted by a toolbar of common functions, showing icons with text labels.
- The ‘advice box’ should have a ‘close’ button.

Appendix 14. Summary of M206 Map Developmental Testing

Summary of M206 Map Dev Testing

Tammy Sumner, Josie Taylor, and Chris McKillop

May 22, 1997

Participants: Total of 6

Four: representative of ‘real’ potential M206 students (one is actually considering taking the course!)

Background on these four:

- All use computers at work.
- None have previous programming experience.
- Conferencing and web experience varied from none (2) to some (2).
- Email experience varied from a little (1) to daily at work (3).
- One is considering taking M206.
- One is currently enrolled in D103 (social science foundation course)
- One is not/has never been affiliated with the OU.

Other Two: post-graduate student interns in IET but otherwise, a similar skill set to expected students though on the technically proficient end of the spectrum:

- Both had some programming experience (e.g., Basic)
- Both claimed to be heavy users of the web.
- One had previous experience with conferencing.

Summary of overall procedure

Participants were asked to do two tasks. Each task consisted of taking a tour first and then using the map to find things as needed to answer three questions. The two tours tested were the general tour and the Block 1 tour. After completing the tasks, each participant was asked questions about the tours, the map layout and structure, the course, and how they might use (or not) the map before and during course presentation. Each session took approximately 1.5 to 2 hours; there was one person running the session and two observers/note-takers for each session. All sessions were videotaped as a backup.

Note that the look-up questions always comprised a mix of difficulty including: (1) finding something shown directly in the tour, (2) finding something mentioned as existing in the tour, and (3) finding something by inference based on a their ‘mental model’ of the structure and content of the map (the ‘trick’ question).

Summary of Key Results

Results grouped in the following areas:

- Overall look and feel of the map
- Navigation
- Tours

- Content of map
- Perceptions of the course
- Use of the map

Overall look and feel of the map

All the participants were very enthusiastic and positive about the overall look and feel of the map. Many voiced unsolicited praise for the colors, the fonts, the design, and the intuitive layout. Thank you Diane!

Navigation

6 out of 6 participants were able to use the map to answer 5 of the 6 questions; these questions were in categories (1) and (2) outlined above.

3 out of 6 were able to answer the ‘trick’ inference question (category 3) with no assistance; the other three required a hint.

In general, people had very few problems navigating and seemed to be able to easily find things they were looking for.

All participants seemed to easily grasp clicking on the background to close windows.

A few participants were confused as to how to close the modal windows (2 out of 6). Several assumed that clicking on the background would also close these. The problem was they needed to do this in task 1 but the instructions on how to do this were not covered until the Block1 tour in task 2.

- Proposed solution: make sure this is explicitly covered in the General Tour. Also, would it be feasible/desirable to make clicking on the background close these (in addition to the close box)?

A few participants (2 out of 6) were initially confused about the status of the general resources list; i.e., what are these things and are they selectable?

- Proposed solution: Add a title to the top of the list like “Course Resources:”

Most of the participants had some difficulties with the rollovers in the level one general resources and the block resources pane. Three kinds of trouble occurred: (1) always clicking on the left hand label and then wondering why the right hand side doesn’t change; (2) being surprised when the text changed (not realizing they had moved the mouse), and (3) the interface was just too jumpy and always changing.

- Proposed solution: Get rid of these rollovers so that the behavior is consistent with the top level global course resource list; i.e., you have to click on these things.

About half of the participants wanted to click on the triangle icons in the course resources list at the top. Most people figured it out after two or three tries but one person had to be told.

- Proposed solution: Can we make this clickable just like the text? This is a minor issue though.

Tours

Each participant took the General tour and then the Block 1 tour.

Participants were given a selection of cards and asked to choose all the ones that applied to the tours. The choices were: too fast, too slow, just right, irritating, helpful, too long, too short. For convergence, participants were also asked direct follow up questions specifically about whether the tours were helpful, a waste of time, irritating, and whether they were ever bored or fidgety. Other questions specifically asked participants about the explicador head and the headlines.

6 out of 6 said the tours were helpful (4 chose the helpful card, other two said tours helpful during follow-up). Follow-up questions (i.e., why do you say it was helpful?) revealed that folks thought the tours were helpful for taking them through the structure of the course phase-by-phase, for introducing the media, and for showing them how to use the map. These responses were very nice to hear considering these were the tour design objectives!

All the participants said that they would probably listen to all or parts of the tours several times.

