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**A STUDY OF “ECONOMICS IN ACTION”:  
A COMPARISON OF COMPUTER-ASSISTED INSTRUCTION USE  
BY MATURE AND YOUNGER STUDENTS**

A thesis

submitted in partial fulfillment  
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by

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A STUDY OF "ECONOMICS IN ACTION":  
A COMPARISON OF COMPUTER-ASSISTED INSTRUCTION USE  
BY MATURE AND YOUNGER STUDENTS

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Computer-assisted instruction offers advantages over traditional forms of teaching. Such advantages may appeal particularly to mature students. This study used automatic data collection and surveys to obtain quantitative data, in order to compare the use of a CAI package, "Economics in Action"(EA), by mature and non-mature students in a first-year economics class. Qualitative data was obtained from interviews.

A significant difference was found between mature and non-mature use of EA. Results show that, on average, mature students used EA twice as much as non-mature students. Reasons for this appeared to be their level of motivation, their desire for control over their learning, and their perception of the value of EA to their study of economics. Mature students also made themselves familiar with EA early in the semester. Non-mature students appeared to meet some "starting hurdles" in the use of EA. It appeared to take non-mature students the whole semester to "catch up" with the mature students in their attitude towards EA.

With expanding numbers of mature students entering tertiary institutions, there is an increasing need to provide flexibility in learning. The findings of this study are significant in that they demonstrate that the provision of a CAI learning resource is perceived to be of value by mature students.

*Keywords:* mature student, non-mature student, computer-assisted instruction, Economics in Action, economics

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# CHAPTER 1 – INTRODUCTION

## 1.1 Background to the Research Question

Computer-assisted instruction (CAI) has had considerable impact on the world of education and training because it offers a number of advantages over traditional forms of teaching. Some of the advantages offered by CAI are that computers can be used by learners at their convenience, well-designed CAI is non-judgmental, self-assessment is provided, and learners can repeat material as desired. Use of CAI thus enables learner control of the learning process.

Mature students are often faced with a number of problems when they seek to further their education. Many have commitments, such as jobs and families, which may reduce attendance at a tertiary institution, or the time available for study, or both of these. Mature students are often concerned about their lack of background knowledge, and their performance in a particular subject.

Many of the problems faced by mature students might be addressed, or considerably reduced by the use of CAI as a learning resource, because it is available at the student's convenience, and can provide background knowledge, feedback, and assessment of performance. Thus, it could be expected that mature students might use CAI more than younger students. On the other hand, it is more likely that mature students would suffer from an increased level of learner anxiety, or 'computerphobia', when confronted with a computer as a learning tool. This could possibly cancel out the advantages of using a CAI package.

In order to obtain some insight into the question of mature student use of CAI, a small pilot study was initially undertaken. The results of the pilot study, combined with anecdotal evidence, suggest that mature students do make more use of CAI than younger students. However, to date, no literature has been found to support this. As there was no evidence to suggest that the indications from the pilot study were erroneous, the detailed study described herein was then undertaken.

The research outlined herein sought to determine whether or not mature students, enrolled in a first-year Economics subject at Lincoln University that included a CAI package 'Economics in Action' (EA) as a learning resource, did use it more often, and for greater amounts of time than younger students. This study also included research into student perceptions of and attitudes to EA. Such information could help explain any differences in use found between mature and younger students.

## 1.2 Terms Used

This study was concerned with differences between mature and younger students. The term “*mature*”(M) is used to describe that group of students fitting the definition of this term given in Chapter 4. The term “*nonmature*”(NM) applies to that group of students who fall outside the criteria determining inclusion in the mature group.

A number of terms are currently used to describe the use of computers in the learning process. The two most commonly used terms are “*Computer-aided Instruction*” (CAI) and “*Computer-Based Learning*” (CBL). The term Computer-aided Instruction (CAI) has been used in this thesis.

Other terms used in this study are:-

### *ECON101*

This was the code of the first year Economics subject that was studied at Lincoln University.

### *Economics in Action (EA)*

This was the piece of CAI used in this study.

### *Mid-semester (MS)*

This is the term used to describe the mid point of the semester, at which a both a survey and student interviews were conducted.

### *Post-exam (PE)*

This is the term used to describe the first week of the semester following the one in which the study was conducted, and denotes the point by which students were aware of their final examination results, and had been awarded a grade for Economics. At this point a further survey and student interviews were conducted.

### *BCM*

This term refers to the Bachelor of Commerce and Management degree offered by Lincoln University.

## 1.3 Overview of the Thesis

A description of literature relevant to the research undertaken in this study is given in Chapter 2. Chapter 3 presents a detailed case description for this study and also presents the findings of the pilot study.

Data for the research was collected in two forms. Quantitative data was collected from automatic usage logs, and by class surveys; qualitative data was collected from interviews with volunteering students. The data collection is described in the Research Methodology in Chapter 4.

The findings of this study are presented in Chapters, 5, 6 and 7. Chapter 5 presents the findings and discussion of the automatically collected usage data. Chapter 6 presents findings and discussion of the first survey conducted in this study, and Chapter 7 presents findings and discussion of the surveys conducted at the mid-semester and post-exam points.

Chapter 8 presents the material collected by interview, along with discussion of the information obtained. The last chapter, Chapter 9 presents overall conclusions from the study. Also presented in this chapter are outlines for possible further analysis of the data collected in this study and suggestions for future research.

## CHAPTER 2 – RELEVANT LITERATURE

### 2.1 Computer-Assisted Instruction (CAI)

#### 2.1.1 Definition and forms of CAI

CAI is also known by a number of other names, such as Computer-Based Learning (CBL), Computer-Aided Learning (CAL), and Computer-Managed Instruction (CMI), and is a subset of Interactive Multimedia Instruction (IMI) (Schwier, 1993). IMI ranges from CAI to elaborate systems incorporating virtual reality interfaces.

According to Schwier(1993), IMI is multiply-sourced, (i.e. multiple media sources are involved), instructional, segmented, intentionally designed, and coherent. Media sources may be chosen from text, graphics, animation, sound, and video, and integrated with the intention of providing instruction. Arcade games are interactive multimedia packages, but whether any instruction is imparted is incidental.

CAI applications can be categorised as drill and practice, tutorial, problem solving, simulation or game (Kemp & Smellie, 1994). In this study the commonly used categories are tutorial and problem-solving. Each category indicates which type of learning occurs with CAI. The 'tutorial' category attempts to emulate a human tutor. The problem-solving category presents students with questions, quizzes and problems to solve. Good problem-solving CAI should reinforce prior learning in the subject, and should also provide feedback, and hints and tips where applicable. Problem-solving CAI is often found in conjunction with tutorial-like CAI packages and it is this dual-category that is referred to when the term CAI is used in this thesis.

#### 2.1.2 Positive Outcomes

Several studies have established that CAI can produce a variety of positive outcomes for learners. Salehi *et al.* (1989) assessed the attitudes of students towards using computers as learning tools. Although the subjects of this study were not adults, responses indicated that students' attitudes towards CAI were very positive, and that they preferred learning with CAI to traditional instruction. These authors also found that teachers were also very positive in their appraisal of CAI.

Maclay & Askov (1987) reported on the use of CAI producing an increase in attendance in an adult literacy program in the USA. The indirectly positive outcome of attendees' children having a greatly improved attitude to their own learning was also observed. This suggests that the positive outcomes are felt sufficiently strongly by the adult learners involved to be transferable to their children.

Two extensive reviews by Rachal (1984, 1993) add weight to the argument that CAI use produces positive outcomes. The positive effects reported were enhanced positive attitudes and commitment to learning, a sense of reward, improved learner self-confidence, privacy to make errors in a non-judgmental environment, provision of feedback, and faster learning.

### **2.1.3 Effective learning with CAI**

While it appears that students using CAI experience positive outcomes, it does not automatically follow that learning with CAI is more effective than traditional methods. However, the following studies show that learning with CAI is at least as effective as other means.

A meta-analysis by Kulik, Kulik & Shwalb (1986), of twenty-four studies, showed an overall increase in final examination scores of 0.42 standard deviations with CAI use. They also reported a dramatic reduction of 29% in the time needed by students to learn. The authors found few studies on the cognitive effects of CAI use, but those analysed did show positive effects on adult learners, such as improvements in learner attitude, reduced attrition and retention.

As well as the positive outcomes discussed above, the two literature reviews by Rachal (1984, 1993) also support the view that CAI is at least as effective as traditional methods. Both reviews report apparent instructional gain, although Rachal comments that many studies are not statistically significant.

### **2.1.4 Integration of CAI into Curriculum as a Learning Tool**

Evidence of how best to integrate CAI into a course of instruction has been published. Najjar (1996) identified specific situations in which multimedia information could help students learn. He suggested that the media should encourage dual coding of the information and that these should support one another. He also considered multimedia particularly pertinent to the needs of learners with low prior knowledge or aptitude. The issue of low prior knowledge was

addressed by Chang and Palmer(1997). They developed CAI specifically to meet the requirements of subjects with large enrollments, which included both high-school graduate and mature age students, bringing a wide range of computer literacy and prior subject knowledge to a first-year university level Information Systems unit. Weems (1996) was aware of the need for CAI material to be fully integrated into the curriculum. In his opinion, students did not concentrate on CAI material that was not part of the required content.

## 2.2 Mature Students

### 2.2.1 Definition of 'mature student'.

The literature was examined to establish what definitions of "mature" might already be in use. This examination of the literature revealed several studies involving "adult" and "mature" students (see, e.g. Munn, MacDonald & Lowden, 1992). The two terms appeared to be used interchangeably and both were used throughout the literature, with little consensus as to the definition of a member of such a group.

Knight & McDonald (1982) define a mature student as "any student who enters university later than the traditional school leaving age." This is further refined to both "those who complete their schooling but decide to defer university entry" and "to a small minority who enter university at the age of retirement." Mature students then, are not defined so much by age as by the fact that they have had an opportunity to experience life since secondary school before entering university.

Lowden, Munn and MacDonald (1990) undertook an extensive review of the literature concerning attitudes and access to adult education. They report that generally definitions incorporate some reference to a break in education, although there is little consensus on how long that break should be or on the age a student must be before being considered an adult/mature learner.

In 1993, The New Zealand Vice Chancellors' Committee (NZVCC) attempted to more clearly define the term "mature". New Zealand universities were surveyed in order to define a generally accepted meaning. However, such was the variation in both the definition itself, and the rationalisation for the definition, that the NZVCC abandoned the attempt.

It is interesting to note that the Prescription for the Study Right Tuition Subsidy, 1995, (Ministry of Education, New Zealand) clearly defines a "school leaver", but makes no attempt

to define students not included in this group. Some universities use this “school leaver” definition as their only criteria for differentiation.

As no literature was found which provided an established definition for “mature”, a definition was developed for this study and is presented in Chapter 4(Section 4.2).

Other studies involving mature students have been reviewed since this study was completed. It appears that age continues to be the differentiating factor between mature and non-mature groups. Sadler-Smith(1996) studied approaches to studying across three factors; age, gender and academic performance. In this study he defined “mature” as 23 years of age or older. He considered the age of 23 years to be

“a logical point at which to divide students who, in the main, came straight from school or college from those who had come via other routes.”

This study was conducted at the Plymouth Business School. Such a division is considered to be inappropriate for division between mature and non-mature here in New Zealand. Many students by age 23 would have had a break from education, which, as discussed above appears to be a significant characteristic of mature students.

Another study, by Trueman and Hartley (1996) comparing time-management skills and academic performance of mature and traditional-entry students, divided students into three groups; less than 21, 21 – 25, more than 25. This approach was used in the pilot study described in Chapter 3, and again used age alone to differentiate between the groups. This study drew similar conclusions to that of the pilot study contained in this thesis: the division of the study population into two groups gave more clearly defined results.

Devlin (1996) used the often-adopted age of 21 to differentiate between mature and non-mature in her study of learning strategies adopted by teacher education students.

### **2.2.2 Characteristics of Mature Students**

Given the varied definitions of “mature”, which is discussed in Chapter 4, this section details some characteristics of mature students extracted from studies where each study employed their own definition of “mature”.

It is more likely that older members of the student population will have families, jobs and other commitments, which will impact on their ability to study. Studies by Munn, MacDonald &

Lowden (1992), Knight and MacDonald (1982), and Saputo & Frieman (1984) show that older students in tertiary education exhibit a particular set of characteristics.

Knight & MacDonald (1982) list initial anxiety, outside commitments, problems coping with mathematics and science, and lack of background knowledge, as problems, which disadvantage adult students. While these problems were not limited to adult students they were more likely to be found amongst adult learners. The study suggested a number of remedies to the above problems, including pre-enrolment counseling, specific teaching of study skills, and flexible course design.

Saputo & Frieman (1984) report on the general characteristics of adult learners in word processing classes. While not a tertiary setting, the characteristics described were similar to the above studies and also included performance anxiety, lack of self-confidence, and demanding of teacher support and assistance.

Munn, MacDonald & Lowden (1992) also sought to identify the problems faced by mature students, and suggested means of dealing with them. The problem of lack of background knowledge was also identified in this study and the authors suggested that this could be overcome by motivation. Finance, childcare and family commitments were also shown to particularly affect students' abilities to cope. A number of ways of helping students cope were discussed, including tutor support, on-going assessment, and student self-help.

Richardson (1994a) discusses the academic performance of mature students. Mature students are often said to be deficient in study skills. He states, "...there is no good evidence that mature students perform any less well than younger students... in higher education." Further, he defends mature students by examining the literature on approaches to studying and concludes that mature students are more motivated, adopt a deep approach to their studies, and that this approach is promoted by their life experiences (Richardson, 1994b).

### **2.2.3 Preferences for learning via CAI by mature students.**

The characteristics of mature students described above indicate that mature students could be expected to benefit from CAI, because the facilities provided by CAI match their needs.

Two studies examined the question of preferred learning mode. Reisenberg & Gor (1989) undertook a study of the ways in which farmers preferred to receive information. One finding of this study was that young farmers, aged 20 - 35 tended to prefer CAI to other methods such as on-farm demonstrations. No reasons for this preference were given. Although the subjects



of this study were farmers, these authors indicated that adults aged 20 - 35 may appreciate receiving information through CAI.

The view that older students may prefer CAI is supported by McNeely (1991). This study investigated the effectiveness of a CAI lesson with older adults, aged 60 - 89. The findings show that CAI is an acceptable and effective instructional strategy for older adult learners, provided that the application is meaningful to them.

This literature provides insight into the characteristics of mature students. Many of their special problems could be solved by use of CAI. If the above list of mature student characteristics is typical, it is likely that mature students would value the opportunity to use a CAI package as a learning resource, as McNeely (1991) suggested for older students. Thus, it is possible that the combination of mature student problems and characteristics, and an indication that CAI is a preferred method of information intake, jointly affect mature student use of CAI to the point where they may make more use of a CAI package than younger students.

## **2.3 Gender Differences**

### **2.3.1 Reason for Inclusion**

At the outset of this study there was concern expressed that any differences found between mature and non-mature students may be due to gender differences. A literature review of gender differences between male and female attitudes to, and use of computers was undertaken in order to establish that such a concern was valid, and, thus, the study should then incorporate a means to ensure any findings were due to maturity differences alone.

### **2.3.2 Difference in Attitude to Computers between Males and Females**

For a number of years, researchers have studied the difference between male and female use of, and attitudes towards, computers. An extensive Gender and Technology Literature Review (Latta & Bransgrove), prepared for the Computers and Learning in Primary Schools (CLIPS) Project in Australia, cites Hattie and Fitzgerald (1987). These researchers "*found that more girls than boys DISLIKE computers*." Kagan (1988), cited in the same review, described gender differences in the use of computer software (FORTRAN). The review cites extensive support for the view that females have a different attitude to computers.

Durndell (1990) also described differences between males and females in their selection of courses on entering higher education. He addressed the issue of low female enrolment in computing areas. His findings suggested that stereotyping, intimidation fears, lack of role models and teacher guidance influenced women into avoiding technological subjects.

Gender differences in computer use are still a current topic of investigation. An article by Stuedahl and Braa (<http://www.ifi.uio.no/~systarb/Jenter.og.IT/tmv-artikkel.html>) asks "Where have all the women gone - from computer science?" The issues influencing women against entering the area of computer science, even though there are an increasing number of job opportunities in this area, were presented. Selby and Ryba (1994) examined research into gender differences in learning styles and suggested means by which the alienation and disadvantage that many women and girls experience in computer environments could be minimised. Lightbody and Durdell (1996) suggested that "it is not technology *per se* that females find off-putting but their expectations of the work place." Durndell (1997) examined a decade of change in the issue of gender and computing by comparing 16-18 year olds in 1995 with similar study groups in 1992, 1989, and 1986. He concludes that gender related changes are occurring over time, but at a slow rate.

## 2.4 Summary

There is much variation with respect to the definition of a "mature" student. It appears that a break in education and age are common themes, but there is little consensus on what constitutes a mature student. Neither was a methodology found that was considered appropriate for the study of the relationship between mature students and CAI. Accordingly, a definition for the term "mature", and a methodology for the study of mature student use of CAI have been developed and are outlined in Chapter 4.

The findings from the literature review on Gender Differences (Section 2.3) bear out the concern expressed in Section 2.3.1 above. Consequently, the current study was designed to incorporate an investigation of gender differences. These are described in Chapter 5.

## **CHAPTER 3 - BACKGROUND**

### **3.1 Case for the Study**

The case chosen for this research was the first-year Economics class, ECON101, at Lincoln University. This subject is compulsory for any Commerce degree undertaken at Lincoln and also for a number of other degrees, such as a Bachelor of Resource Studies (BRS). ECON101 was a large class of approximately 550 students, which provided a sufficient number of mature students for inclusion in this study. This class used "Economics in Action" (EA), a CAI package, as a learning resource. EA was available throughout the university via the computer network.

This class would normally expect to have lectures delivered by two lecturers during the semester. Unfortunately, due to unforeseen circumstances, ECON101 was taken by four different lecturers with a lecturer who spoke English as a second language for the major part of the second term.

#### **3.1.1 Economics in Action (EA)**

EA is a CAI program that demonstrates the principles of economics, and could be considered to come as close as possible to "doing" economics. It consists of 17 different modules each concerned with a particular topic. Selection of a module provides the student with a tutorial on that topic, with information presented in textual and graphic form. Tutorials use economics related problems to lead the student through a series of "Actions" which demonstrate economic principles and concepts. The graphs are interactive, and the student is encouraged to manipulate the graphs in order to illustrate the principle involved. "Action" statements contained within the on-screen text invite the user to manipulate variables according to suggestions made by EA. (Figure 3.1).

