STATISTICS FOR WORKERS IN SOCIAL AND HEALTH SCIENCES BY FLEXIBLE LEARNING MODES

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There is an increasing need for people from a wide range of disciplines, including the social and health sciences, to have a sound knowledge of statistics to adequately carry out their professional duties. To help meet these needs, the authors' university has developed on-campus graduate programs in social and health statistics. Recently these courses have been extended to include off-campus study to assist people who prefer this mode of study. Initially some of the off-campus subjects were offered in text based modules, but with the initiative of the Swinburne Online Education Project a number of subjects are being developed which utilise the advantages of modern technologies. This paper outlines some of the thinking behind these developments and provides some examples of what is being done.

GENERAL BACKGROUND TO THE NEED FOR SUCH COURSES

During the past ten years the School of Mathematical Sciences at Swinburne University of Technology, Australia has run part-time evening graduate programs in social and health statistics which are specifically designed for graduates in humanities, social and health sciences who have a professional interest in the use of statistics, but who often do not have strong mathematical or computer backgrounds. Their statistical needs range from those who only have to carry out basic data collection and write simple reports, to those who need to report their own studies in professional journals or in research dissertations. Furthermore, a greater number of students from courses across the board are now required to study at least one statistics subject in their undergraduate program. As people from a wider range of backgrounds find they need to undergo such training, the need for greater flexibility in course delivery has become apparent. An increasing number of people are looking for training which does not involve attendance at classes.

The reduction of restrictions which occur with off-campus study appeal not only to those affected by distance, but also to people like medical professionals who are on call, people with young children and people who work non-standard hours. The move to providing flexibility in the way learning can occur allows students to move through the material at their preferred time and place and at their own pace. It can also allow course content to be adjusted to suit individual needs. However along with the advantages of

having flexible ways to study, there are quite different problems which need to be addressed when students cannot obtain information directly from the lecturer. Some of these, along with how they are being dealt with at Swinburne University of Technology, will be discussed in this paper.

INTRODUCTION TO FLEXIBLE LEARNING MODES

The best known programs which offer statistics at the post secondary level by distance are the Open University courses which began in the UK in the early 1970's (McConway, 1990) and are now available in many other countries. Until recently these distance courses were generally text based with supplementation by videos and often included short residential programs where the students had some opportunity to interact with staff. Among the main problems with these approaches include communication difficulties, the passive nature of the student experience, students' lack of access to adequate computer software or hardware and limitations on the assessment methods which could be used. Recent developments in technology have potentially lead to great improvements in distance courses, including interactive learning modes and modern communications. A major development in medical statistics is occurring in the University of Pittsburgh Roadmap to Prevention program: A Global Health Network Supercourse (www.pitt.edu/~super1). The Supercourse developers see the internet as a revolutionary force requiring an entirely new outlook on education (Cimino, 1997).

In recent years universities in Australia, as in many other countries, have offered an increasing number of statistics courses using flexible modes employing the newer technologies such as the internet and CD ROMs. Examples include Deakin University's involvement with the Australian Open Learning program (Gollan, 1994) and the LUDITE program for Australian teachers (Watson and Baxter, 1997). The health area has attracted particular attention with developments such as at the University of Newcastle (http://www.health.newcastle.edu.au/disciplines/cceb/Learning-Modes.html).

THE SWINBURNE ONLINE EDUCATION PROJECT

In 1997 Swinburne University of Technology, an institution which traditionally offered its courses on-campus only, decided to expand its approach to course delivery. To this end, the Online Learning Education Project, OLE, was established. The University put aside funds to help develop learning materials and communication facilities for

students to be able to study their courses in an off-campus format based around the internet. Key staff were selected across all areas of the University and given time release to work on the developments of over 50 subjects as web based courses. This included four statistics subjects including some of the graduate subjects in social and health statistics as well as some undergraduate statistics subjects.

SOME ISSUES RELATING TO FLEXIBLE LEARNING METHODS

The electronic media provide the opportunity for animated demonstrations, increased interactive participation by students, and more effective channels of communication. There is little question that flexible learning modes need to be employed if educational institutions are to keep pace with the changing needs of students; however the use of technology to simply modify traditional courses is not adequate. Flexible learning modes must be approached with fresh attitudes and creative solutions, while keeping issues of pedagogy foremost (Moore, 1997).

While the use of technology can greatly enhance courses, it will not necessarily replace traditional modes completely. Integrating a range of learning modes helps overcome the disadvantages of any one method, as weaknesses in one mode can be compensated for by the strengths in another. In the OLE statistics courses a multi-modal approach is proposed. In this the course content will be provided primarily in print based materials.

Communication will focus on the use of the internet. Course outlines, study guides and updates will be provided on the WWW and student interaction with the material will mainly be done via CD ROM’s in the form of simulations and demonstrations. This model ensures that the student does not have to rely entirely on one mode of delivery. A trial of this model of print, CD ROM and website is currently being conducted with undergraduate statistics students in the social sciences.