1 out of 6 said the tours were just right --> follow-up questions showed he was referring to the graphics/layout of the map that were shown in the tour.

4 out of 6 said the tours were too fast

1 out of 6 said the tours were too long

2 out of 6 said the tours were irritating (both of these were the post-graduates)

We have grouped these together because follow-up questions reveal commonality in the underlying problems. Basically, the tours as written cover too much, too fast. Most people are comfortable with the general content and level of description but just want the tours to pause more for them to assimilate what they have just heard. Thus, part of these responses is an artifact of the testing procedure in that the participants could not pause and restart the prototype software. The irritating responses also involved a related issue - too many things to attend to at once. These two tried very hard to hear and read everything at the same time and were frustrated because this is impossible.

- Proposed solution: We need to rewrite the scripts to eliminate some detail, to make sure the audio track and the text is more clearly synchronized, and to encourage them to pause and explore in various places. We also need to include some explicit tour taking suggestions near the beginning; i.e., tell them to stop and explore, tell them to not try to read everything the first time and relax and listen, tell them they may want to listen to parts more than once.

Concerning the explicador head and the headlines...

It is difficult to gauge the effectiveness of the explicador head and the headlines since these were only functional for small amounts of the tour.

4 out of the 6 participants viewed the explicador head positively; 1 did not care (when asked about the head versus an audio track); 1 found the head to be irritating because it did not move. (He felt impelled to stare at it expecting video-like behavior and then nothing ever really happened; thus he felt wrongly distracted.) The positive responses liked seeing who was talking and liked having a visualization to look at during the audio. These people did not appear to expect video-like behavior.

Th headlines only worked briefly. Most people did not remember noticing these 3 or 4 headlines at the beginning of the General tour. Those that did thought they were helpful.

Content of Map

People seemed to understand the different types of map content (general resources, blocks pages, block resources, and chapter overviews).

A few minor nits however...

- We should be careful about using terms like ‘object inspector’ in the general resources and tour since this is not self-explanatory.
- We should not use the ‘Internet’ and the ‘Web’ interchangeably (we sort of do in the general tour / web resource area and somewhere in block2). Most people are already confused about the relationship between these anyway without us adding to the problem.
- We should be more explicit about where resources live; i.e. more emphasis on the fact that printed text are physical pages in a ring binder and not on-line materials.

Perceptions of the course

Results in this category come from two sources. First, after each task, participants were asked to answer questions about the course using the map. The questions were:

After the general tour....

Please describe what the course is about in one or two sentences.

Please describe the role of the printed texts in the course and how does this compare with the role of the Smalltalk LearningBooks.

Please describe the role of conferencing in the course and how does it compare with the role of the World Wide Web.

After the Block 1 tour....

Please describe the structure of the course in one or two sentences?

Can you describe what chapters are? What resources and materials compose chapters?

Only half of the participants were able to adequately answer the question about smalltalk versus printed text. However, due to a bug in the system, this information only appeared in audio form during the tour and was not visible in the text when people went back later to explore.

- Proposed solution: We may need to be more explicit in the text descriptions in these resources than we currently are.

Everyone was able to articulate that conferencing was for communicating with other students and tutors and the web was a resource area for getting updates to course materials. Yeah!!!

5 out of 6 participants were able to clearly articulate the structure of the course; i.e., 7 blocks, study weeks, chapters, etc. (the other one (one of the post graduates) seemed to think we were asking a deeper question about design of educational materials)

5 out of 6 participants were able to clearly articulate that ‘chapters’ consisted of a variety of resources such as printed text, learning books, web pages, and television programmes.

After both tasks, participants were given a selection of cards and asked to choose all the ones that applied to their perceptions of the course, based on the map and tours. The choices were: interesting, difficult, hard, easy, boring, confusing, approachable, technical, fun, do-able, challenging, stimulating.