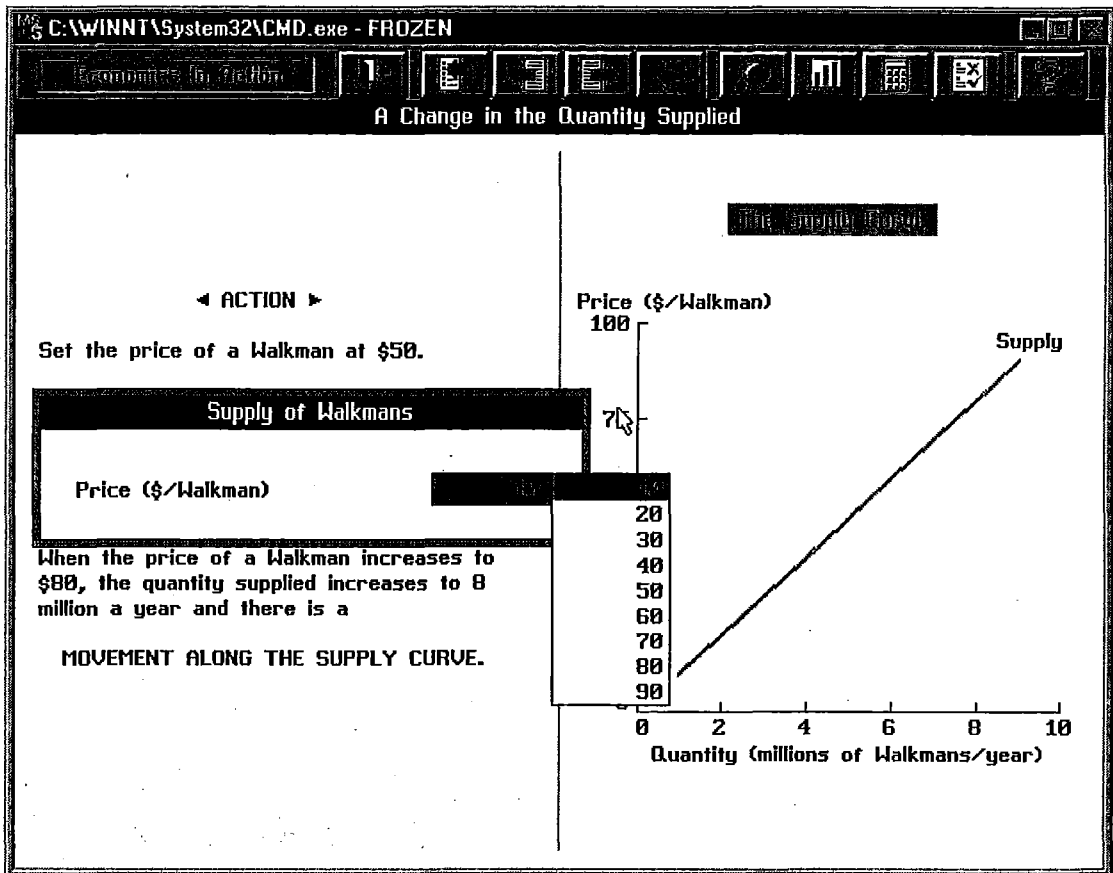


Figure 3.1 Typical screen from EA showing an “Action” being carried out.

Each module provides the student with three modes: Tutorial, as described above, Free Mode, and Quiz. Free Mode provides an interactive, graphical environment that takes variable input from the user. It requires some understanding in order to be helpful to the student, but is a useful tool for the lecturer. Quiz mode allows the student to undertake a quiz on the topic in question and offers twenty multiple-choice questions. Quiz mode also provides interactive graphs to help the student select the correct answer. Explanations of both correct and incorrect answers are provided. One review of EA states:

“The Quiz Mode includes detailed explanations of why chosen answers are correct or incorrect. This is one of the better features of the program”. (Anon, 2001)

EA allows the learner control over topic choice, sequence of tutorial and quiz, and repetition of material. A further option available in EA is an ‘evaluation test’ which keeps a tally of correct answers, but provides neither interactive graphs nor explanations. In order to encourage use of EA, students received five percent of their assessment for undertaking five of the evaluation tests. This five percent was assigned to the undertaking of evaluation tests in EA in order to encourage students to use it. This action is consistent with Weems (1996) suggestion that CAI should be an integral part of the course.

### **3.1.2 ECON101 Assessments**

ECON101 students were required to undertake twelve pieces of assessment during the semester. Five of these assessments were known as EA Tests. They were spread throughout the semester, and required students to take an evaluation test in EA. Each test undertaken was awarded 1% of the final mark for ECON101. Other assessments were four written, essay type assignments, worth 5% each, and two progressive tests, worth 10% each. The final exam was worth 55% of the final mark. The week in which each assessment fell, the date on which it was due, and the allocated marks are shown in Appendix 1.

## **3.2 Pilot Study**

A pilot study was undertaken in order to provide justification for a full-scale study. The subjects for study were first-year students taking ECON102 and using EA. ECON102 is taught in the second semester of the academic year, and is a repeat of the first year economics paper, ECON101. The pilot study was undertaken near the end of the second semester, 1994.

This pilot study had two parts to it:

1. a quantitative part consisting of a brief questionnaire to students present at either of the two lectures of ECON102 on one day
2. a qualitative part involving interviewing four students while observing them using EA

### **3.2.1 Questionnaire Analysis**

The questionnaires were analysed according to age groups: under twenty-one (<21), between twenty-one and twenty-four (21-24), and twenty-five and older (25+) (and also analysed by gender across all groups). It was decided that three age groups would be considered, because of the lack of clear definition of a "mature" student available from the literature.

To determine the amount of use of EA, students were asked how often they used the package. A higher proportion of both the 25+, and 21 - 24 age groups indicated more frequent use of EA than did the under 21 age group. This indicated that the mature students did make more use of EA. The results are shown graphically in Fig 3.2 below.

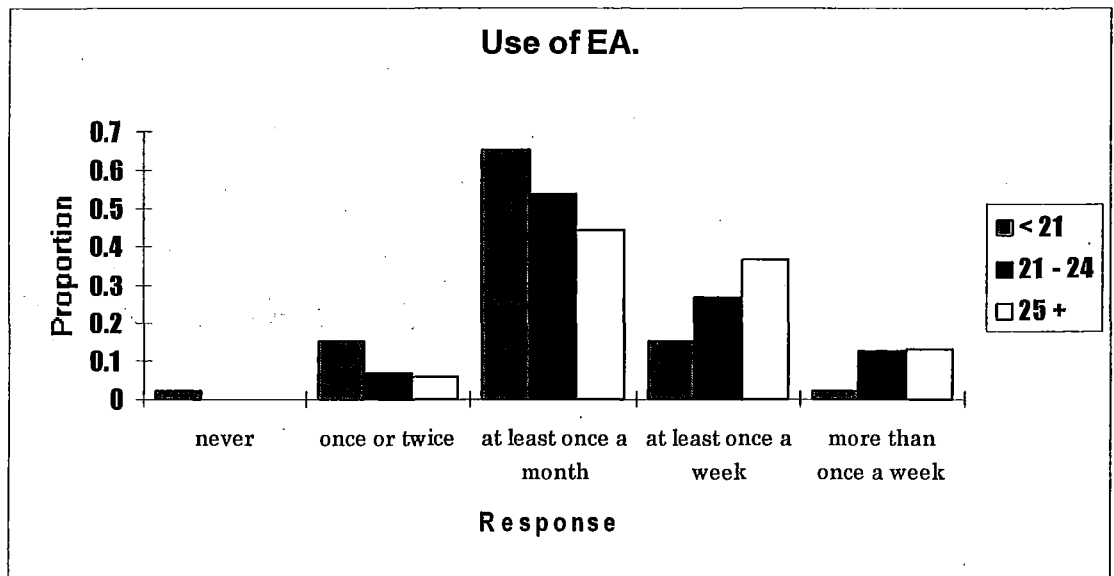


Figure 3.2: Use of EA by age group.

A second question attempted to determine whether students found EA helpful to their understanding of Economics. Analysis of the results appeared to show that the mature students found EA more helpful than younger students. Fig 3.3 below, displays these results graphically.

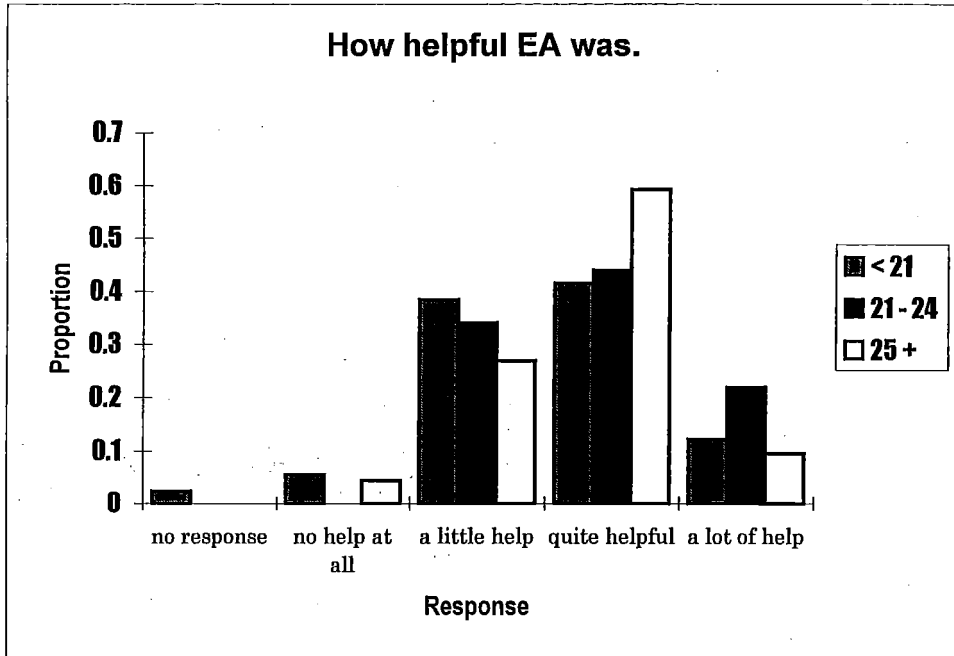


Figure 3.3: How helpful EA was, by age group.

An open-ended question attempted to determine how students felt about using EA. Analysis supported the view that the mature students were more positive about using it than younger students. This is demonstrated graphically by Fig 3.4 below. The response modes are given in Table 3.1.

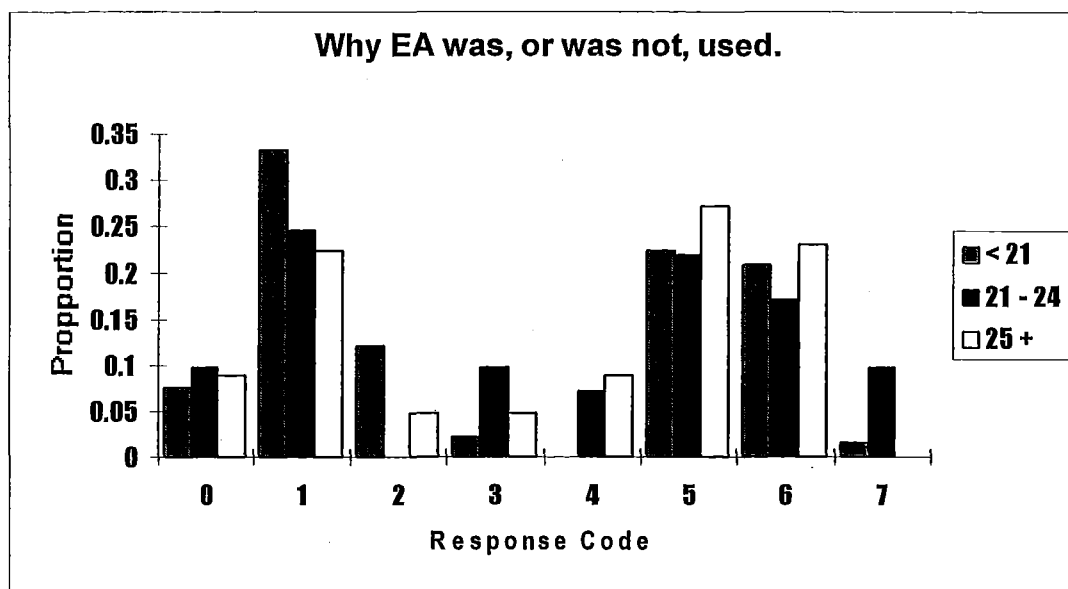


Figure 3.4: Why EA was used, or not, by age group.

Table 3.1 Code for responses shown in Fig 3.4, above.

|   |   |
|---|---|
| 0 | no response   |
| 1 | used EA to gain marks allocated to it   |
| 2 | did not use for EA for reasons such as no time/problems associated with computing/too much effort required for 5% |
| 3 | used EA but gave negative comments about EA   |
| 4 | mixed positive and negative comments. 'Yes, but...' type responses.   |
| 5 | generally positive comments but no mention of any specific feature found helpful.                                 |
| 6 | positive comment on a specific helpful feature(s) of EA.  |
| 7 | as for 6 above, but strongly positive comments.   |

Analysis by gender of responses to questions showed no significant differences. This suggests that differences in responses given by age group are indeed differences due to age, and not differences due to different gender proportions within the groups. This issue is discussed further in Chapter 5.

It appears that students in the 25+ group used EA the most. They also gave more positive comments. The under 21 group appeared to use EA less and were less positive, with the 21-24 group falling in between these two groups as to use and response types. The overall impression



gained from examination of the three figures is that the more mature the group, the more EA was used, the more helpful it was considered, and the more positive the responses.

This study does not purport to be statistically significant. It merely provides a 'snapshot' of the use and opinions of EA made by students attending those lectures in which the survey was conducted. However, the results did suggest that a further statistically meaningful survey would be justified.

### **3.2.2 Interview Analysis**

The qualitative part of the study consisted of four half-hour interviews with four voluntary respondents, one from the 21 - 24 age group, the remainder from the 25+ group. These interviews were conducted in a private office, equipped with a computer. Each respondent was observed using EA. Questions were asked during the EA sessions, and the students were invited to freely give their comments and opinions.

The difference in approach by the four students was quite surprising. They all had different methods of learning from the package. Their comments varied considerably, though all agreed that EA was helpful and that they had learnt from it. Two students made the interesting comment that initially, they had not been inclined to use EA, and did so only to obtain the 5% of assessment. However, having experienced benefits from its use, they now considered EA very helpful and would like to see similar packages available in other subjects.

### **3.2.3 Conclusions from Pilot Study**

The overall impression gained from this pilot study was that these mature students found EA valuable. However, it appeared to be valuable in different ways, which, along with the impression gained from the figures given above, suggested that a further, more comprehensive study should be carried out. The details of this expanded study are described in the Chapter 4, with results and discussion being presented in Chapters 5, 6 and 7.

## CHAPTER 4 - RESEARCH METHODOLOGY

### 4.1 Introduction

For the purpose of this study, it was necessary to define terms for the two study groups. The terminology adopted was “Mature” for those students matching the definition outlined in 4.1.1, below, and “Non-mature” for those not meeting this definition.

The main aim of this study was to determine whether there were differences between mature and non-mature students’ use of EA. In order to determine if differences did exist, data was collected in three forms;

- usage data was collected
- surveys were conducted
- interviews were undertaken.

#### 4.1.1 Definition of “mature student”.

Many studies, as outlined in Chapter 2, have contributed to an enlarging body of literature giving weight to the argument that students in this “adult” or “mature” group exhibit different characteristics from younger students. For this study, the term “mature” is preferred to that of “adult”, as it suggests the acquisition of some experience of life, something more than no longer being a teenager. “Adult” is a biological definition only, whereas the term “mature” incorporates sociological and psychological definitions in the sense that members of this group are more able to make sound judgments, are autonomous, and exhibit a stronger sense of responsibility.

For the purpose of this study, mature students are defined as those who are either: -

1. 25 years of age or older,  
or
2. 21 years of age and less than 25, but also have one of the following:-
  - a. a full-time job,
  - b. a dependant child/children
  - c. a period of at least 2 years away from full-time study.

It was considered that a 25-year-old, even if they had been in continuous, full-time study since finishing secondary education, would have had sufficient opportunity to acquire some experience of life outside of a tertiary institute.

The term “non-mature” was chosen to represent any student who did not meet the mature student criteria.

It is recognized that the above definition of “Mature” adopted for this study may not place every student in the most appropriate category. For example, a 24 year-old who already has a degree would be classed as “Non-mature”. For any further research involving mature students, the definition should be modified to include the more unusual instances and take into account all variables equally. The definition used in this study considered age firstly, then categorized students according to the possession of other characteristics.

A 20 year-old who may have worked for 2 years after leaving school, and have a child would still be classed as “Non-mature”. This could occur and, again, would possibly mis-categorise such a student. However, it appears that other definitions of “Mature” also exclude those less than 21 years of age.

#### **4.1.2 Usage data collection**

Usage data was collected continuously throughout the semester that indicated who was logged on to EA, when, and for how long. This collection produced a large quantity of records of EA use, which were aggregated by semester week. One assessment was due in each week of the semester (refer 3.1.2 and Appendix 1). As it was expected that EA use may follow the pattern of assessments, the automatic data was aggregated by semester week. The data collection schedule for the entire study is given in Appendix 2. These data were analysed using Microsoft Excel spreadsheets.

#### **4.1.3 Survey Data**

The first survey, performed at the start of the semester, collected data needed to: -

- categorise students into the two study groups (M and NM)
- ascertain any differences in the backgrounds of students in the two groups
- determine students’ expected use of EA
- determine students’ pre-use perceptions the value of EA use.

The second(MS) and third(PE) surveys, were respectively administered mid-way through the semester, and after exam results were released. These were done to test if students' actual use of EA, and their perceptions of its value, had changed over the course of the semester.

#### **4.1.4 Interview Data**

It was decided to collect interview data as well to supplement the quantitative data obtained from usage data collection and the surveys. The expectation was that interview data would provide a deeper understanding of student perceptions and perceived benefits of EA use and act as a further aid to the explanation of any differences found in the study. Interviews with student volunteers were carried out after the MS and PE surveys.

## **4.2 Collection of Data**

### **4.2.1 Automated Collection of Usage Data**

Data on the use of EA was automatically collected by the use of a computer program that generated a log file. This program ran whenever a user initiated EA and automatically recorded the following data:

- Student user name
- Day of the week
- Date
- Start time
- Finish time

The program calculated the length of use (in seconds) of EA, and wrote the calculated time and all other data to a log file. As EA was available on a number of different file servers at Lincoln University, each ran a separate log file to ensure capture of all EA users across all servers.

Students were informed at the beginning of the semester that such logging of their EA use was occurring, and were invited to withdraw from participation if they so desired. No student made such a request formally. However, students may have refrained from using EA.

#### 4.2.1.1 Categorisation of Usage Data

Data gathered in the first survey was used to facilitate categorization of the automatically collected usage data and was entered into an Excel spreadsheet. The official class list for ECON101 was used to provide the username for each student. The student ID number obtained in the first survey questionnaire was matched with the student ID number in the class list, from which the username was extracted. Usernames were not requested on the questionnaire for two reasons; many students did not know their usernames at the outset of the semester, and it was considered that requesting the ID only would protect the privacy of each student. The username was added to each row in the Excel spreadsheet in order to match rows to the survey questionnaires. By matching usernames on Excel rows to questionnaires, the data necessary for classification could be accessed.

A formula was used to classify each student according to the definition of a “mature” student described previously. This allowed the attachment of classification codes, i.e. M for mature, NM for non-mature to each row. Two text files were then prepared from the spreadsheet data. One contained a list of all mature usernames, the other a list of all non-mature usernames.

The log files from all servers were “cleaned” of all records not generated by those who took part in the initial survey (4.2.2.1). The data needed for classification into M and NM groups was available from those who completed the first survey only, thus no other users could be classified.

“Cleaning” was achieved by the use of a Turbo Pascal program. This program extracted the username from each record in the log file, and compared it to the list of usernames in the Mature file. If it matched, the entire record was written to a new file with the character “M” attached. If no match was found, the username was then compared to those in the NM file, and written to the new file with NM attached if a match was made. If the username remained unmatched at the end of this process the record was written to another file containing all unmatched records. These files were then rechecked to ensure no records that should have been retained had been transferred to the unmatched files. This step also removed all records for those not part of ECON101.

The resulting unmatched files were discarded. The number of records removed is unknown, but was approximately 1% of the total records collected. This left approximately 7000 records of EA use. Examples of records discarded during the “cleaning” process were those of staff using EA, records generated during testing procedures, students withdrawing from ECON101, and students who had not completed the first survey questionnaire.

#### 4.2.1.2 *EA Use at Home*

A copy of EA was available to students as a package with the accompanying textbook. No provision was made for collecting usage data for those using EA outside the University. An effort to estimate the numbers doing so was made by the inclusion of a question in the initial survey.

### 4.2.2 Surveys

#### 4.2.2.1 *First Survey*

The first survey was conducted at the beginning of Semester 1 1995 when student attendance at lectures was expected to be better than later in the semester.

The lecturers of ECON101, Dr. Paul Dalziel and Dr. Hugh Bigsby, cooperated with the study, allowing this first survey to be administered during lecture time. As many students in ECON101 as possible were surveyed by the first questionnaire, which was conducted after the students received information on the availability of EA to them and its role in their studies.

Students were requested to provide their student ID on the questionnaire. IDs were checked against the class list obtained from Registry. This process identified enrolled students who had not completed a questionnaire. Where possible, students identified in this manner were individually contacted and issued with the questionnaire.

All three questionnaires used in this study are detailed in Appendix 3.