Although these students are not ‘distance students’ in the normal definition, the flexible methods being developed have application to traditional distance students. Traditional lectures are still offered, as are drop-in tutorials, however these are non-compulsory. Students are provided with a comprehensive printed learning guide containing all of the course material, exercises, revision materials and graphic calculator instructions. An electronic online workbook is provided via the university server, which can be accessed either through computer terminals on-campus or remotely through

modem access. A TI-83 calculator emulator provides animated instruction via the website and discussion groups are available for student contribution.

PRINTED MATERIALS

While print materials may have served the past and present generations of learners very well, such materials should not simply be re-assigned to either web pages or CD ROMs. Scrolling down pages of text on a computer screen can become tedious and makes it difficult to keep track of your place in the document. The printed page has the advantage of always being at hand and for subjects such as statistics the need to write on the notes and to carry out calculations is an important consideration. A comprehensive set of printed notes, which may include a guide to a text book, and clear guidelines to the other learning modes, is seen as an essential and primary part of our model.

INTERACTIVITY AND CD ROMS

There are various CD ROMs available for learning statistics, from elementary levels to more advanced. "ActivStats" by Data Description Inc. (http://www.datadesk.com), for example, offers a range of activities including videos, visualisation tools to illustrate specific concepts, narration illustrated with text, pictures and animations, and personal exercises which test the learner's understanding of a topic. It is proposed that in time Swinburne will develop its own CD ROM encompassing various levels of statistics. This will include both software developed by the institution and existing software purchased from private software companies. CD ROMs provide Interactivity, in the form of simulations and demonstrations, which can facilitate understanding of statistical concepts in ways that neither print nor traditional face-to-face methods can achieve.

In the past, numerous technologies have been used in an attempt to provide both on and off-campus students with motivation and understanding in statistics courses. These have had varying degrees of success. For example many videos are available which demonstrate concepts using animations, but these are essentially passive, hence they are of limited value for real learning (Moore, 1997). In the courses under development, the element of interactivity will be used to provide a way for students to become actively engaged in the learning process. For example, students can engage in simulations which

allow them to change data values to explore the ways in which graphs may change. Some of these interactive activities will be demonstrated in our presentation.

COMMUNICATION AND FEEDBACK

Communication and feedback are an essential part of the learning process for any student. This aspect of the course becomes paramount for the distance student. The learner must be provided with effective and efficient channels of communication to the teacher. Furthermore, the ability to interact with other students also affords important learning opportunities through the sharing of ideas, problems and solutions with their peers. With on-campus study this process usually occurs naturally via the day-to-day classroom interaction. However, when the students do not have ready access to either the teacher or other students, as in off-campus study, good methods of communication and feedback may be the key to overcoming the problem of student isolation.

The OLE courses will provide communication via the internet. This will include one-to-one e-mail (particularly between the instructor and individual students), one-to-many information messages (between instructor and groups of students and many to many chat groups (among groups of students). Students will also receive individual feedback in the form of formative or summative assessment, which goes hand in hand with a feeling of involvement in the learning process. Software activities and continuous assessment will be incorporated so that students can monitor their own progress and acknowledge areas of difficulty. The continuous assessment will also allow staff to monitor student progress and intervene with additional help when required.

COST AND STAFFING

Technology should be used as a tool to enhance learning modes rather than as a means of reducing costs. While offering flexible learning modes may sound more cost effective than traditional lecture and classroom methods, there are hidden costs to be considered in the development of materials which will take advantage of the new technologies. Communication such as discussion groups must be monitored daily to be effective and students require frequent and regular responses to questions which, can be very time consuming. Furthermore, websites must be maintained and updated, and technical support must be provided to deal with unexpected problems.

EQUITY

Offering technology based materials entails an underlying assumption that all students are familiar with the technology and hardware that supports them. While using an integrated system of learning addresses some of the inequities involved, a more proactive approach is necessary. An assessment of each student's computer competency is needed and, where these skills are lacking, provision for a short training course should be made. It may also be necessary to provide some initial technical support, to help students set up the appropriate hardware, software and connection to the internet. This would ensure maximum participation and not restrict the admission of any student to the course on the grounds of unfamiliarity with the technology. This is an issue particularly relevant to those who may be returning to study. Access to the equipment is also an issue when developing any technology based course.

CONCLUSION

With the increasing use of statistics in the social and health sciences, the need for readily available training courses has become paramount. The flexible nature of distance education is particularly useful for people who are already working in these fields. However, traditional text based approaches to distance education have many shortcomings, especially in the area of communication and active student involvement. Rethinking distance education in the light of modern technologies is an exciting prospect. The new technologies can provide opportunities for students to engage more fully in the learning experience via interactive exercises as well as providing enhanced communication both between students and between staff and students. There is a danger, however, that we will get so excited by the things it is possible to do, that we will not stop to question their educational value. Rather than just using the technology for its own sake, we need to constantly review what it will add to the students' learning experience.

Students involved in early trials of our distance education subjects have consistently commented that it requires greater effort, but they feel they are achieving greater understanding than in 'face to face' courses. This feedback is encouraging. While web based courses will not overcome all of the problems of isolation and assessment difficulties faced by traditional distance education, they do offer a great improvement. Flexible modes of learning, which incorporate both the newest technology and traditional

methods, offer students a range of options to suit their style of learning, their individual pace and their lifestyle.

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