Participant 1 chose:

approachable, do-able: could become comfortable learning this way

challenging: something completely different

interesting: the way the course is laid out and using up-to-the-minute technologies

fun: using new bits like the web and first class

Participant 2 chose:

stimulating, interesting: way tour presents course makes it seem interesting

approachable: looking at blocks and tasks made it seem approachable and accessible, made it seem easier

hard, challenging: [because of subject matter]

Participant 3 chose:

technical, challenging: [because of subject matter]

stimulating: new media and materials

interesting: due to the layout and the way it takes you around

Participant 4 chose:

approachable: the breakdown of the blocks and the way you can choose your way through rather than sifting through paper

interesting: different subject, neither hard nor easy

stimulating, challenging: new things, different from what I'm used to

technical: lots to get your head around

fun: looks like a nicer way of learning, rather than being sat with a list of books

Participant 5 chose:

do-able: you know where you are supposed to be and if you followed your timetable you couldn't go too far off track

stimulating: packed full of lots of different things, lots of different media

technical: have to be able to connect all your widgets up

fun: looks fun if things are going well (all your software works and you can get everything installed)

Participant 6 chose:

approachable: because of the layout, easy to jump in and begin

do-able: the general resources, plus the descriptions of how the media used in the course made it seem like a good opportunity to experiment

technical, challenging: involves a certain degree of technical aptitude

fun: each of the general resources looks fun to explore, 'look and feel' of map interface is exciting and appealing

stimulating: the new media and being an opportunity to experiment

We have included brief summaries of what each participant chose and their explanations of their choices so you can judge for yourself. Based on these responses, we feel that the map made a large contribution to people's overall positive perceptions about the course. The tours, the general resources, the clear layout and the overall friendliness of the map seemed to contribute to people's perceptions of approachable, do-able, fun, stimulating, interesting. One participant remarked that the map made the course "look quite structured, organized, and divided into manageable chunks"; these sentiments were echoed in different ways by all of the participants. Thus, we appear to be on target for meeting many of our design objectives laid out in the map design brief presented to the course team last October.

Use of the Map

We asked people detailed questions about how they would use the map and when it would be most useful to them (or not). We looked at three types of usage: using the map promotional material for prospective students, using the map in the beginning of the course, using the map throughout the course.

Specifically, we asked:

Do you think this would be useful for convincing you to take the course?

Or for helping you get started on the course? Or for using throughout the course?

using the map promotional material for prospective students....

6 out of 6 participants thought the map would be very useful for helping them to decide whether to take the course.

4 out of 6 participants thought it would be preferable to paper-based promotional material

1 out of 6 wanted both paper-based materials, a video promo, and the map!

1 out of 6 noted that it would give her the necessary confidence prior to starting a course she would otherwise be a little scared to take (this participant is actually considering to take M206 next year).

1 out of 6 pointed out that the map might 'put you off in terms of workload' since it 'looks like a lot to be doing'. However, another participant (an actual OU student) viewed this as a desirable feature since it gave her a better idea of what she would be getting into and committing to do for the next year.

using the map in the beginning of the course.....

6 out of 6 participants thought the map would be very useful at the beginning of the course

Most thought they would look at the tours several times. One said he would explore the whole map briefly at the beginning .

using the map throughout the course....

6 out of 6 participants thought the map would be very useful throughout the course

1 out of 6 used a phrase like 'aim to use it throughout' since he might not carry through if he got too involved in the course proper

1 out of 6 mentioned that she would particularly use it at the beginning of every block

Several participants said they would use it throughout the course to help with catching up (if they got behind), planning their study, and helping with revising and planning their revising.

Please remember that this is a rough report, done quickly to make information available. It will be amended and expanded later into an IET developmental testing report.

Appendix 15. Summary of Interviews with M206 Developmental Testers (Comments relevant to study guide)

Features of an on-line study guide wanted

Need to see progress (current progress is moving through pages)

Wants to know what sort of progress you should be making

Wants more feedback - benefit of interactivity

More pressure to force pace.

To see a common course structure - be led through step by step

Annotations

Want to tick things off (makes you feel good).

Most like sound of on-line study guide, one unsure, one skeptical.

Reminders wanted.

Want hard copy to 'look at over cornflakes' or to file.

Be able to print it

More on-line the better, less paper

Want to be more interactive.

More on-line the better, less paper the better.

A guide not a record.

Likes tool bar with icons across bottom/in neat line.

Existing study habits

Mark progress using sticky labels.

Notes done on-line, printed and stored in binder.

Notes in margins.

Notes in notebook.

Jotted down in book points of interest.

Marking such as highlighting.

Use red pen, write into notes.

Write notes on other side of paper.

Left physical books open at current page.

Book mark if had to close.

Paper work kept in binder.

Often don't look back in old notebooks.

Keep track of time spent on chapters.

Study in one sitting or few hours at a time or depends on weather or rest of life.

Set aside blocks of time.

Little use of external organisational aids - depend on memory.

Use of diaries.