This first questionnaire collected data on: -

- demographic details
- previous computer experience
- whether or not the student intended to use EA
- whether or not the student felt that EA use may improve their performance
- a rating of expected use of learning resources including textbook, lecture material, EA, individual help by the tutor available to them and library books.

The survey data collected in 4.3.2 above was used to categorise students into the two study groups, Mature (M) and Non-mature (NM). Data from each questionnaire was entered into an

Excel spreadsheet. One row of data contained all responses from any one student. An Excel formula checked the responses to the questions on age, length of time away from formal education and details of jobs and children, and allocated each student to the appropriate study group, M or NM.

Approximately half of the students in ECON101 were Commerce students. The remainder consisted of a mixture of other degrees. As far as possible, samples were selected to reflect the composition of ECON101, although it was not the intention of this study to investigate differences between Commerce and other students.

Samples were then extracted randomly from each group for two further surveys. No student was sampled more than once, to prevent any bias caused by repeated requests for participation. The sample size was established after the completion of collection of first survey questionnaires. This produced 508 completed questionnaires. An updated class list was checked prior to sample selection for the MS and PE surveys to prevent the inclusion of students no longer enrolled in ECON101.

#### *4.2.2.2 MS and PE Surveys*

The second survey was conducted in week 7 of the semester. By then, students had had an opportunity to use EA and form an opinion of its usefulness or otherwise. This second survey sought information on: -

- estimated time spent using EA
- perceived usefulness
- a further rating against textbook, lecture material, individual help, and other learning resources.
- actual use as opposed to initial expected use.

A final survey was conducted after exam results were released. Each survey contained some repeated questions in order to ascertain any changes in beliefs and attitudes over time. Other questions were included to allow the comparison of current EA use with expected use, determination of differences between the study groups in the perception of EA's value, and the perceived effect of EA on grades received.

Every effort was made to ensure all selected students responded to the second and third surveys to prevent bias caused by non-participation. This was done by ensuring students were made

aware of the significance of the research for themselves and fellow students. As students completed questionnaires they were given a chocolate fish as a small token of thanks.

### **4.3.3 Collection of Interview Data**

Qualitative data was collected by interview. A question included in the second and third survey questionnaires allowed students to volunteer to be interviewed. Interview appointments were arranged by e-mail.

Two sets of interviews were conducted. All students who volunteered were interviewed. This resulted in ten M and ten NM students being interviewed in the week following the MS survey (week 7 of the semester, see Appendix 2). These interviews are denoted as the mid-semester (MS) interviews. Ten M and thirteen NM students were interviewed during the first two weeks of the second semester, 1995. These interviews are denoted as the post-exam(PE) interviews. All students had used EA. Despite some efforts to induce non-EA users to volunteer, none was persuaded to do so.

Some questions were of the “Yes / No” variety, but every question addressed to a student was accompanied by a prompt to add any comment they wished. A set of questions was used as a basis for the interviews, but respondents were encouraged to talk freely. In some instances students did not know the answer to a question, or felt unable to respond. In order to keep respondents feeling as comfortable as possible, no pressure was put on them to provide an answer. When students did answer questions, however, they were prompted to provide clear, detailed responses.

Interviews were tape-recorded and hand-written notes taken. All interviewees were aware that interviews were being recorded.

## **4.4 Analysis of Data**

### **4.4.1 Usage data**

The “cleaned” log files were transferred to an Excel spreadsheet. Allocation of each record to a study group was made at this time by comparing Student IDs from the log file with Student IDs from the Excel spreadsheet containing the first survey data. The two study groups were then compared, by the use of pivot tables in Excel, for differences in the following: -



- the amount of time spent using EA
- the frequency of use of EA.
- any patterns of use that may be present.

Date, time and day of week information were used to determine if use of EA was more prevalent around certain events, e.g. after lectures, or before a test. The presence of a pattern was expected to indicate the times students found particularly convenient for EA use.

The usage data was analysed with respect to the two groups, M and NM, and also male and female. Difference in means, using confidence intervals (the z-test), was used to test if any differences between the two groups were significant.

#### **4.4.2 Survey Data**

Survey data was analysed to establish differences between the two groups using the Chi-squared test (4.4.4.1). One question asked in both the MS and PE questionnaires was analysed using the Sign test (4.4.4.3).

#### **4.4.3 Interview Data**

The questions asked in the mid-semester interviews were divided amongst three categories:

Category 1: *Reasons for using EA and its helpfulness*

Category 2: *Access to EA*

Category 3: *Other Applications for CBL*

Most of the questions fell into *Reasons for using EA and its helpfulness*, making this category rather large. However, the two aspects are interconnected, and it proved difficult to split the category into two smaller sections.

In the post-exam interviews, Category 2: *Access to EA* was subdivided into two sub categories. Questions from each of the three categories were interspersed with one another during an interview, although the order of questions remained the same for each respondent. Respondents were also given the opportunity to make a final comment, which allowed them to express any opinions not addressed by the questions. These free-form comments are discussed under the most appropriate category.

A list of expected key terms and phrases was prepared for each question. The responses to each question were then examined for inclusion of these key terms and phrases, and any unexpected responses added to the list for that question. Responses were then allocated to a response option according to the inclusion of key terms and phrases. Any one respondent may have mentioned several of those key words and phrases in their response, and, thus, that response would be allocated to several options. All questions were analysed with respect to the two study groups, M and NM. No statistical analysis is given. As stated earlier, the participants were entirely voluntary, so the sample cannot be described as random.

#### **4.4.4 Statistical Analysis**

##### **4.4.4.1 Use of Chi-Squared Analysis**

This study was concerned with the differences in behaviour and perceptions of and attitudes to the use of EA between the two study groups, M and NM. This presented a classic situation for the use of Bivariate Tabular Analysis, commonly known as the Chi-Squared test. This test is used to test whether or not two variables are independent (Lapin, 1990, Connor-Linton, [http://www.georgetown.edu/cball/webtools/web\\_chi\\_tut.html](http://www.georgetown.edu/cball/webtools/web_chi_tut.html)). The variables in this study fit the requirements for Chi-squared analysis. Two independent variables are present, M and NM, and a number of mutually exclusive dependent variables, such as use of EA and attitudes towards EA, are examined. The purpose of this study was to determine whether or not the dependent variables were statistically independent for the two groups, i.e., were the behaviours displayed with respect to EA dependent on whether a student was in the M or NM group?

##### **4.4.4.2 Significance**

A significance level of 0.01 ( $p=0.01$ ) was considered to be statistically significant. This level was adopted as a “safety measure” to ensure statistical difference. However, as the significance level normally adopted (Lapin, 1990) is 0.05,  $p$  values in the range 0.01 to 0.05 are considered to be indicative of significant difference between the two study groups.

Significance is reported with respect to the number of degrees of freedom that applies to each test. The term “*df*” denotes degrees of freedom.

##### **4.4.4.3 Use of the Sign Test**

One question in each of the MS and PE surveys required respondents to rank a number of learning resources. The Sign Test was used to test for any significant difference between the two study groups in the rankings placed on these resources. The Sign Test is a non-parametric test suitable for use when investigating differences between two populations involving samples

of matched pairs (Lapin, 1990). It considers the direction of difference in each sample pair, which is expressed by a plus or minus sign, hence the name, Sign Test.

# CHAPTER 5 - AUTOMATIC DATA COLLECTION

## 5.1 Introduction

As described in Chapter 4, automatic collection of EA usage data continued throughout the semester (See Study Schedule in Appendix 2). Approximately 7000 logins to EA were retained for analysis. The data records thus obtained were entered into an Excel spreadsheet. Each record was assigned to one of the two study groups, M or NM (Chapter 4), and also to male or female. The reason for also categorising the data into male and female is discussed below, Section 5.2.1 and also in Chapter 6, Section 6.3.2.

The simplest way to view this large collection of data was by allocating records to weeks of the semester. Patterns of use were then easily visualised from the weekly usage figures.

Data collection was undertaken to determine whether M students used EA more than NM students. The data is thus analysed as the amount of time spent in each week by both groups. This chapter describes the analysis of the automatically collected data. It is presented in summarised form as tables and graphs. A discussion of the results is also presented.

The term “break” used in the following presentation of results and discussion refers to the two week break from scheduled lectures in the middle of the semester. Data collected in this two week period has been combined and presented as if it were one single week.

## 5.2 Results and Discussion

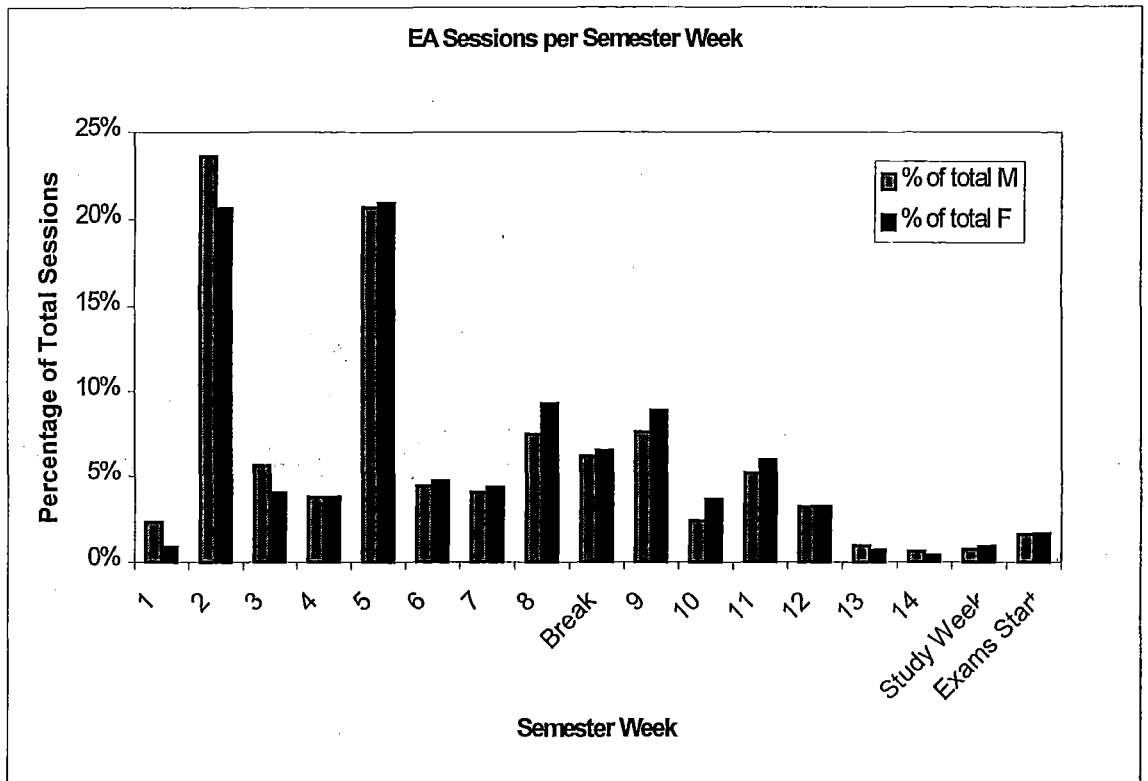
### 5.2.1 Inclusion of Gender Question

An initial view of the data was required in order to see if both males and females followed the same patterns of use. The simplest way to do this was to view the distribution of the percentage of total logins to EA across the weeks of the semester.

Given that there is a significant difference present between the numbers of male and females in each study group, (See Chapter 6, Table 6.2e) it was necessary to ensure that any differences found between the study groups, M and NM, were due to a difference in maturity, not to a difference between male and female behaviour. Hence, the first analysis of the data was to view patterns of EA sessions by each gender across the semester weeks. This data is given in Table 5.2 below, and is displayed in Fig 5.1, below.

**Table 5.1:** *Distribution of sessions by semester week by Gender*

| <b>Semester Week</b> | <b>Key Assessments</b> | <b>Male<br/>% of total<br/>sessions</b> | <b>Female<br/>% of total<br/>sessions</b> |
|----------------------|------------------------|---|---|
| 1                    |                        | 2                                       | 1   |
| 2                    | EA Test 1              | 24                                      | 21  |
| 3                    |                        | 6                                       | 4   |
| 4                    |                        | 4                                       | 4   |
| 5                    | Progressive Test 1     | 21                                      | 21  |
| 6                    |                        | 4                                       | 5   |
| 7                    |                        | 4                                       | 4   |
| 8                    |                        | 7                                       | 9   |
| Break                |                        | 1                                       | 0   |
| 9                    | Progressive Test 2     | 6                                       | 6   |
| 10                   |                        | 8                                       | 9   |
| 11                   |                        | 2                                       | 4   |
| 12                   |                        | 5                                       | 6   |
| 13                   |                        | 3                                       | 3   |
| 14                   |                        | 1                                       | 1   |
| Study week           |                        | 1                                       | 1   |
| Exams start          |                        | 2                                       | 2   |



**Figure 5.1:** *EA Sessions per Week by Gender*

Figure 5.1 above clearly demonstrates that there is very little difference in the patterns of use between males and females.

**Table 5.2:** *Statistical Analysis of Gender Differences in Average Duration of Use*

| <b>Gender</b> | <b>Duration in minutes</b> | <b>M</b>  | <b>NM</b>                      | <b>Total</b>   |          |  |
|---------------|----------------------------|-----------|--------------------------------|----------------|----------|--|
| Males         | Average                    | 22.3      | 16.5                           | 18.5           |          |  |
|               | No. of observations        | 1429      | 2795                           | 4224           |          |  |
|               | Variance                   | 744.2     | 437.0                          | 548.3          |          |  |
| Females       | Average                    | 23.4      | 16.2                           | 17.4           |          |  |
|               | No. of observations        | 461       | 2401                           | 2862           |          |  |
|               | Variance                   | 772.0     | 468.8                          | 524.4          |          |  |
|               | <b>Std error of means</b>  |           | <b>Std error of difference</b> | <b>z-value</b> | <b>p</b> |  |
|               | <b>M</b>                   | <b>NM</b> |                                |                |          |  |
| Males         | 0.72                       | 0.39      | 0.82                           | 7.04           | 2.52E-12 |  |
| Females       | 1.29                       | 0.44      | 1.37                           | 5.27           | 1.44E-07 |  |

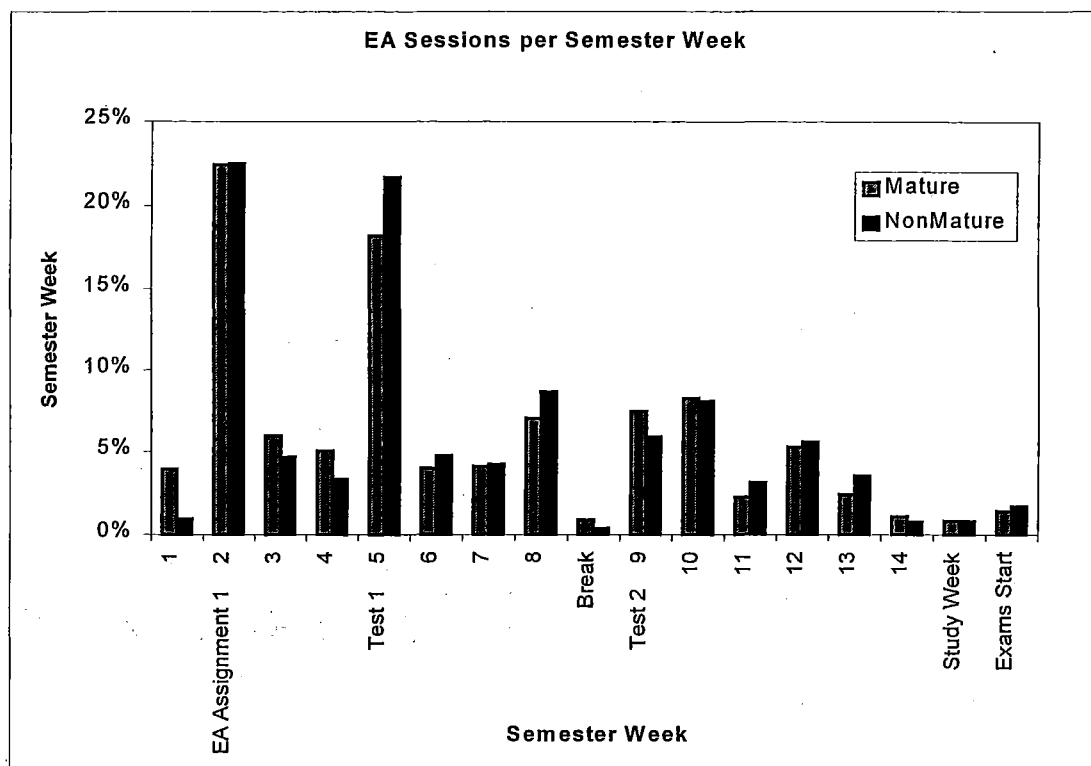
The statistical analysis in Table 5.2 above shows that there is a significant difference (using the z test) between the average duration of use by males (22.3, 16.5) **across** the two study groups and also a significant difference in duration for females (23.4, 16.2) **across** the two study groups. However there is no significant difference in average duration between males and females **within** the same group. There is also no significant difference in the **differences** across the study groups. Differences in average duration between the two study groups are therefore attributable to maturity, and not to gender. This suggests that M students do use EA more than NM students. Further findings providing evidence of this are presented below.



## 5.2.2 Patterns of Use of EA

**Table 5.3:** *Distribution of sessions by semester week*

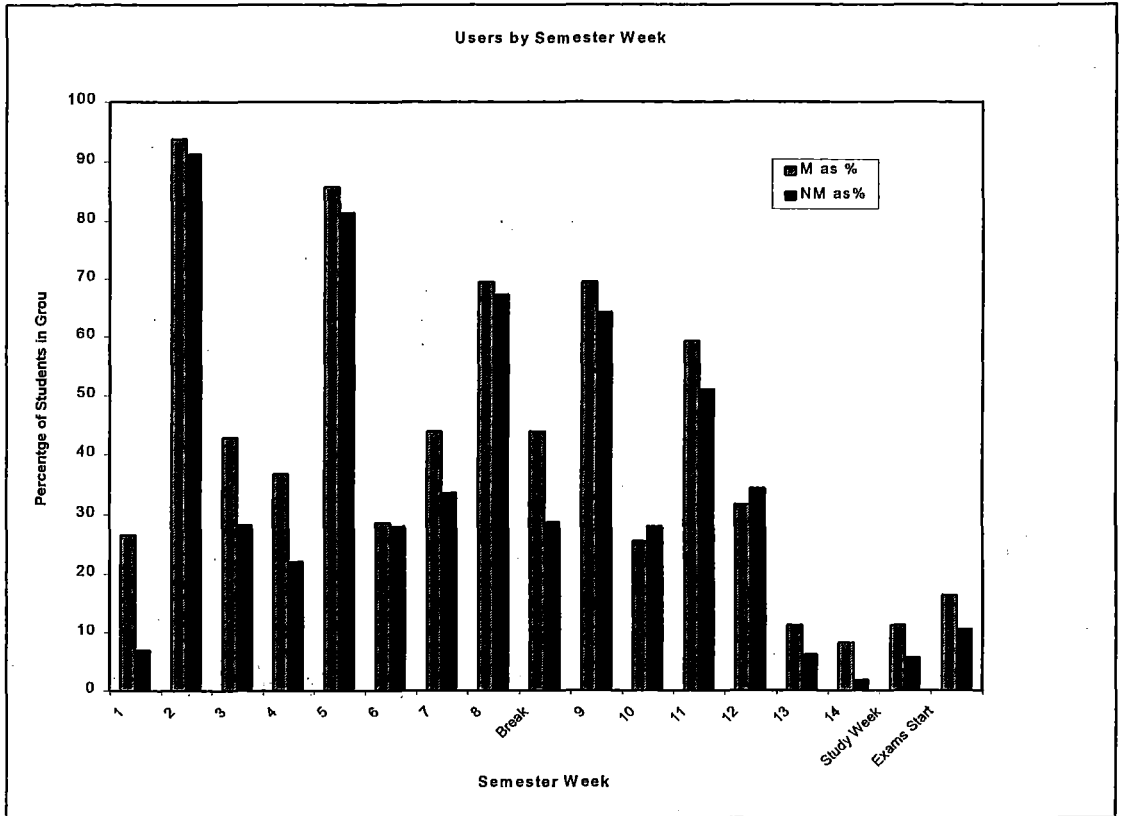
| Semester Week | Key Assessments    | M<br>% of total<br>sessions | NM<br>% of total<br>sessions |
|---------------|--------------------|-----------------------------|------------------------------|
| 1             |                    | 4                           | 1                            |
| 2             | EA Assignment 1    | 22                          | 22                           |
| 3             |                    | 6                           | 5                            |
| 4             |                    | 5                           | 3                            |
| 5             | Progressive Test 1 | 18                          | 22                           |
| 6             |                    | 4                           | 5                            |
| 7             |                    | 4                           | 4                            |
| 8             |                    | 7                           | 9                            |
| Break         |                    | 1                           | 0                            |
| 9             | Progressive Test 2 | 7                           | 6                            |
| 10            |                    | 8                           | 8                            |
| 11            |                    | 2                           | 3                            |
| 12            |                    | 5                           | 6                            |
| 13            |                    | 2                           | 4                            |
| 14            |                    | 1                           | 1                            |
| Study week    |                    | 1                           | 1                            |
| Exams start   |                    | 1                           | 2                            |



**Figure 5.2:** *EA Sessions per Semester Week by Study Group*

Fig 5.2 graphically displays the data in Table 5.3. It can be seen that the pattern of logins to EA is very similar for both groups. In the main, assessments were due on Mondays. Some revision may occur in the previous week, but, as peaks occur in the week of the assessment, it is likely that high use occurred on assessment day itself!

There is an obvious decrease in EA use by both study groups as the semester progresses. This is discussed further in Chapter 7.



**Figure 5.3:** *Percentage of Students Using EA in each Study Week by Group*

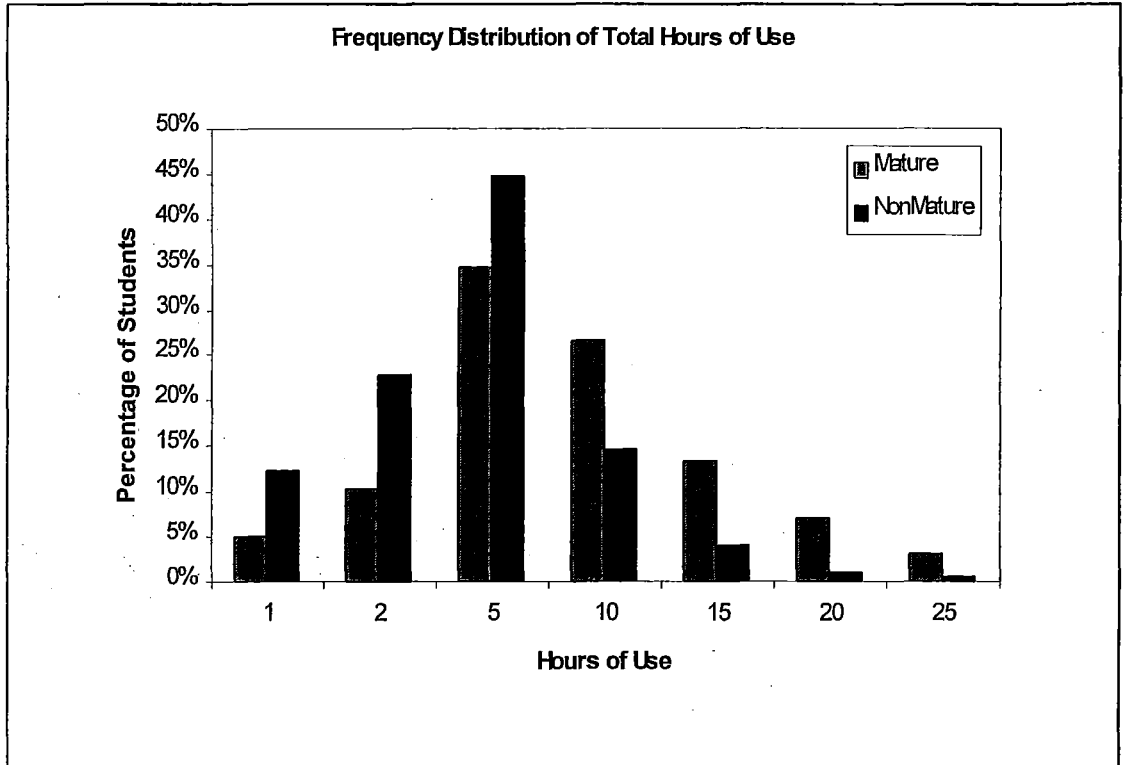
Figure 5.3 above shows the percentage of students in each group using EA in each week of the semester. It can be seen that the percentage of M students is always greater, except for Weeks 10 and 12. It is interesting to note the higher percentage of M students using EA in the very first week of the semester, whereas the NM students do not start serious use of EA until the second week.

The peaks of use occur where assignments fall due, as expected. Although the pattern is different from that shown in Fig 5.2, the general trend towards diminished use towards the end of the semester is still evident.

### 5.2.3 Length of Time of Use of EA

**Table 5.4:** *Frequency distribution of Total Hours of Use*

| Total Hours of Use | M  | M % | M<br>Cumulative<br>% | NM  | NM % | NM<br>Cumulative<br>% |
|--------------------|----|-----|----------------------|-----|------|-----------------------|
| 1                  | 5  | 5%  | 5%                   | 48  | 12%  | 12%                   |
| 2                  | 10 | 10% | 15%                  | 89  | 23%  | 35%                   |
| 5                  | 34 | 35% | 50%                  | 174 | 45%  | 80%                   |
| 10                 | 26 | 27% | 77%                  | 57  | 15%  | 94%                   |
| 15                 | 13 | 13% | 90%                  | 16  | 4%   | 98%                   |
| 20                 | 7  | 7%  | 97%                  | 4   | 1%   | 99%                   |
| 25                 | 3  | 3%  | 100%                 | 2   | 1%   | 100%                  |
|                    | 98 |     |                      | 390 |      |                       |

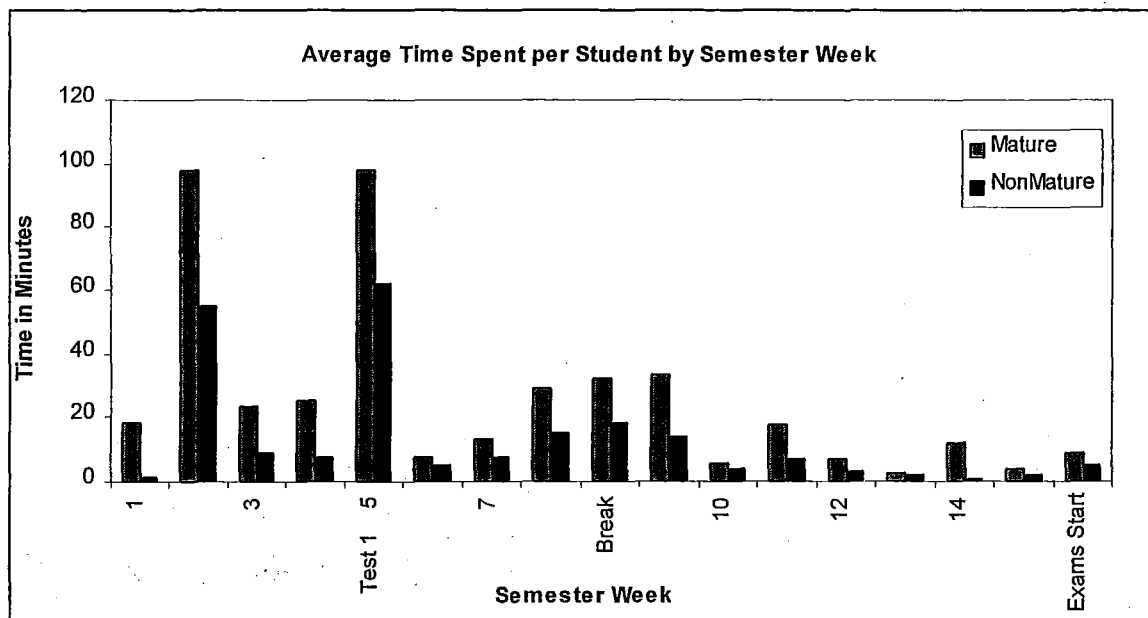


**Fig 5.4** *Frequency Distribution of Total Hours of Use*

The data in table 5.5 was graphed to produce Fig 5.4. It can be seen that there is a difference in the distribution of total hours of use between the two groups, with more M students using EA for larger total times. This is a further indication that M students do use EA more than NM students.

**Table 5.5:** *Average Time per Week Spent per Student by Semester Week*

| Semester Week | Key Assessments | M<br>Minutes | NM<br>Minutes |
|---------------|-----------------|--------------|---------------|
| 1             |                 | 18           | 1             |
| 2             | EA Assignment 1 | 98           | 55            |
| 3             |                 | 23           | 9             |
| 4             |                 | 25           | 7             |
| 5             | Test 1          | 98           | 62            |
| 6             |                 | 8            | 5             |
| 7             |                 | 13           | 7             |
| 8             |                 | 29           | 15            |
| Break         |                 | 12           | 1             |
| 9             | Test 2          | 32           | 18            |
| 10            |                 | 33           | 14            |
| 11            |                 | 6            | 4             |
| 12            |                 | 18           | 7             |
| 13            |                 | 7            | 3             |
| 14            |                 | 2            | 2             |
| Study Week    |                 | 4            | 2             |
| Exams Start   |                 | 9            | 5             |



**Fig 5.5:** *Average Time Spent per Student by Semester Week*

Fig 5.5 clearly shows that, on average, the time M students spend using EA is approximately twice that of NM students. Most weeks show M student using EA between 1.4 and 3.3 times as much as NM students.

An interesting observation to note is that M students begin using EA in the very first week, and also make more use of it in the mid-semester break.

**Table 5.6:** *Significant difference in average total time between study groups*

| <b>Total time in hours</b> | <b>M</b> | <b>NM</b> |                                |                |
|----------------------------|----------|-----------|--------------------------------|----------------|
| Average                    | 7.26     | 3.64      |                                |                |
| No. of observations        | 98       | 390       |                                |                |
| Variance                   | 44.36    | 11.14     |                                |                |
| <b>Std error of means</b>  |          |           | <b>Std error of difference</b> | <b>z-value</b> |
| <b>M</b>                   | <b>M</b> | <b>NM</b> |                                |                |
| 0.67                       | 0.67     | 0.17      | 0.7                            | 5.22           |
|                            |          |           |                                | $p < 10^{-7}$  |

Table 5.6 above gives the average hours per student in each study group over the semester. The number of hours for M students is 2.16 that of NM students. This is consistent with Fig 5.5 above. It appears that, on average, in any week, M students use EA approximately twice as much as NM students, except for Week 1 and the break. In most weeks the average length of use of EA for M students was between 1.4 and 3.3 times that of NM students. The differences shown in Week 1 and the break suggest that M students were keen to discover what EA had to offer as a learning resource. The greater use shown by M students in the break also suggests, however, that M students are “hard workers” (Sadler-Smith, 1996), and continue to study during non-lecture periods.

### 5.3 Summary

There is little difference between males and females in their patterns of use of EA (Fig 5.1). The statistical analysis presented in Table 5.2 shows that there is no statistical difference between male and female use of EA within the same study group. This suggests that any differences found in EA use across the two study groups will be due to the differences in maturity. Table 5.2 shows that there is a statistical difference in use of EA between both males and females across the two study groups. This is the first evidence that there are differences in use between the M and NM groups.

Patterns of use were very similar between the two study groups. Use of EA was closely related to the need to complete assessments. Thus, the response to those requirements was similar in both groups.



However, Table 5.4 shows that the frequency of hours of use is weighted towards the larger values in the distribution for the M students. This provides further evidence that M students were using EA for longer times. This was further supported by Table 5.5, which shows that the average time per M student per week is, on average, twice that of an NM student.

## CHAPTER 6 –SURVEYS

### 6.1 Introduction

Surveys were conducted for two reasons; to collect data so that students could be assigned to the two study groups, Mature (M), and Non-Mature (NM), and to obtain information on any differences in attitudes to, and perceptions of, Economics in Action (EA).

Surveys were carried out by the use of questionnaires at three points in the semester: in the first week, at the mid-point of the semester (MS), and after the exam, early in the second semester (PE). The study schedule is shown in Appendix 2.

When the surveys were introduced to students enrolled in ECON101, it was explained to them that the results of the surveys would be used to help students with their studies in both ECON101, and other subjects. It was also explained that summary data only would be published, with no individual details being released. When the first survey was conducted students were informed that automatic data collection of their use of EA was intended. Students were invited to withdraw from such collection if they desired. However, no withdrawals were received.

The questionnaires used in all three surveys asked for identification information (Student I.D. and name) and these were on the last page. Placement of such questions in this position ensured that identification details were not easily visible, and provided the student with a measure of privacy. Students were told that these details could be withheld if they so wished, but provision of I.D. would enable the matching of respondents' details with EA usage data.

Questions were divided into categories to facilitate the comparison of responses across surveys. Categories in the first survey differed from the other two in that it was necessary to collect data allowing assignment to study group (M or NM), and data concerning student background and previous computer experience at this time. Categories of questions in the MS and PE surveys were very similar and sought data on EA use and perceptions. Categories and their question content are explained fully as each set of survey results is given.

Questions were largely either of the tick-box variety or "Yes / No" type questions. A very small number of questions were open-ended and one question required the use of a scale.

Copies of the questionnaires can be found in Appendix 3. A description of the data analysis and results, and a discussion of the results follow in this chapter. Results are presented and discussed in categories.

## 6.2 Data Analysis

All data collected was entered into Excel spreadsheets prior to analysis and tested for any difference in proportions, using the Chi-squared test. Results for each question are reported along with the  $p$  value obtained from the application of the Chi-squared test. The  $p$  value indicates the probability of obtaining such a result by chance. Results are considered to be significant if  $p$  is less than 1%, i.e.  $p = 0.01$  or less. All statistical testing ignored the non-responses.

Questions in the first category of questions (described below) were analyzed first, in order to assign students to the two study groups. The remaining categories were then analyzed with respect to the two groups after the acquisition of the MS and PE data.

## 6.3 First Survey

### 6.3.1 Introduction

This survey was conducted in the first week of the semester during two lecture periods. In order to accommodate all students enrolled in ECON101, students were divided into two lecture sessions, and all lectures were repeated. Questionnaires were distributed to all students present at both lecture sessions. 508 complete questionnaires were collected.

Questions asked in this survey were analysed in four categories:

Category 1: *Assignment to Study Group*

Category 2: *Student Background*

Category 3: *Computer Experience*

Category 4: *Expected Use of EA*

## 6.3.2 Category 1: Assignment to Study Group

### 6.3.2.1 Inclusion of Gender Question

The first question (Question 1) in the questionnaire asked for the gender of the respondent. Although not a direct part of this study, the difference between male and female usage of computers is currently a “hot” topic (2.3). This question was used to assign students to the groups M and F. A comparison of the average weekly use of EA by males and females has been included in this thesis for completeness, and can be found in Chapter 5.

A primary aim of this first survey was to collect data that would enable the assignment of each student to one of the two study groups, either M or NM, according to the definition described in Research Methodology (4.1.1). Thus, the first category of questions solicited this data. The list of questions in this category is provided in Table 6.1. Full questions are not reproduced here (see Appendix 3); rather the essential data sought by the question has been listed.

**Table 6.1:** Category 1: *Questions enabling the assignment of students to the two study groups.*

|     |                           |
|-----|---------------------------|
| Q2  | Age                       |
| Q8  | 2 year break in education |
| Q9  | Dependant child/children  |
| Q10 | Employment status         |

Students were told to consider their age as a whole number of years, and disregard any months past a birthday.

### 6.3.2.2 Results and Discussion of Category 1: Assignment to Study Group

The number of respondents taking part in the survey was 508. However, the number of respondents answering each question is given with the results, as not every respondent answered every question.

Assignment to a study group was determined by the use of an Excel spreadsheet formula that examined the response to each of the above questions, and placed each student in category Mature (M) or Non-Mature (NM).

**Table 6.2:** *Results of classification of students into the two study groups*

| <b>Study group</b> | <b>Total</b> | <b>Percentage</b> |
|--------------------|--------------|-------------------|
| Mature             | 104          | 20%               |
| Non Mature         | 404          | 80%               |
| Column total       | 508          |                   |

The sole purpose of these questions was to place students in the appropriate categories. However, in order to provide the reader with an understanding of the differences in the groups, tables of the assignment criteria are provided below.

**Table 6.2a:** *Category by Age (Q2)*

| <b>Response</b>     | <b>M</b> | <b>NM</b> | <b>Row total</b> |
|---------------------|----------|-----------|------------------|
| Under 21            | 0        | 340       | 340              |
| 21-24               | 51       | 64        | 115              |
| 25+                 | 53       | 0         | 53               |
| <i>Column total</i> | 104      | 404       | 508              |

Of note here is the distribution of the students in the 21-24 age bracket. There is an almost equal distribution of this age bracket across the two study groups. This highlights the difficulty of using age alone as a discriminator between mature and non-mature students.

**Table 6.2b:** *Category by Break in Education (Q8)*

| <b>Response</b>     | <b>M</b>          | <b>NM</b>   | <b>Row total</b> |
|---------------------|-------------------|-------------|------------------|
| No response         | 1                 | 0           | 1                |
| Yes                 | 99                | 10          | 109              |
| No                  | 4                 | 394         | 398              |
| <b>Column total</b> | <b>104</b>        | <b>404</b>  | <b>508</b>       |
|                     | $\chi^2 = 426.43$ | $p = 0.000$ | 1 df             |

**Table 6.2c:** *Category by Dependent Children (Q9)*

| <b>Response</b>     | <b>M</b>         | <b>NM</b>   | <b>Row total</b> |
|---------------------|------------------|-------------|------------------|
| No Response         | 0                | 1           | 1                |
| Yes                 | 14               | 1           | 15               |
| No                  | 90               | 402         | 492              |
| <b>Column total</b> | <b>104</b>       | <b>404</b>  | <b>508</b>       |
|                     | $\chi^2 = 50.27$ | $p = 0.000$ | 1 df             |

**Table 6.2d:** *Category by Job (Q10)*

| <b>Response</b>     | <b>M</b>         | <b>NM</b>   | <b>Row total</b> |
|---------------------|------------------|-------------|------------------|
| No response         | 3                | 6           | 9                |
| Yes                 | 13               | 9           | 22               |
| No                  | 88               | 389         | 477              |
| <i>Column total</i> | 104              | 404         | 508              |
|                     | $\chi^2 = 21.52$ | $p = 0.000$ | 1 df             |

**Table 6.2e:** *Category by Gender (Q1)*

| <b>Response</b>     | <b>M</b>        | <b>NM</b>   | <b>Row total</b> |
|---------------------|-----------------|-------------|------------------|
| Male                | 75              | 233         | 308              |
| Female              | 29              | 171         | 200              |
| <i>Column total</i> | 104             | 404         | 508              |
|                     | $\chi^2 = 7.22$ | $p = 0.007$ | 1 df             |

Almost all M students have had a break of two years or more (Table 6.2b), a characteristic which may well be used as a sole differentiating factor in further studies involving mature students. As might be expected, the proportion of M students with dependent children (Table 6.2c), and with jobs (Table 6.2d), is also significantly higher. The distribution of males and females is significantly different between the two groups (Table 6.2e). This is discussed further in Chapter 5, where data is given to support the view that differences between the two study groups are indeed as a result of differences in maturity, and not differences in the behaviour of the two genders.

The number of students in each age group is given in Table 6.3a.

**Table 6.3a:** *Results from Question 2: Age*

| <b>Response</b>                | <b>Total</b> | <b>Percentage</b> |
|--------------------------------|--------------|-------------------|
| Under 21                       | 340          | 67%               |
| Older than 20 and less than 25 | 115          | 23%               |
| 25 or older                    | 53           | 10%               |
| Column total                   | 508          |                   |

**Table 6.3b:** *Table showing distribution of 1<sup>st</sup> year student age groups at Lincoln University*

|              | <b>All 1<sup>st</sup> year students</b> | <b>BCM 1<sup>st</sup> year students</b> |
|--------------|---|---|
| Under 21     | 691                                     | 75                                      |
| 21 - 24      | 106                                     | 33                                      |
| 25 or older  | 91                                      | 12                                      |
| Column total | 888                                     | 120                                     |

**Table 6.3c:** *Distribution of age groups within BCM students and ECON101, the study class*

|              | <b>BCM 1<sup>st</sup> year students</b> | <b>ECON101 study class</b> |
|--------------|---|----------------------------|
| Less than 21 | 75                                      | 340                        |
| 21-24        | 33                                      | 115                        |
| 25+          | 12                                      | 53                         |
| Column total | 120                                     | 508                        |

First year BCM students are slightly different than first year students as a whole in that the proportion who are younger than 21 is lower, and the proportion of those aged 21-24 is higher (Table 6.3b). This suggests that there may be more mature students in ECON101, a compulsory subject for BCM students, than would normally be expected in a first year class at Lincoln University. Table 6.3c shows that the distribution of age groups in ECN101 is little different to those of the B.C.M students.



### 6.3.3 Category 2: Student Background

Questions in this category are listed in the following table.

**Table 6.4:** *Category 2: Questions seeking differences in the backgrounds of students in the two study groups*

|     |   |
|-----|---|
| Q3. | Degree studied for                      |
| Q4  | Primary school attendance in NZ         |
| Q5  | Years of attendance at secondary school |
| Q6  | Tertiary education                      |
| Q7  | Part-time or Full-time study            |

#### 6.3.3.1 Results and Discussion of Category 2: Student Background

**Table 6.5:** *Results from Q3: Degree studied for*

| Response     | M   | NM  | Row total |
|--------------|-----|-----|-----------|
| BCM          | 41  | 174 | 215       |
| Other        | 63  | 230 | 293       |
| Column total | 104 | 404 | 508       |

$$\chi^2 = 0.45 \quad p = 0.502 \quad 1df$$

**Table 6.6:** *Results from Q4: Primary school attendance in NZ*

| <b>Response</b>     | <b>M</b>   | <b>NM</b>  | <b>Row total</b> |
|---------------------|------------|------------|------------------|
| Yes                 | 77         | 363        | 440              |
| No                  | 27         | 40         | 67               |
| <b>Column total</b> | <b>104</b> | <b>403</b> | <b>507</b>       |

$$\chi^2 = 18.53 \quad P=0.000 \quad 1df$$

**Table 6.7:** *Results from Q5: Years of attendance at secondary school*

| <b>Response</b>     | <b>M</b>   | <b>NM</b>  | <b>Row total</b> |
|---------------------|------------|------------|------------------|
| <3                  | 2          | 13         | 15               |
| 4                   | 17         | 2          | 19               |
| 5                   | 36         | 17         | 53               |
| 6                   | 33         | 334        | 367              |
| 7                   | 8          | 16         | 24               |
| >7                  | 5          | 18         | 23               |
| <b>Column total</b> | <b>101</b> | <b>400</b> | <b>501</b>       |

$$\chi^2 = 163.34 \quad p=0.000 \quad 5df$$

**Table 6.8:** *Results from Q6: Tertiary education*

|  | <b>Response</b>     | <b>M</b>                       | <b>NM</b>  | <b>Row total</b> |
|--|---------------------|--------------------------------|------------|------------------|
| Completed 1 or more university degrees           | Yes                 | 2                              | 3          | 5                |
|  | No                  | 102                            | 401        | 503              |
|  | <b>Column total</b> | <b>104</b>                     | <b>404</b> | <b>508</b>       |
|  |                     | $\chi^2 = 1.18 \quad p=0.277$  |            | 1df              |
| Partially completed a university degree          | Yes                 | 36                             | 109        | 145              |
|  | No                  | 68                             | 295        | 363              |
|  | <b>Column total</b> | <b>104</b>                     | <b>404</b> | <b>508</b>       |
|  |                     | $\chi^2 = 2.36 \quad p=0.124$  |            | 1df              |
| Completed one or more polytechnic qualifications | Yes                 | 39                             | 24         | 63               |
|  | No                  | 65                             | 380        | 445              |
|  | <b>Column total</b> | <b>104</b>                     | <b>404</b> | <b>508</b>       |
|  |                     | $\chi^2 = 75.83 \quad p=0.000$ |            | 1df              |
| Partially completed a polytechnic qualification  | Yes                 | 11                             | 10         | 21               |
|  | No                  | 93                             | 393        | 486              |
|  | <b>Column total</b> | <b>104</b>                     | <b>403</b> | <b>507</b>       |
|  |                     | $\chi^2 = 13.65 \quad p=0.000$ |            | 1df              |
| Other tertiary education                         | Yes                 | 11                             | 8          | 19               |
|  | No                  | 93                             | 396        | 489              |
|  |                     | <b>104</b>                     | <b>404</b> | <b>508</b>       |
|  |                     | $\chi^2 = 16.98 \quad p=0.000$ |            | 1df              |

**Table 6.9:** *Results from Q7: Part time or full time study*

| <b>Response</b> | <b>M</b> | <b>NM</b> | <b>Row total</b> |
|-----------------|----------|-----------|------------------|
| Part            | 2        | 7         | 9                |
| Full            | 102      | 396       | 498              |
| Column total    | 104      | 403       | 507              |

$$\chi^2 = 0.02 \quad p=0.899 \quad 1 \text{ df}$$

In general, it appears that there are differences in the backgrounds of the two groups. No significant differences were found in the degree being studied for (Table 6.5), or in the numbers studying part time (Table 6.9). However, there are significant differences between the groups as to the attending of primary school in N.Z (Table 6.6), and the years spent at secondary school (Table 6.7). It is difficult to explain the higher proportion of M students who did not attend primary school in NZ. A possible explanation is that those students not attending primary school in NZ have now become permanent residents here and are not classed as overseas students.

**Table 6.9a:** *Overseas and NZ first year students*

|                            |     |               |
|----------------------------|-----|---------------|
|                            |     | as % of total |
| Overseas 1st year students | 88  | 10%           |
| NZ 1st year students       | 800 | 90%           |
| Total 1st year students    | 888 |               |

**Table 6.9b:** *Number and gender of overseas 1st year students in each age group for overseas students*

|              | Male | Female | Row total |
|--------------|------|--------|-----------|
| less than 21 | 21   | 18     | 39        |
| 21 - 24      | 18   | 19     | 37        |
| 25+          | 9    | 3      | 12        |
| Column total | 48   | 40     | 88        |

$$\chi^2 = 2.55 \quad p=0.279 \quad 2df$$

The M group students appear to have spent fewer years at secondary school (Table 6.7). Approximately 5% of both groups indicated that they spent more than seven years at secondary school. These values are regarded with some suspicion, as five years at secondary school is considered the norm. These students may have attended school that catered for Forms 1 to 7, rather than Forms 3 to 7. Their responses to Question 5 may have reflected a different definition of secondary school.

No differences were found between the two groups as to completion or partial completion of university degrees (Table 6.8), but differences were shown in the proportions having complete or partially completed polytechnic qualifications or other tertiary education. As expected, a higher number of M students have gained or attempted these.

### 6.3.4 Category 3: Computer Experience

Questions in this category, seeking data on previous computer experience, are listed as follows:

**Table 6.10:** *Questions seeking differences in the computer experience of the two study groups*

|             |  |
|-------------|--|
| Q14         | Previous computer experience                         |
| Q15         | Taking COMP101 this semester                         |
| Q15, part 2 | Reason why, if COMP101 not being taken this semester |

**Table 6.11:** *Results from Q14: Computer experience*

| <b>Response</b>                  | <b>M</b>         | <b>NM</b> | <b>Row total</b> |
|----------------------------------|------------------|-----------|------------------|
| Never used a computer            | 17               | 18        | 35               |
| Used a computer only a few times | 36               | 174       | 210              |
| Used a computer quite often      | 42               | 180       | 222              |
| Very experienced computer user   | 9                | 29        | 38               |
| Column total                     | 104              | 399       | 505              |
|                                  | $\chi^2 = 18.89$ | $p=0.000$ | 3df              |

**Table 6.12:** *Results from Q15: Taking COMP101 this semester*

| <b>Response</b> | <b>M</b>        | <b>NM</b> | <b>Row total</b> |
|-----------------|-----------------|-----------|------------------|
| Yes             | 36              | 153       | 189              |
| No              | 66              | 247       | 313              |
| Column total    | 102             | 400       | 502              |
|                 | $\chi^2 = 0.30$ | $p=0.582$ | 1df              |

**Table 6.13:** *Results from Q15.2: Reasons for not taking COMP101 this semester*

| <b>Response</b>                                       | <b>M</b>        | <b>NM</b> | <b>Row total</b> |
|---|-----------------|-----------|------------------|
| Have a credit for, or have already passed,<br>COMP101 | 11              | 30        | 41               |
| Do not intend to take COMP101                         | 55              | 192       | 247              |
| Intend to take it later                               | 1               | 21        | 22               |
| Column total  | 67              | 243       | 310              |
|   | $\chi^2 = 4.50$ | $p=0.105$ | 2df              |

The data in Table 6.11 on previous computer experience shows that a significantly higher proportion of M students had not used a computer before, and a higher proportion of NM students had used a computer a few times. Similar proportions in both categories had used a computer quite often, or considered themselves experienced computer users.

The proportions of both categories taking COMP101 (a first year computing subject) in this semester were very similar (Table 6.12). Those students not taking COMP101 in this semester were asked to give their reasons why not, and there were no significant differences found between the M and NM categories in the distribution of responses (Table 6.13). It appears, therefore, that students in the M category had less computing experience than students in the NM group. As the numbers intending to study COMP101, and the spread of students across the reasons for not taking COMP101 this semester are very similar, additional computer experience gained by students in both categories should be similar, and therefore not impact on the results of this study. However, the increased level of computing experience in the NM group may have some impact.

#### **6.3.5 Category 4: Expected Use of EA**

This category included three questions, designed to provide information on the students' expected use of EA. They are listed as follows: -

**Table 6.14:** *Questions on expected use of EA*

|      |   |
|------|---|
| Q 11 | Expectation of use of EA  |
| Q12  | Intention to purchase own copy of EA                                |
| Q13  | Comparison of expectation of use of EA and other learning resources |

**Table 6.15:** *Results from Q11: Expectation of use of EA*

| <b>Response</b>  | <b>M</b>         | <b>NM</b>  | <b>Row total</b> |
|--|------------------|------------|------------------|
| I do not intend to use it at all, or I will only use it because it is worth 5% of the subject marks. | 14               | 91         | 105              |
| I intend to use it for more than just the 5%   | 44               | 204        | 248              |
| I plan to use it a lot.  | 45               | 107        | 152              |
| <b>Column total</b>  | <b>103</b>       | <b>402</b> | <b>505</b>       |
|  | $\chi^2 = 50.82$ | $p=0.000$  | 2df              |

**Table 6.16:** *Results from Q12: Intention to purchase own copy of EA*

| <b>Response</b>     | <b>M</b>        | <b>NM</b>  | <b>Row total</b> |
|---------------------|-----------------|------------|------------------|
| Yes                 | 21              | 83         | 104              |
| No                  | 80              | 316        | 396              |
| <b>Column total</b> | <b>101</b>      | <b>399</b> | <b>500</b>       |
|                     | $\chi^2 = 0.00$ | $p=0.998$  | 1df              |

The results of Question 13: Comparison of expectation of use of EA and other learning resources, were not analysed, as approximately half of the responses were invalid. Many responses appeared to use the response scale in the reverse order, many assigned the same number to different resources, and a large number did not respond to the question at all. It was felt that an inference for the class should not be made on the basis of such a reduced number of responses, and the question was abandoned at this point. However, the question was asked again, in a different form, in the mid-semester and post-exam surveys.

A significant difference between the two categories can be seen in the responses to Question 11: Intention to use EA (Table 6.15). A much higher proportion of NM students do not intend to use EA at all, or will only use it because it is worth 5% of the subject marks. However, a significantly higher proportion of M students planned to use EA a lot.



No significant difference was found in the numbers already owning, or planning to purchase a copy of EA for home use (Table 6.16).

There is something of a contrast between the data in Table 6.15, concerning students' intentions to use EA, and the data in Table 6.11, which provides information on students' previous computer experience. Table 6.11 clearly shows that students in the M group have less computer experience, yet, according to the data in Table 6.15, they intend to make more use of EA. This is, however, consistent with the known characteristics of M students, in that they are more anxious about their performance, and are reported anecdotally to "work harder". These results contrast somewhat with the "computerphobia" described by Zeffane & Cheek (1993). In this case, mature students with little or no computer experience appear not to be exhibiting "computerphobia", but intend to use the computer as a learning tool.

If M students were "computerphobic", it could be expected that a smaller proportion of M students would have chosen response 1, (have a credit for, or have already passed, COMP101), and a larger proportion, response 2, (do not intend to take COMP101), when asked if they were taking COMP101 this semester (Question 15) (Table 6.13). No significant difference in proportions was found here, and it can be concluded that "computerphobia" is unlikely to be a deterrent to M student use of EA as a learning resource. It must be remembered, however, that all B.C.M students enroll for COMP101 in the first semester of their first year, thus, these M students followed a prescribed course.

This is also supported to some extent by the fact that equal proportions in both groups intend to purchase, or have purchased, EA for home use. However, it is possible that numbers of students purchasing copies of EA for home use will change during the semester.

### **6.3.6 Summary**

In general, it appears that there are differences in the backgrounds of the two groups. These differences cover a range of facets from educational background to prior computer experience. M students appear to have spent fewer years at secondary school than NM students did, but have undertaken more tertiary education than NM students. M students also appeared to have a lower level of prior computer experience, which may have some impact on this study.

Evidence was found which supported the decision to not categorise students as M or NM on the basis of age alone. A better discriminator was the two-year break from formal education. It

appears that almost all M students have had such a break. These two aspects of classification as “mature” warrant further study.

It appears that “computerphobia” is generally not exhibited by M students; they indicated that they intended to use EA as learning tool to a greater extent than NM students. This is also supported to some extent by the fact that equal proportions in both groups intend to purchase, or have purchased, EA for home use. This is discussed further at the end of Chapter 7.

## **6.4 Mid-Semester and Post-Exam Surveys**

The mid-semester and post-exam surveys were similar in many respects. In order to facilitate simultaneous presentation of the findings from these surveys, and the accompanying discussion, they have been entered into a separate chapter. The following chapter, Chapter 7, contains an introduction to, and results and discussion of, the mid-semester and post-exam surveys.

## CHAPTER 7 - MID-SEMESTER AND POST-EXAM SURVEYS

### 7.1 Introduction

The second survey was conducted midway through the semester, the third during the first week of the following semester. The timing of these surveys is shown in the Study Schedule in Appendix 2. These surveys are referred to as the mid-semester (MS) and post-exam (PE) surveys, respectively. Both were designed to provide information on student use of EA and perceptions of its helpfulness. The mid-semester point was chosen as students had had time to settle into study patterns, but the pressures of end-of-semester deadlines for course work and study for examinations were not yet upon them. As it was impractical to conduct a survey in the final weeks of a semester, the PE survey was undertaken at the beginning of the second semester. By that time, students had also had more time to reflect on their experiences with EA.

Students were told that these surveys were follow-ups to the one conducted at the beginning of the semester, and steps were taken to give the questionnaires a similar appearance. Questions were again of the Yes / No, or tick-box variety, with one question requiring the use of a scale, and one open-ended question in both surveys (see Appendix 3).

Unlike the first survey, which was undertaken using as many members of the ECON101 class as it was possible to contact, these later surveys used a random sample from each of the M and NM categories. The MS survey questionnaire was given to 31 M students and 32 NM students, the PE to 32 M and 36 NM students. Not all respondents answered every question; numbers responding are shown in each table of results.

The questions asked fell into five categories; the first category contained a set of questions, which were very similar to, or identical to questions in the first survey. These were included primarily to give the questionnaires a similar appearance to that of the first survey, but also to check for any changes that may have occurred since the beginning of the semester.

The remaining questions were divided into four categories. Questions in the two questionnaires were very similar. Differences in the results between the two surveys are discussed in their respective categories. The purpose of these questions was to provide information on students' use and perceptions of EA. Each category sought information on a different aspect of EA use. As in the first survey, all data was analysed with respect to the two study groups, M and NM. The results and discussion of the second and third survey follow. Results and discussion for

these surveys are presented together for ease of comparison. Results are compared with those obtained in the first survey at the end of this chapter.

Throughout the following presentation of results in table form MS survey results are listed on the left, PE survey results on the right.

## 7.2 Category 1: Demographics

**Table 7.1:** *Questions in Category 1: Demographic data*

|    |                                |
|----|--------------------------------|
| Q1 | Age                            |
| Q2 | Enrolment in a Commerce degree |
| Q3 | In NZ especially to study      |

Questions in this category were ‘checking’ questions. Question 1 in these surveys was very similar to Question 2 on age in the first survey, and was included in order to give the second questionnaire a similar appearance to the first survey, and provide a feeling of continuity. However, the second response option was modified slightly. In the first survey, it was decided that the phrasing of the second response should be ‘older than 20 and less than 25’, in order to ensure that students aged 21 and 24 chose that response. In the draft version of the first survey, the phrase ‘21 - 24’ was used, and some test subjects were unsure as to the meaning of this. Did it mean ‘22 and 23’, or were 21 and 24 year olds to select this option also? Hence the wording was altered. However, even though students were asked to give their ages in whole years, some confusion still arose at the time of administration of the first survey, as to which option should be selected. The second response was then rewritten as ‘21 - 24’ in these surveys. Although students had been assigned to categories on the basis of their responses to the age question in the first survey, and categorisation would not be changed, the results of Question 1 are compared with those of Question 2, Survey 1.

Question 2 differed slightly from the similar question in the first survey. The question in the first survey asked students to state the degree being studied for. The findings presented in Chapter 6 are for those students studying for a B.C.M degree. The question in the MS and PE surveys would include any Commerce students, such as B.Com.(Tourism). This may have changed the proportion of Commerce students slightly and it is recognized that the wording of questions in future surveys should remain consistent.

The third question in this category was an attempt to ask Question 4 in the first survey, the question seeking information on primary school attendance in NZ, in a different way. In the first survey, a significant difference was found between the two groups, M and NM, with respect to this. It was thought that the re-phrasing of the question to "Have you come to NZ especially to study?" was a more appropriate way of ascertaining whether students had quite different backgrounds as a result of their primary schooling. It was thought that students making the effort to come to NZ to study could have a different attitude from those residing here. If a significant difference between the two groups was found, this could have influenced the desire to succeed in ECON101, and thus affect the use of EA.

**Table 7.2:** *Results from Q1: Age*

| Response     | N for MS        | N for PE   | Row Total |
|--------------|-----------------|------------|-----------|
|              | Survey          | Survey     |           |
| Under 21     | 29              | 28         | 57        |
| 21 - 24      | 16              | 20         | 36        |
| 25 or older  | 18              | 20         | 38        |
| Column total | 63              | 68         | 131       |
|              | $\chi^2 = 0.38$ | $p = 0.83$ | 2df       |

**Table 7.3:** *Results from Q2: Enrolment in Commerce Degree*

| Response     | MS              |            |           | PE              |            |           |
|--------------|-----------------|------------|-----------|-----------------|------------|-----------|
|              | M               | NM         | Row total | M               | NM         | Row total |
| Yes          | 12              | 11         | 23        | 15              | 14         | 29        |
| No           | 19              | 21         | 40        | 17              | 22         | 39        |
| Column total | 31              | 32         | 63        | 32              | 36         | 68        |
|              | $\chi^2 = 0.13$ | $p = 0.72$ | 1df       | $\chi^2 = 0.44$ | $p = 0.51$ | 1df       |

**Table 7.4:** Results from Q 3: In NZ especially to study

| Response     | MS              |            |           | PE              |            |           |
|--------------|-----------------|------------|-----------|-----------------|------------|-----------|
|              | M               | NM         | Row total | M               | NM         | Row total |
| Yes          | 6               | 2          | 8         | 7               | 4          | 11        |
| No           | 24              | 30         | 54        | 24              | 31         | 55        |
| Column total | 30              | 32         | 62        | 31              | 35         | 66        |
|              | $\chi^2 = 2.60$ | $p = 0.11$ | 1df       | $\chi^2 = 1.47$ | $p = 0.23$ | 1df       |

### 7.2.1 Discussion

The distribution of students amongst the three age groups, under 21, 21 - 24, 25 and over, from Survey 1, was 67%, 23%, 10% respectively (Table 6.3a). The distribution of the sample of students ( $n = 63$ ) in the second survey, is a little different, being 46%, 25%, 29%. This is to be expected as the first survey was conducted across the population of ECON101, whereas Survey 2 was conducted using two samples, one drawn from those students categorised as M, and the other from those categorised as NM. The distribution of ages over the sample of students in the third survey was very similar to that of the second survey (Table 7.2).

There are some differences between the proportions of students studying for a B.C.M or other Commerce degrees. The proportion of M students studying for such a degree is very similar between the first and second survey, but rises in the third survey (39%, 39%, 43% respectively). The proportion of NM students studying for a B.C.M or other Commerce degree drops in the second survey and rises again in the third (43%, 34%, 39%). The difference between the first and second surveys is likely to be due to the first survey being applied to the whole class, whilst the second survey is a sample. Differences between the second and third surveys are slight. It is considered that the use of EA is therefore unlikely to be affected by the requirement for Commerce students to take ECON101.

No significant difference was found in the proportion of students within each study group coming to NZ especially to study, across the MS and PE surveys. A significant difference was found between the two groups in the first survey, but not in the MS and PE surveys. Although this finding does not entirely alleviate the concern that M students may have a somewhat

different background from NM students, due to the fact that a considerably higher proportion of them did not attend primary school in NZ, it does reduce the concern as to whether a higher proportion of M students may have come to NZ specifically to study, and might, therefore, have a different attitude to study.

### 7.3 Category 2: Expectations of EA Use

The second category of questions, seeking information on students' expectations of EA were as follows: -

**Table 7.5:** *Questions in Category 2: Expectations of EA use*

|    |   |
|----|---|
| Q4 | Home copy of EA                             |
| Q5 | EA use compared with expectation of use     |
| Q6 | Helpfulness of EA compared with expectation |

Question 4 was different from the question on EA purchase contained in the first survey; in that survey the question sought data on students' intentions to obtain EA for home use; in the MS and PE surveys the question sought information on those who had obtained a copy of EA for home use.

**Table 7.6:** *Results from Q4: EA at home*

| Response     | MS                         |    |           | PE                         |    |           |
|--------------|----------------------------|----|-----------|----------------------------|----|-----------|
|              | M                          | NM | Row total | M                          | NM | Row total |
| Yes          | 8                          | 1  | 9         | 5                          | 1  | 6         |
| No           | 23                         | 31 | 54        | 27                         | 35 | 62        |
| Column total | 31                         | 32 | 63        | 32                         | 36 | 68        |
|              | $\chi^2 = 6.62$ $p = 0.01$ |    | 1df       | $\chi^2 = 3.48$ $p = 0.06$ |    | 1df       |

**Table 7.7:** Results from Q5: EA use compared with expectation of use

| Response                     | MS              |            |           | PE              |            |           |
|------------------------------|-----------------|------------|-----------|-----------------|------------|-----------|
|                              | M               | NM         | Row total | M               | NM         | Row Total |
| less often than expected     | 12              | 8          | 20        | 10              | 7          | 17        |
| the same as you expected     | 12              | 13         | 25        | 18              | 21         | 39        |
| more often than you expected | 7               | 11         | 18        | 4               | 8          | 12        |
| Column total                 | 31              | 32         | 63        | 32              | 36         | 68        |
|                              | $\chi^2 = 1.71$ | $p = 0.42$ | 2df       | $\chi^2 = 1.86$ | $p = 0.39$ | 2df       |

**Table 7.8:** Breakdown of responses to "less often than expected" option in Table 7.7, above (asked in PE Survey only)

| Response                     | M  | NM |
|------------------------------|----|----|
| no time / too time consuming | 5  | 0  |
| forgot it was available      | 1  | 0  |
| not useful / helpful         | 1  | 2  |
| lazy / can't be bothered     | 0  | 3  |
| sick of computers            | 1  | 0  |
| not needed                   | 1  | 0  |
| did not have a personal copy | 1  | 0  |
| Column total                 | 10 | 5  |



**Table 7.9:** *Results from Q6: Helpfulness of EA compared with expectation*

| Response                          | MS                                       |    |           | PE                                       |    |           |
|-----------------------------------|--|----|-----------|--|----|-----------|
|                                   | M  | NM | Row total | M  | NM | Row total |
| less helpful than you thought     | 1  | 8  | 9         | 6  | 5  | 11        |
| equally as helpful as you thought | 13                                       | 8  | 21        | 18                                       | 19 | 37        |
| more helpful than you thought     | 17                                       | 15 | 32        | 8  | 12 | 20        |
| Column total                      | 31                                       | 31 | 62        | 32                                       | 36 | 68        |
|                                   | $\chi^2 = 6.75 \quad p = 0.03 \quad 2df$ |    |           | $\chi^2 = 0.69 \quad p = 0.71 \quad 2df$ |    |           |

### 7.3.1 Discussion

It is interesting to note that a difference between the M and NM study groups was found, in the MS survey, in the numbers of students having EA at home (Table 7.6, left-hand side). A much greater proportion of M students had obtained their own copies. This may be for a number of reasons. M students are more likely to have children, jobs or other family responsibilities, and thus find it more convenient to study at home. In this case, EA could be a valuable learning resource. However, caution should be exercised in the interpretation of these results given the low number of “Yes” responses made by NM students.

It appears that use versus expectation of use was fairly similar for both groups, with similar proportions giving the same response to this question (Table 7.7). The general pattern of use across the two surveys was for students to use it less often or the same as expected. A decrease occurred in the number of students using it more often than expected by the third survey (Table 7.7, right-hand side). This drop may be explained by the fact that students are often busier in the latter part of a semester, with many assignments due, and consequently less time available.

The most frequent response given by M students when asked why EA was used less often than expected was that of “no time, or too time consuming” (Table 7.8). This response is consistent with the above explanation. No statistical analysis was applied to the responses received in the

“Why not” question because the numbers were too small. It is interesting to note that a response concerning time was not given by any NM student, rather laziness or “can’t be bothered” would appear to be the main reason why EA was not used!

A significant difference was not found between the groups as to students’ perceptions of the helpfulness of EA compared with their expectations (Table 7.9). However, MS survey results suggest ( $p=0.03$ ) that M students found EA more helpful than expected. Reasons for this are conjecture only, but it is possible that mature students’ attitudes to study may provide the motivation to spend more time exploring the package, and discovering what help it may offer, whereas non-mature students may give it only a cursory inspection. It is interesting to note that approximately half of the students in both groups found EA more helpful than anticipated in the MS survey. However, this response is not reflected in the PE survey results. The perception of M students appears to have changed, with a general shift of M responses towards the “less than or equally helpful” responses. EA may have lost some of its attraction for M students by the end of the semester.

It appears that, in general, students’ expectations of the package were met.

## 7.4. Category 3: Value of EA

**Table 7.10:** *Questions in Category 3: Value of EA*

| MS  | PE   |  |
|-----|------|--|
| Q7  | Q7   | EA option for best learning                                  |
| Q11 |      | Contribution of EA to assessment marks                       |
|     | Q11a | Contribution of EA to test marks                             |
|     | Q11b | Contribution of EA to final exam marks                       |
| Q12 | Q18  | Opinion of availability of similar package in other subjects |
| Q15 | Q13  | Comparison scale with other learning resources               |

A sub-category, 3a, of Category 3 was included in Survey 3. Questions in this sub-category, *EA’s Contribution to Learning*, are listed in Section 7.4.4.1 below.

**Table 7.11:** Results from Q7: EA option for best learning

| Response     | MS              |            |           | PE              |            |           |
|--------------|-----------------|------------|-----------|-----------------|------------|-----------|
|              | M               | NM         | Row total | M               | NM         | Row total |
| tutorial     | 9               | 8          | 17        | 12              | 11         | 23        |
| free mode    | 4               | 3          | 7         | 3               | 4          | 7         |
| quiz         | 17              | 19         | 36        | 15              | 19         | 34        |
| Column total | 30              | 30         | 60        | 30              | 34         | 64        |
|              | $\chi^2 = 0.31$ | $p = 0.86$ | 2df       | $\chi^2 = 0.41$ | $p = 0.82$ | 2df       |

**Table 7.12:** Results from Q11: Contribution of EA to assessment marks (MS survey only)

| Response     | M               | NM         | Row total |
|--------------|-----------------|------------|-----------|
| Yes          | 24              | 23         | 47        |
| No           | 7               | 9          | 16        |
| Column total | 31              | 32         | 63        |
|              | $\chi^2 = 0.26$ | $p = 0.61$ | 1df       |

**Table 7.13:** Results from Q11a: Contribution to test marks (PE survey only)

| Response     | M               | NM         | Row total |
|--------------|-----------------|------------|-----------|
| Yes          | 29              | 25         | 48        |
| No           | 9               | 11         | 20        |
| Column total | 32              | 36         | 68        |
|              | $\chi^2 = 0.05$ | $p = 0.83$ | 1df       |

**Table 7.14:** Results from Q11b: Contribution to final exam (PE survey only)

| <b>Response</b> | <b>M</b> | <b>NM</b> | <b>Row total</b> |
|-----------------|----------|-----------|------------------|
| Yes             | 15       | 13        | 28               |
| No              | 16       | 20        | 36               |
| Column total    | 31       | 33        | 64               |

$$\chi^2 = 0.53 \quad p = 0.47 \quad 1df$$

**Table 7.15:** Results from MS Q12 and PE Q18: Opinion of availability of similar package in other subjects

| <b>Response</b> | <b>MS</b> |           |                  | <b>PE</b> |           |                  |
|-----------------|-----------|-----------|------------------|-----------|-----------|------------------|
|                 | <b>M</b>  | <b>NM</b> | <b>Row total</b> | <b>M</b>  | <b>NM</b> | <b>Row total</b> |
| Yes             | 27        | 27        | 54               | 26        | 34        | 60               |
| No              | 4         | 3         | 7                | 6         | 2         | 8                |
| Column total    | 31        | 30        | 61               | 32        | 36        | 68               |

$$\chi^2 = 0.13 \quad p = 0.72 \quad 2df \quad \chi^2 = 2.84 \quad p = 0.09 \quad 2df$$

**Table 7.16:** Results from MS Q 15 and PE Q13: Comparison scale with other learning resources

| Resource              | MS    |        |        |         | PE    |        |        |         |
|-----------------------|-------|--------|--------|---------|-------|--------|--------|---------|
|                       | Ave M | Ave NM | Rank M | Rank NM | Ave M | Ave NM | Rank M | Rank NM |
| individual help       | 2.9   | 3.5    | 6      | 6       | 2.9   | 2.4    | 6      | 6       |
| textbook              | 5.2   | 4.6    | 1      | 2=      | 5.2   | 5.3    | 1      | 2       |
| library books         | 1.8   | 1.7    | 7      | 7       | 2.1   | 1.7    | 7      | 7       |
| lecture notes         | 4.9   | 5.6    | 2      | 1       | 4.7   | 5.6    | 2=     | 1       |
| EA                    | 4.6   | 4.6    | 3      | 2=      | 4.0   | 3.9    | 4      | 5       |
| previous tests/papers | 4.3   | 4.2    | 4      | 5       | 4.7   | 4.2    | 2=     | 3       |
| help from others      | 3.8   | 4.6    | 5      | 2=      | 3.7   | 4.0    | 5      | 4       |

Z=0.38 p=0.65

Z=0.38 p=0.65

The results from MS Q15 and PE Q13 were analysed using the Sign Test (4.4.4.3).

#### 7.4.1 Discussion

This series of questions indicates that there is no difference between the two groups where the helpfulness of EA is concerned. It appears that the preferred option for best learning, i.e. quiz mode, is similar in both groups. (Table 7.11). Similar distributions are found in both surveys. Such a result indicates that EA tends to be used as a check for knowledge, rather than as a provision of knowledge, and has been used in the same manner throughout the semester.

Both groups indicated quite strongly that they thought the use of EA had helped the achievement of better marks at the MS point (Table 7.12). At the PE point, both groups indicated quite strongly that EA use had contributed to better marks in the tests, but opinion on its contribution to exam marks was divided (Table 7.13, 7.14). A reason for this is that exam questions were of an essay type, whereas EA provides multi-choice type questions.

Both groups also showed strong support for a similar package to EA to be available in other subjects (Table 7.15). Such a result could be expected; as the students felt EA use had improved their assessment marks in ECON101, they would expect to benefit from a similar resource in other subjects. If the quiz facility in EA is indeed the most beneficial, then it also follows that students would wish to check their knowledge of other subjects.

Strong similarities exist between the M and NM groups as to how helpful they found each learning resource (Table 7.16). Students were not asked to rank the resources but a ranking based on the average measurement for that resource for each group has been provided for interest. No significant differences were found. It appears that M and NM groups find EA almost equally helpful as compared with other resources, with the traditional resources of lecture notes, and text book being considered the most helpful. NM students, however, did indicate that they found help from others more helpful than EA. There may be a relationship between this and the suggestion that M students spend more time exploring what EA has to offer. Help from others is 'instant' and does not require NM students to learn to use it before the help is obtained.

The shift in the ranking of previous tests/papers in the PE survey is not surprising. It is normal practice for students to refer to previous exam papers, and they could be expected to find them helpful at this stage of the semester.

#### ***7.4.1.1 EA's Contribution to Learning (PE survey only)***

Data obtained for questions in this category are presented in Tables 7.18 to 7.21.

**Table 7.17:** *Questions in Category 3a: EA's contribution to learning*

|     |   |
|-----|---|
| Q14 | Expectation of grade received                     |
| Q15 | EA's contribution to overall grade                |
| Q16 | Use of EA for revision                            |
| Q17 | Perception of contribution of increased use of EA |

These questions could be asked in the PE survey only as they sought information on student's reflections over the entire semester.

**Table 7.18:** *Results from Q14: Expectation of grade received*

| <b>Response</b>                      | <b>M</b>        | <b>NM</b>  | <b>Row total</b> |
|--------------------------------------|-----------------|------------|------------------|
| Did not sit exam                     | 0               | 0          | 0                |
| Received a lower grade than expected | 8               | 6          | 14               |
| Received grade expected              | 16              | 17         | 33               |
| Received higher grade than expected  | 8               | 13         | 21               |
| <b>Column total</b>                  | <b>32</b>       | <b>36</b>  | <b>68</b>        |
|                                      | $\chi^2 = 1.28$ | $p = 0.53$ | 2df              |

The zero responses were ignored in the analysis.

**Table 7.19:** *Results from Q15: EA's contribution to overall grade*

| <b>Response</b>                                     | <b>M</b>        | <b>NM</b>  | <b>Total</b> |
|---|-----------------|------------|--------------|
| Was no help at all, or made it(overall grade) worse | 4               | 5          | 9            |
| Helped a little                                     | 18              | 22         | 40           |
| Helped quite a lot, or a great deal                 | 10              | 9          | 19           |
| <b>Column total</b>                                 | <b>32</b>       | <b>36</b>  | <b>68</b>    |
|   | $\chi^2 = 0.33$ | $p = 0.85$ | 2df          |

In the original questionnaire, it is important to note that the two options listed in the first and last responses above were offered separately. However, in order to provide statistically valid analysis, the results are combined.

**Table 7.20:** *Results from Q16: Use of EA for revision*

| <b>Response</b>                         |     | <b>M</b>        | <b>NM</b>  | <b>Row total</b> |
|---|-----|-----------------|------------|------------------|
| Use EA to revise before Test 1          | Yes | 25              | 27         | 52               |
|   | No  | 7               | 9          | 16               |
| Column total                            |     | 32              | 36         | 68               |
|   |     | $\chi^2 = 0.09$ | $p = 0.76$ | 1df              |
| Used EA to revise before Test 2         | Yes | 20              | 19         | 39               |
|   | No  | 12              | 17         | 29               |
| Column total                            |     | 32              | 36         | 68               |
|   |     | $\chi^2 = 0.65$ | $p = 0.42$ | 1df              |
| Used EA to revise before the final exam | Yes | 9               | 11         | 20               |
|   | No  | 23              | 25         | 48               |
| Column total                            |     | 32              | 36         | 68               |
|   |     | $\chi^2 = 0.05$ | $p = 0.83$ | 1df              |



**Table 7.21:** *Results from Q17: Perception of contribution of increased use of EA*

| <b>Response</b>   |     | <b>M</b>        | <b>NM</b>  | <b>Row total</b> |
|---|-----|-----------------|------------|------------------|
| With increased use of EA,<br>would have done better in tests      | Yes | 17              | 28         | 45               |
|   | No  | 15              | 8          | 23               |
| Column total  |     | 32              | 36         | 68               |
|   |     | $\chi^2 = 4.60$ | $p = 0.03$ | 1df              |
| With increased use of EA,<br>would have done better in final exam | Yes | 14              | 24         | 38               |
|   | No  | 18              | 12         | 30               |
| Column total  |     | 32              | 36         | 68               |
|   |     | $\chi^2 = 3.61$ | $p = 0.06$ | 1df              |

#### 7.4.1.1.1 Discussion

No differences were found between the two groups as to perceptions of EA's contribution to learning. Students were generally satisfied with the grade received for ECON101 (Table 7.18). Results suggest that students consider EA use to have contributed, at least a little, to those grades (Table 7.19).

The results of the questions on EA use for revision are interesting (Table 7.20). It appears that the numbers of students in both groups using EA for revision steadily decreases as the semester proceeds. Few students used EA to revise for the final exam. This may be for the reason given earlier; the ECON101 exam was known to contain essay-type questions. EA provides multi-choice questions in its quiz facility.

Opinion was divided amongst the M students as to whether increased use of EA would have produced better test or exam marks, but NM students appeared to recognise that EA could have contributed, had they made better use of it (Table 7.21). Although there appears to be a difference between the two groups, the results are not significant at the 1%, but are significant at the 5% level. This result is important as it provides some validity for the inference that NM

students “catch up” with M students by the end of the semester in their recognition of the value of EA.

## 7.5 Category 4: Student interactivity with EA

Data from the questions in this category are presented in Tables 7.23 and 7.24

**Table 7.22:** *Questions in Category 4: Questions seeking information on the amount of interactivity with EA*

|    |  |
|----|--|
| Q8 | Amount of interactivity in EA tutorial |
| Q9 | Amount of interactivity in EA quiz     |

**Table 7.23:** *Results of Question 8: Interactivity in EA tutorial*

| Response         | MS |    |           | PE |    |           |
|------------------|----|----|-----------|----|----|-----------|
|                  | M  | NM | Row total | M  | NM | Row total |
| no               | 2  | 6  | 8         | 3  | 5  | 8         |
| sometimes        | 7  | 7  | 14        | 11 | 13 | 24        |
| most of the time | 20 | 12 | 32        | 11 | 15 | 26        |
| always           | 2  | 7  | 9         | 6  | 3  | 9         |
| Column total     | 31 | 32 | 63        | 31 | 36 | 67        |

$$\chi^2 = 6.76 \quad p = 0.08 \quad 3df$$

$$\chi^2 = 1.92 \quad p = 0.59 \quad 3df$$

**Table 7.24:** Results from Q 9: Interactivity in EA quiz

| Response         | MS                         |    |           | PE                         |    |           |
|------------------|----------------------------|----|-----------|----------------------------|----|-----------|
|                  | M                          | NM | Row total | M                          | NM | Row total |
| no               | 2                          | 5  | 7         | 4                          | 5  | 9         |
| sometimes        | 11                         | 9  | 20        | 12                         | 11 | 23        |
| most of the time | 14                         | 12 | 26        | 11                         | 11 | 22        |
| always           | 4                          | 6  | 10        | 4                          | 9  | 13        |
| Column total     | 31                         | 32 | 63        | 31                         | 36 | 67        |
|                  | $\chi^2 = 2.02$ $p = 0.57$ |    | 3df       | $\chi^2 = 1.71$ $p = 0.63$ |    | 3df       |

### 7.5.1 Discussion

Two interesting apparent differences appear as a result the first question (Q8). Data from the MS survey show that a large proportion, almost two-thirds, of the M group (Table 7.23) changes the variables in the graphs most of the time. It is perhaps not surprising that a larger proportion of NM than M students do not change the variables as suggested; what is interesting is that a larger proportion of NM students do so “always”. These results are not statistically significant, but are approaching the level considered suggestive of difference. This presents something of a contrast with the results of Question 6: Helpfulness of EA (Table 7.9). These results, although not considered significantly different, were strongly suggestive of differences between the two study groups in the perception of helpfulness. In general NM students found EA no more helpful than M students did, yet here is a group who make use of the interactivity EA offers in order to illustrate the concept of the tutorial topic. This facility offered by EA could therefore be helpful. This result could also be explained, however, in other ways. It may be that M students have done more preparative study before using EA, and simply don’t need to use the interactive features in order to understand the concept involved.

Neither study group exhibited different behaviour with respect to the use of the interactive graphs in EA tutorials (Table 7.23), nor was a difference found in behaviour regarding the use of the interactive graphs provided to help answer quiz questions (Table 7.24). Results were similar for both the MS and PE surveys. The fact that there is no difference in behaviour between the two groups suggests that both groups have similar approaches to answering the

questions, that they go about the learning process in the tutorial in similar ways, and that EA was used in the same way throughout the semester.

## 7.6 Category 5: Perceived amount of use and reasons for use of EA.

Questions in this category are as follows: -

**Table 7.25:** *Questions in Category 5.*

| MS  | PE           |   |
|-----|--------------|---|
| Q10 | Q10          | Number of times EA used since start of semester |
| Q14 | Q12          | Statement of perceived amount of use of EA      |
| Q16 | Not included | Reasons of use, or non-use of EA                |

**Table 7.26:** *Results from Question 10: Number of times EA used since start of semester*

| Response     | MS |              |    | PE |           |    |    |           |
|--------------|----|--------------|----|----|-----------|----|----|-----------|
|              | MS | PE           | M  | NM | Row total | M  | NM | Row total |
| <=3 times    |    |              | 6  | 5  | 11        | 1  | 2  | 3         |
| 4 – 6 times  |    |              | 6  | 11 | 17        | 11 | 14 | 25        |
| >6 times     |    | 6 – 10 times | 19 | 16 | 35        | 9  | 12 | 21        |
|              |    | >10 times    |    |    |           | 10 | 8  | 18        |
| Column total |    |              | 31 | 32 | 63        | 31 | 36 | 67        |

$$\chi^2 = 1.8 \quad p = 0.41 \quad 2df \qquad \chi^2 = 0.98 \quad p = 0.81 \quad 3df$$

In the questionnaires, it is important to note that the first three response options were “never”, “only once”, and “two or three times”. These were combined in order to provide a statistically valid analysis, and are given as <= 3 times.

**Table 7.27: Results from MS Q14 and PE Q12: Use of EA**

| Response   | MS                                       |    |           | PE                                       |    |           |
|--|--|----|-----------|--|----|-----------|
|  | M  | NM | Row total | M  | NM | Row total |
| Did not use it at all(PE only)                             |  |    |           | 0  | 0  | 0         |
| I only use it because it is worth 5% of the subject marks. | 7  | 7  | 14        | 12                                       | 17 | 29        |
| I use it for reasons other than just the 5%                | 16                                       | 18 | 34        | 16                                       | 16 | 32        |
| I use it a lot   | 8  | 7  | 15        | 4  | 4  | 8         |
| Column total   | 31                                       | 32 | 63        | 32                                       | 37 | 69        |
|  | $\chi^2 = 0.17 \quad p = 0.92 \quad 2df$ |    |           | $\chi^2 = 0.50 \quad p = 0.78 \quad 2df$ |    |           |

Note: In order to provide a statistically valid analysis, it was necessary to combine the first and second options in the MS survey only. The combined values are shown above as “I only use it because it is worth 5% of the subject marks”. However, no student from either study group had selected the first option.

**Table 7.28:** *Results from Q16: Reasons for use or non-use of EA*

| Response Category     | Response                                | M  | NM |
|-----------------------|---|----|----|
| 1                     | For 5%                                  | 6  | 4  |
| 2                     | Use of 'helps/helpful'                  | 5  | 7  |
| 3                     | Clarifies/Improves learning/knowledge   | 7  | 6  |
| 4                     | Revision                                | 4  | 8  |
| 5                     | Practise/Practise questions             | 4  | 6  |
| 6                     | Test knowledge/Do questions             | 5  | 2  |
| 7                     | Reinforce text book or lecture material | 4  | 3  |
| 8                     | Interactivity/graphic manipulation      | 7  | 4  |
| 9                     | Reduction in time spent                 | 3  | 5  |
| 10                    | Time problem of some sort               | 2  | 2  |
| 11                    | Preference for other learning resource  | 5  | 1  |
| 12                    | Confusing/hard to understand            | 1  | 2  |
| Number of respondents |   | 32 | 29 |

### 7.6.1 Discussion

No differences appear in the estimated number of times EA was used in either survey (Table 7.26). The majority of both groups indicate that EA was used more than 6 times to this point in the semester. The perception of the number of visits to EA is the same for both groups, where perhaps it could be expected that NM students would have used it less times than M students.

Responses to Q14 (Q12 in PE survey) were distributed similarly in both groups (Table 7.27). Given the equal perception of the number of times EA was used, it is not surprising that the distribution of responses is also similar for this question. It appears that EA is generally used for more than just 5% of assessment marks, with more M than NM students having the perception that they use it "a lot".

The responses to Q16 (MS survey only) varied considerably. There are insufficient responses in a large number of the response options to allow statistical analysis to be undertaken.

Responses were grouped according to the mention of a key word such as “helps” or “helpful” (Table 7.28). Others have been collected under a general heading, such as “time problem”.

Responses in this group included statements such as “problems getting computer access”, “competition with other compulsory CAI exercises”, or simply “no time”.

A very small number of responses were difficult to include in any of the above and have been included in the category considered to be the most appropriate for the comment made. An example of this problem is the response given by an NM student. In reply to the question, he wrote, “I don’t need to use EA”! This response was included in the ‘Preference for other learning resource’ category.

Some respondents gave several reasons why they used EA, but no respondent gave more than one reason for not using EA. No one response stands out, but it appears that M students find EA helps, or is helpful, with interactivity and graphical manipulation being mentioned an equal number of times. Revision seems to be the favoured response of NM students.

There appears to be little difference between the two groups in the proportion of students using EA for the 5% contribution to their overall mark. However, there does appear to be a difference in response 2, with a higher proportion of NM students finding EA “helpful”. This may be due merely to different expressions used in response to the question. If the numbers in responses 2 and 3 were to be combined under a heading such as “improved learning”, the resulting proportions would be 38%M, and 45% NM, and the difference in proportion between the two groups is considerably reduced.

A greater proportion of NM students appear to use EA for revision. It also appears that a higher proportion of NM students use EA for “practice”, but M students use it to “test knowledge”.

These responses could be considered similar, and, if Response Categories 5 and 6 were combined the proportions would be exactly the same for both groups, 28%. Similar proportions in both groups found EA useful where reinforcement of material from other sources was required. It appears that a much higher proportion of the M group found the interactive, graphical manipulatory feature of EA useful. NM students appeared to find that using EA reduced the time spent learning economics.

A similar, small proportion of both groups indicated that time problems of some sort prevented their use of EA. It is interesting to note that the above data suggests that the M students have a

much greater preference for other learning resources than NM students do. This contrasts with the impression gained from the results of Q6 (Table 7.9), which shows almost all M students finding EA as helpful, or more helpful than expected. A small percentage of both groups found EA confusing or hard to understand.

## 7.7 Summary

It appears that the findings of the demographic data analysis is consistent across the surveys, and that those students who took part in the surveys are representative of the ECON101 class as a whole.

Some difference between study groups was found in their expectations of EA use. The M students expected to use EA more than was indicated by the NM students. This expectation is possibly reflected in the larger proportion of M students having EA at home, the only significant difference found between the two groups in the MS and PE surveys. This is also interesting when contrasted with the findings shown in Table 7.28, where M students indicated a preference for other learning resources, suggesting that it is not so much the contribution to the learning process made by EA that appeals to M students, but its convenience and ease of access. Such a response provides evidence of the different life styles between the two groups.

It is also interesting to consider the above in light of the results of Question 5 (Actual use compared with expected use, Table 7.7). It does not appear that M students use EA more than they expected to, yet more have purchased copies for home use. This may be not unexpected. More NM students may live on campus, and have access to Lincoln University's computer system. M students have other responsibilities such as jobs and family, and could find it more convenient to study at home. Again, this emphasises the difference in lifestyle between the two groups.

In general, there appears to be no difference between the groups in terms of the value of EA usage. However, there is some indication that NM students recognised the value of EA "after the event", possibly representing an aspect of maturity. No differences were found in the preferred mode of EA use, or in any other usage characteristic.

Findings from the surveys did not provide an explanation for the differences in EA usage found between the two groups (Chapter 5). The reasons for this difference remain unclear at this point.



## CHAPTER 8 — INTERVIEWS

### 8.1 Introduction

Chapter 4 described the collection by survey of quantitative data on student use and perceptions of EA. Although much information was provided by these surveys (see Chapters 6 & 7), almost all questions in the questionnaires were of the tick-box variety. Only one question provided students with an opportunity to answer in their own words. The question “Why do you use, or not use EA?” was the last question on the mid-semester survey questionnaire, and was included with the aim of encouraging students to volunteer additional information. Most students did not do so, possibly because more time would have been required to write out a response. It was felt that students would respond more fully, and provide more information on their use and perceptions of EA if interviews were conducted.

Consequently, interviews were conducted at both the MS and PE points, shortly after the collection of the survey questionnaires. Volunteers for the interviews were identified by their response to a question contained in both questionnaires, thus interviews could not be conducted until after questionnaire collection. All volunteers were interviewed.

A set of questions was used as a basis for all interviews, with students being strongly encouraged to respond freely. No statistical analysis was undertaken.

The PE interviews were conducted during the early part of the second semester after the first semester exam results had been produced. The objective was to collect responses from students with a complete “picture” of their experiences in ECON101, in order to collect information on their perception of the part that EA had played in their study of economics. It was possible that, by conducting these interviews after students knew their final exam results, responses may have been biased by student reaction to those results. This was unavoidable, as responses were required from both those who had passed ECON101, and those who had not.

### 8.1.1 Sample Sizes

Interviews were conducted with sample sizes as follows:

|    |     |      |
|----|-----|------|
| MS | 10M | 10NM |
| PE | 10M | 13NM |

It was decided to continue with the 13 NM volunteers in the PE interviews, as a reduction to ten would have required further selection from an already self-selected sample. Responses from these interviews could not be analysed for statistical validity due to the nature of the sample selection process. It was felt that more information might be gained by interviewing all 13 volunteers. No interviewee in the PE interviews had taken part in the mid-semester interviews.

### 8.1.2 Categories of Questions

Questions were presented in categories that were the same for both sets of interviews, but the categories were expanded in the PE interviews to include additional questions (Appendix 4).

The first category sought to obtain information on the reasons why students used, or did not use, EA, and their perceptions of its helpfulness. This category included questions on problems encountered in EA use, or EA features not liked. The second category sought information on students' experiences accessing EA. The topic of the third category was that of the impact made on EA use by other CAI applications.

At the end of each interview, the student was invited to comment freely on any aspects of EA. These comments are included discussed in the Final Comments section.

Some difficulties were experienced in comparing student's responses to questions across the two sets of interviews (MS and PE), because no response options were provided. However, as the results of the two surveys were presented together in Chapter 7, the same format is used here.

The main objective of this study was to seek information on the differences in use of CAI by M and NM students. It appears from the analysis of the EA usage data (Chapter 5), that M students do indeed use EA more than NM students. Allowing students to freely express themselves, within the more conducive environment of an interview, was expected to build a richer picture of the differences in M and NM perceptions of, and attitudes to, EA, which may help explain the differences.

Analysis of all responses was carried out by examining each individual response for key words or phrases. Keyword occurrences for both study groups were tallied, and are presented in the Results and Discussion section. All questions were analysed with respect to the two study groups, M and NM. The results are presented and discussed by category.

The question numbers in the following discussion refer to the question number and not to the order in which they were asked. Questions in all categories were interspersed with each other but were asked in the same order, during each interview.

## 8.2 Interview Category 1: Reasons for using EA, and its helpfulness

Information was sought on:

- reasons for students either using or not using EA
- their perceptions of EA's helpfulness
- the problems they encountered when using EA
- any features of EA disliked by students

### 8.2.1 Results and Discussion of Category 1: Reasons for using EA, and its helpfulness.

**Table 8.1:** *Results from Interview Q1: EA used for assessment/helpfulness*

|                          | MS |    | PE |    |
|--------------------------|----|----|----|----|
|                          | M  | NM | M  | NM |
| to gain assessment marks | 7  | 4  | 2  | 3  |
| because it's helpful     | 6  | 1  | 0  | 0  |
| both                     | 6  | 4  | 8  | 10 |

**Table 8.2 Results from Interview Q2: Subreasons from Q1 above**

| Key words and Phrases   | MS |    | PE |    |
|---|----|----|----|----|
|   | M  | NM | M  | NM |
| graph manipulation/hands on/doing                                   | 7  | 4  | 6  | 11 |
| preferred to textbook/concise/key concepts only/instant/easy        | 6  | 1  | 2  | 2  |
| tutorials useful/improved understanding/clarifies/improves learning | 10 | 7  | 4  | 4  |
| quiz useful/feedback/test knowledge                                 | 7  | 10 | 5  | 5  |
| needed 1% to get started  |    |    | 3  | 1  |
| do on own/control/convenient  |    |    | 4  | 1  |
| practice/revision/knowledge check                                   |    |    | 4  | 4  |
| computer illiterate or a non-preference for computer study          |    |    | 2  | 1  |
| not helpful   |    |    | 1  | 1  |

The options available to Interview Q1 were not mutually exclusive. All responses received are shown in Table 8.1. These results suggest that M students used EA both for assessment marks and for its helpfulness in both interview times. NM students appear to be less enthusiastic about the use of EA than M students in the MS interviews, but their responses are little different from those of the M group by the PE interviews. This again suggests that NM students have “caught up” by the end of the semester.

Some differences in responses to the question asking why EA was used only to gain assessment marks, or why it was helpful, can be seen between the M and NM groups (Table 8.2). All M students found the tutorials useful at the MS stage, whereas the tutorials did not appear to appeal to NM students at either stage. A large proportion of M students mentioned that the interactive graphs were particularly helpful in both interviews, whereas the NM group did not appear to appreciate the value of graph manipulation until the end of the semester. Again, a catching up process was displayed. Many NM students commented on this aspect of EA in the PE interviews.

Typical comments were:

“you can do it”

“you can do things, see things”.

One student went so far as to say

“ (it’s) like playing a computer game”!

Those M students who mentioned the usefulness of the interactive graphs, did so in much less enthusiastic terms at this later stage.

A few M respondents in the PE interviews mentioned EA's conciseness and highlighting of key concepts as appealing. Most of the comments about student use of EA in general were positive. The few negative comments received, from NM students only, were largely from those who used EA for assessment marks only. The comments were not directly about EA itself, but more to do with computer access problems, lack of instruction, and lack of time. Examples of such comments were:

“ I didn't know you could change the graphs”

“ Its too hard to calculate numbers on the screen”

“Trying to get a computer and have time to do EA between lectures is a problem”

There was some evidence from the PE interviews that students needed the 1% to ‘get started’(Table 8.2). A typical comment was:

“the 1% introduced me to it, led to its being useful”

Such comments, along with those made by students, typically M, who described themselves as “not computer literate” suggest that an introductory session with EA may allow students to become more comfortable using this type of learning resource.

Also appearing at the PE stage were comments from M students such as:-

“ Choices important, didn't have to work through in order”

“ try problem again, go back, repeat”

M students appreciated being able to ‘do it on their own’, control the order and time of EA use, repeat at will, and found it convenient.

**Table 8.3** *Results from Interview Q3: Initial EA use.*

|                         | <b>MS</b> |           | <b>PE</b> |           |
|-------------------------|-----------|-----------|-----------|-----------|
|                         | <b>M</b>  | <b>NM</b> | <b>M</b>  | <b>NM</b> |
| for 1% assignment       | 5         | 4         | 7         | 7         |
| to see what it was like | 3         | 6         | 2         | 5         |
| a bit of both           |           |           | 1         | 1         |

**Table 8.3a:** *Students' comments associated with PE Interview Q3 above*

|                                     | <b>M</b> | <b>NM</b> |
|-------------------------------------|----------|-----------|
| 1% made me use it                   | 3        | 2         |
| I was scared                        | 1        | 1         |
| It looked interesting/fun/different | 0        | 3         |
| It was not helpful                  | 2        | 1         |

**Table 8.4** *Results from Interview Q4: Perception of initial helpfulness*

|            | <b>MS</b> |           | <b>PE</b> |           |
|------------|-----------|-----------|-----------|-----------|
|            | <b>M</b>  | <b>NM</b> | <b>M</b>  | <b>NM</b> |
| Yes        | 6         | 9         | 7         | 11        |
| No         | 1         | 1         | 3         | 1         |
| Don't know | 1         | 0         |           |           |

**Table 8.5** *Results from Interview Q5: Expectations satisfied.*

|            | <b>MS</b> |           | <b>PE</b> |           |
|------------|-----------|-----------|-----------|-----------|
|            | <b>M</b>  | <b>NM</b> | <b>M</b>  | <b>NM</b> |
| Yes        | 8         | 7         | 7         | 10        |
| No         | 0         | 2         | 1         | 1         |
| Don't know | 1         | 0         | 2         | 2         |

**Table 8.5a** *Students' comments on Q5 above (PE survey only)*

|  | <b>M</b> | <b>NM</b> |
|--|----------|-----------|
| Didn't have expectations                           | 2        | 1         |
| Beyond / better than<br>expected                   | 1        | 2         |
| Not initially but improved<br>expectations not met | 3<br>1   | 0<br>2    |

Over half the students in both groups expressed the opinion that EA appeared to be helpful on first use. The comments received in response to further prompting in Interview Q5 in the PE interviews (Table 8.5a) throw little light on why EA was first used or not used. A small number of students in both groups repeated that the 1% had encouraged their initial use of EA. The comments received in association with Interview Question 3 suggest that there was some initial apprehension towards EA use, and that a "prod" in the form of an introductory session in EA for students may be of benefit to all students. This is further justified by noting the opinions of two NM students who considered EA to have not met their expectations: both commented that an introductory laboratory session should have been conducted. M students made comments such as "...hard to relate to learning from a computer". Again, an introductory session may ease this discomfort.

One NM student commented that it was not what they expected, but were unable to describe what was expected!

There is little difference shown in the results of Interview Questions 4 and 5, neither between study groups, nor between interview times. It appears that students expected EA to be helpful, and that these expectations were largely met.

It appears that the 1% assignment mark was influential in the initial use of EA in both study groups, with some curiosity expressed by the NM group. NM students mentioned that EA looked "interesting", "fun" or "different".

**Table 8.6** *Results from Interview Q6: Change in opinion of EA*

|                    | MS |    | PE |    |
|--------------------|----|----|----|----|
|                    | M  | NM | M  | NM |
| Enhanced opinion   | 4  | 4  | 4  | 2  |
| Same opinion       | 4  | 1  | 5  | 9  |
| Diminished opinion | 1  | 5  | 0  | 2  |
| Don't know         |    |    | 1  | 0  |

**Table 8.6a** *Students' comments from PE Interview Q6 above*

|  | M | NM |
|--|---|----|
| Enhanced opinion - overcame computer illiteracy              | 1 | 1  |
| Enhanced opinion - EA clarified / explained lecture material | 3 | 1  |
| Opinion same - never liked it                                | 1 | 1  |
| Opinion diminished - didn't go with book                     | 0 | 1  |

**Table 8.7** *Further results from MS Interview Q6: Reasons for change/retention of opinion of EA.*

|   | M | NM |
|---|---|----|
| helps learning  | 3 | 3  |
| opinion enhanced <i>after</i> initial time spent using EA | 1 | 4  |
| not as keen as initially                                  | 1 | 2  |
| tutorials tedious   | 2 | 1  |
| some parts take a long time                               | 3 | 1  |
| examples not clear / problems understanding               | 0 | 2  |

PS respondents made no further comments from those presented in Table 8.6a as to the reasons for their enhanced opinions of EA, thus, the data shown in Table 8.7 present MS interview findings only.



There is an interesting difference between the two groups in opinion change over the semester. At the MS stage, only one M student's opinion had diminished, but five NM students had diminished opinions (Table 8.6), which is in line with the results of Question 5 (Table 8.5). This difference does not appear to exist by the PE interviews. By the PE interviews there is a noticeable difference in results for the NM group: a considerable upward shift in opinion has occurred.

It is interesting to note that the enhancement of opinion for four NM students occurred *after* they spent some time exploring EA (Table 8.7). Almost all remaining NM students had diminished opinions. This suggests that NM students did not perceive any benefits from EA use *until* they properly understood its use and capabilities. Although only one M student had indicated a diminished opinion of EA, five M students considered either the tutorials to be tedious or some parts to be time-consuming. Even so, it appears that M students in general found EA to be a valuable learning resource, indicated by almost all of them having the same or enhanced opinions of EA.

**Table 8.8** Results from Interview Q7: EA's most helpful feature

|  | MS |    | PE |    |
|--|----|----|----|----|
|  | M  | NM | M  | NM |
| control of learning process<br>(what, when, how) | 3  | 1  | 1  | 2  |
| interactivity                                    | 2  | 2  | 1  | 3  |
| quiz / self-testing                              | 5  | 4  | 6  | 13 |
| feedback   | 2  | 2  | 1  | 2  |
| tutorials  | 2  | 0  | 1  | 2  |
| concise / key concepts only                      | 1  | 1  |    |    |
| everyday examples                                |    |    | 3  | 1  |
| ease of use                                      |    |    | 0  | 2  |
| nothing helpful                                  |    |    | 0  | 1  |

Table 8.8 shows that both groups considered the quiz facility the most helpful feature, but there is some indication that control over the learning process may also be important to M students.

One NM student stated that "You can't get a computer the day before an economics test because everyone's doing EA". This indicates that perhaps all, but NM students in particular used it as a last minute checking resource, whereas M students possibly regarded EA as just another learning resource.

**Table 8.9** *Results from PE Interview Q9: Passed ECON101*

|            | <b>M</b> | <b>NM</b> |
|------------|----------|-----------|
| Passed     | 8        | 11        |
| Not passed | 2        | 2         |

**Table 8.9a** *Results from MS Q8 and PE Q9: Reuse of EA if ECON101 repeated*

|            | <b>MS</b> |           |     | <b>PE</b> |           |
|------------|-----------|-----------|-----|-----------|-----------|
|            | <b>M</b>  | <b>NM</b> |     | <b>M</b>  | <b>NM</b> |
| Yes        | 6         | 7         | Yes | 8         | 5         |
| No         | 0         | 1         | No  | 0         | 1         |
| More so    | 1         | 0         |     | 2         | 3         |
| Don't know | 1         | 2         |     |           | 1         |

This question was asked in order to provide a guide to students overall perceptions of EA. It appeared to be considered equally valuable by both groups, a result slightly at odds with the results regarding students' opinions of EA shown in Table 8.6. There is little difference shown, neither between the two study groups, nor the two interview times, in students' predictions of repeating EA use.

It is interesting to note from the PE results that all eight M students who passed ECON101 would use EA again (Table 8.9a), with the two who actually did not pass indicating strongly that they would use it more than before. Three of the eight NM students who said they would use EA again also suggested they would use it more than previously. One of those who failed said they would not use EA again, and the other failure "didn't know". There is possibly a slight increase in the numbers of students stating that they would use EA "more so", if they repeated ECON101, in the PE interviews. This could be viewed as "the wisdom of hindsight"!

The results for the PE version of this question were slightly different from those obtained for the same question in the Mid-semester interviews. In the post-exam interviews, all ten M students indicated that they would use EA again, an increase from seven. Although M students in general found EA helpful from the beginning of the semester, this result could indicate that M students find EA increasingly helpful as the semester continues, and they overcome any computer illiteracy or anxiety they may have had.

**Table 8.10** *Results from PE Interview Q10: Desired grade achieved.*

|     | <b>M</b> | <b>NM</b> |
|-----|----------|-----------|
| Yes | 4        | 11        |
| No  | 6        | 2         |

It appears that NM students were more satisfied with their final grades than M students (Table 8.10). Almost all NM students appeared to have achieved their desired grade, whereas less than half the M group had done so. Possible explanations could be:

- M group students have higher expectations. It is possible that a greater number of NM students would be satisfied with just a pass.
- M group students at first year level may not achieve as well as NM students. Reasons for this may be that they are unused to studying, have other commitments, and have less background knowledge in economics. They may also be unfamiliar with assessment requirements, examination procedures, and a university environment in general. However, Richardson (1995) states that “the academic performance of mature students...is at least as high as that of younger students.” This second explanation would appear to be less likely in light of this statement.

**Table 8.11** *Results from PE Interview Q10a: EA's contribution to grade.*

|                           | <b>M</b> | <b>NM</b> |
|---------------------------|----------|-----------|
| improved understanding    | 1        | 1         |
| 5% ( for the assignments) | 0        | 2         |
| 10% or more               | 2        | 8         |
| practice/revision         | 2        | 2         |
| made no difference        | 3        | 1         |

**Table 8.12** *Results from PE Interview Q10b: Other influential factors*

|  | <b>M</b> | <b>NM</b> |
|--|----------|-----------|
| Harder study/less time spent on other subjects | 3        | 2         |
| better tutors/tutors weren't good              | 2        | 1         |
| prior knowledge helped                         | 1        | 0         |
| interest in subject                            | 2        | 1         |
| more EA would help                             | 1        | 0         |
| textbook was good                              | 1        | 2         |

These two tables display results of questions asked only to those students satisfied with their grades, hence the lower number of responses.

It is interesting to note that, in Table 8.11, eight NM students felt able to 'measure' the contribution made by EA to their grade, but did not explain how that 10% was contributed. Three M students felt that EA had made no difference to their grades. Of those, one student found it hard to read from the computer, and another had earlier described himself as "computer illiterate".

Although the number of responses shown in Table 8.11 is small, the results appear to support the inference made above, that M students were generally dissatisfied with their achieved grades. M students were more able to provide information on factors that they considered would have improved their final grades, than NM students could.

**Table 8.13** *Results from Interview PE Q10c: Grade reflection of effort put into ECON101*

|     | <b>M</b> | <b>NM</b> |
|-----|----------|-----------|
| Yes | 2        | 1         |
| No  | 2        | 1         |

**Table 8.14** *Results from Interview PE Q10d: Reasons for desired grade not achieved*

|                                   | <b>M</b> | <b>NM</b> |
|-----------------------------------|----------|-----------|
| didn't know - studied/worked hard | 0        | 3         |
| lost interest                     | 2        | 1         |
| exam not what was expected        | 2        | 1         |

PE Questions 10c and 10d were asked of those who did not achieve their desired grade. There was an equal distribution of those students not achieving their desired grade as to whether their grades reflected the effort put into ECON101 (Table 8.13). NM students felt that they had studied hard and should have achieved good grades, but M students suggested that they had lost interest in the subject, and that the exam was very different from what was expected.

### 8.3 Interview Category 2: Access to EA

Questions in this group were concerned with student access to EA, and whether or not access, or perceived difficulty of access to EA, affected its use.

Questions in this category were:

- 1 Do you have a computer at home?
- 2 Do you have EA at home?
- 3 Why did you buy/not buy EA?

**Table 8.15** *Results from Interview Q1: Computer at home*

|                     | <b>MS</b> |           | <b>PE</b> |           |
|---------------------|-----------|-----------|-----------|-----------|
|                     | <b>M</b>  | <b>NM</b> | <b>M</b>  | <b>NM</b> |
| Computer at home    | 3         | 5         | 3         | 7         |
| No computer at home | 7         | 5         | 7         | 6         |

**Table 8.16** *Results from Interview Q2: EA at home*

|               | MS |    | PE |    |
|---------------|----|----|----|----|
|               | M  | NM | M  | NM |
| EA at home    | 3  | 0  | 3  | 2  |
| No EA at home | 7  | 10 | 7  | 11 |

In both the MS and PE interviews three M students had computers at home complete with EA. It appeared that a greater number of NM students had PCs at home, but EA was not common amongst the NM group.

**Table 8.17** *Results from Interview Q3: Reasons for purchase/ non-purchase of EA.*

|  | MS |    | PE |    |
|--|----|----|----|----|
|  | M  | NM | M  | NM |
| appeared to be useful study guide/<br>learning aid | 3  | 0  | 2  | 1  |
| easier at home/no access problems                  | 3  | 0  | 1  | 1  |
| would buy if had own computer                      | 3  | 2  |    |    |
| available on campus                                | 1  | 9  |    | 2  |
| didn't know it was available                       | 1  | 0  |    |    |
| given EA/purchased with textbook                   |    |    |    | 2  |
| wouldn't use it                                    |    |    |    | 3  |

The three M students with computers at home also had copies of EA at home, whereas no NM students, even those with computers had copies of EA (Tables 8.15, 8.16).

The question of cost was mentioned by two M students; one considered it costly, but had still purchased a copy of EA, the other considered it to be cheap with the textbook. Two M, and one NM, student(s) would have "gone halves" with other students. The major difference between the two groups in the MS interviews is shown in Table 8.17. This apparently explains why no NM students have their own copies of EA; there are a large number of NM students who consider EA's availability on campus sufficient for their needs. Only one M student gave this as a reason for their non-purchase of EA.

**Table 8.18** *Results from PE Interview Q4: EA use affected by unrestricted computer access*

|                                | <b>M</b> | <b>NM</b> |
|--------------------------------|----------|-----------|
| Yes                            | 5        | 6         |
| No                             | 3        | 3         |
| n/a (computers at home) or d/k | 2        | 4         |

**Table 8.19** *Results of PE Interview Q5*

|                              | <b>M</b> | <b>NM</b> |
|------------------------------|----------|-----------|
| would use more               | 2        | 5         |
| PC used for things had to do | 2        | 0         |
| dislike of computers         | 1        | 0         |
| didn't have access problems  | 1        | 2         |
| no time anyway               | 0        | 1         |

**Table 8.20** *Results from PE Interview Q6: Residence in Halls*

|     | <b>M</b> | <b>NM</b> |
|-----|----------|-----------|
| Yes | 3        | 3         |
| No  | 7        | 10        |

**Table 8.21** *Results from PE Interview Q7: Worth of PC investment for CAI packages*

|     | <b>M</b> | <b>NM</b> |
|-----|----------|-----------|
| Yes | 8        | 7         |
| No  | 2        | 5         |

It appears that M students are more in agreement with the purchase of a PC to use CAI packages than NM students (Table 8.21). Reasons why are presented in Table 8.22:

**Table 8.22** *Analysis of comments received in conjunction with PE Interview Q7*

|                                       | <b>M</b> | <b>NM</b> |
|---------------------------------------|----------|-----------|
| so you can use CAI packages           | 2        | 4         |
| Convenience e.g. at home              | 4        | 2         |
| no pressure for lab computers         | 2        | 1         |
| if computer needed for other subjects | 2        | 2         |
| should invest in PC anyway            | 1        | 0         |
| not if available here (at LU)         | 2        | 2         |
| not is same as textbook               | 1        | 0         |

Use of EA by students in both groups appear to be affected by access to computers, with five members of the NM group commenting that they would have used EA more (Table 8.19).

Those resident in the Halls were asked "Would having a networked computer in your room have affected your use of EA?" Only one M student felt that their EA use would have been affected. Comments received from students in the Halls suggested that they were more prepared to use the computers outside normal University daytime hours, and thus did not have access problems. A number of reasons were given, but it appears that the main reason for PC purchase in the M group was the convenience factor (Table 8.22). NM students indicated more strongly that purchase of a PC would be driven by the availability of CAI packages.

### **8.3.1 EA Introductory Session**

Throughout their responses to the above questions a number of students made reference to the fact that their use of EA was affected by the lack of an initial instruction session with it. Such comments may have been made in response to any of the questions asked. Analysis of these comments is as follows:



**Table 8.23** *Analysis of comments referring to an introduction to EA*

|  | <b>M</b> | <b>NM</b> |
|--|----------|-----------|
| needs help to start, i.e. a lab or intro session | 2        | 3         |
| confusion at first                               | 1        | 3         |
| found own way through                            | 2        | 1         |
| didn't realise its full potential                | 1        | 0         |
| should have a booked lab time                    | 0        | 2         |
| didn't expect to learn from computers            | 1        | 4         |

No specific question such as “ Would an introductory session have improved your use of EA?” was asked. The comments offered above (Table 8.23) were often in response to a question such as “ Has your opinion of EA changed over the course of the semester?” Given that no specific question on the effect of an introductory session was asked, the numbers of students volunteering each comment are quite significant. A number of NM students responses made reference to the fact that no initial instruction for EA was given, and that they were expected to find out how to use it for themselves. A few M students commented on this, but also indicated that the instructions were “clear enough”, and that this had caused no difficulty. NM students appeared to find the lack of instruction something of a stumbling block, and appeared to have not made much effort to discover EA's use for themselves.

It was also surprising to find four NM students commenting that they did not expect to learn from computers. These students are more likely to have been exposed to computers at school, and perhaps could be expected to be more used to using computers as learning resources.

### 8.3.2 Results and Discussion of Category PE Interview Category 2a: *Factors affecting EA use*

**Table 8.24** *Results from Interview Q1: Closeness of EA to lecture material*

|                  | M | NM |
|------------------|---|----|
| Closely          | 1 | 1  |
| Fairly closely   | 7 | 6  |
| Somewhat closely | 1 | 6  |

**Table 8.24a** *Analysis of the question "Was this good or bad?"*

|      | M | NM |
|------|---|----|
| Good | 7 | 7  |
| Bad  | 0 | 2  |

Students were also asked why they considered EA's closeness/non-closeness to be good or bad. Their comments are presented in Table 8.24b below.

**Table 8.24b** *Results of the question "Why?"*

|   | M | NM |
|---|---|----|
| Backed-up/reinforced/clarified lecture material | 3 | 6  |
| EA provided more/better examples                | 1 | 5  |
| Concise/key concepts only                       | 2 | 1  |
| Needs to follow lecture material                | 4 | 3  |
| Should only contain examinable material         | 2 | 3  |
| Picture "muddied" because EA didn't follow      | 0 | 1  |

ECON101 was taken by four different lecturers during the semester, with a lecturer who spoke English as a second language for a major part of the second half of the semester. When asked if the changes in lecturer affected their use of EA, students replied:

**Table 8.25** *Results from Interview Q2: Effect of changes of lecturer.*

|     | <b>M</b> | <b>NM</b> |
|-----|----------|-----------|
| Yes | 3        | 6         |
| No  | 7        | 7         |

Their comments as to the way in which EA use was affected were grouped as follows:-

**Table 8.25a** *Results of the question "In what way?"*

|   | <b>M</b> | <b>NM</b> |
|---|----------|-----------|
| change of style                                 | 1        | 2         |
| couldn't understand                             | 2        | 3         |
| lost interest                                   | 2        | 0         |
| missing info / recognised<br>knowledge was poor | 1        | 3         |
| no tutor available / poor<br>tutorials          | 1        | 0         |
| didn't use EA more anyway/<br>no time           | 3        | 2         |

On the whole, students appeared to consider EA as following the lecture material fairly closely (Table 8.24), although the degree of closeness was on average less in the NM group. Most students felt that this degree of closeness was good (Table 8.24a). Reasons for this were varied, as shown in Table 8.24b, but back up or reinforcement was mentioned by both groups. The provision of more or better examples was important to the NM group. There was a fairly strong feeling that the content of EA should follow the lecture material, and that only examinable material should be included. A further question was asked at this point: "Would being presented with a broader range of examples have been more helpful?" Very few students felt able to answer that question. Most responded with "Don't know".

Table 8.25 shows that the changes of lecturer appeared to affect EA use more in the NM group than the M group. General comments suggest that M students were more able to cope with the very different lecturing style, and the strongly accented English of the last lecturer. Some comments were received that suggested that students had been affected by the change in lecturer, but for some reason, possibly lack of time, had not used EA more (Table 8.25a).

## 8.4 Results and Discussion of Category 3: Other Applications of CAI

**Table 8.26** Results from Interview Q1: CAI as learning resource in other subjects

|                  | MS |    | PE |    |
|------------------|----|----|----|----|
|                  | M  | NM | M  | NM |
| all / everything | 5  | 1  | 0  | 2  |
| science          | 3  | 4  | 7  | 10 |
| stats / maths    | 2  | 3  | 2  | 2  |
| engineering      |    |    | 1  | 0  |
| marketing        |    |    | 0  | 1  |
| none             |    |    | 0  | 1  |

**Table 8.27** Results from Interview Q2: Why CAI seen as desirable

|  | MS |    | PE |    |
|--|----|----|----|----|
|  | M  | NM | M  | NM |
| control                                      | 6  | 2  | 0  | 0  |
| interactivity                                | 3  | 0  | 0  | 2  |
| quiz / self-testing                          | 2  | 4  | 5  | 4  |
| feedback                                     | 2  | 1  | 1  | 1  |
| concise / key concepts only/more interesting | 1  | 0  | 1  | 3  |
| additional / reinforcement to learning       | 4  | 4  | 5  | 2  |
| extra exercises / calculations               | 0  | 4  | 3  | 2  |

At the MS point, Table 8.26 shows that the M students tended to be quite enthusiastic about having packages similar to EA available in other subjects, demonstrated by five of them responding with “all” or “everything”. By the end of the semester, it appeared that science subjects were the most popular choice for both groups.

The question asking why students would like something like EA to be available in other subjects produced, as expected, a range of responses (Table 8.27) similar to those for the question “What is the most helpful thing about EA?” (Table 8.8). However, in this set of responses, “control” over the process of what, when and how something was undertaken was important to the M students at the MS point. This reason changed by the PE point; the self-testing feature and learning reinforcement features offered by CAI were more important to the M students. The shift in emphasis is possibly not unexpected as students focus on revision for

examinations towards the end of the semester. The pattern of NM students' responses was very similar to that received for the earlier question on the most helpful feature of EA, and little difference was shown in their responses as to why CAI was considered desirable across the two interview times.

**Table 8.28** *Results from PE Question 3: Use of other CAI or assessment packages*

|     | <b>M</b> | <b>NM</b> |
|-----|----------|-----------|
| Yes | 4        | 7         |
| No  | 5        | 6         |

**Table 8.28a** *Results from the question "Did using that affect your use of EA?"*

|     | <b>M</b> | <b>NM</b> |
|-----|----------|-----------|
| Yes | 4        | 3         |
| No  | 6        | 6         |

**Table 8.28b** *Results from the question "Did use of CBL at school affect your use of packages here at Lincoln?"*

|     | <b>M</b> | <b>NM</b> |
|-----|----------|-----------|
| Yes | 0        | 0         |
| No  | 5        | 9         |

It is not clear from the above results whether use of other CAI packages affected student use of EA. The four M students who considered that it did do so, were most emphatic about the negative effect of one other piece of CAI encountered at Lincoln University. As in the earlier survey, the main CAI "culprit" affecting EA use appears to be the first year accounting package. Completion of the sections in this package was a requirement of the accounting course. Students in general reported spending a "lot" of time on this, leaving no time for EA use, or inducing a feeling of being "fed up" with CAI, and no desire to use other packages. There appeared to be a strong feeling of resentment amongst students against the requirements of the accounting paper. "If I didn't have to do the accounting..." was a frequently heard comment. The impression gained was that experiences with the accounting package impacted badly on student use of EA.

Two M students, who described themselves as "computer illiterate" felt that prior exposure to CAI packages would have introduced them to the concept of learning with a computer, and also provided some "driving" experience.

When asked about use of CAI packages at school (Table 8.28b), a small number of NM students reported using packages they considered to be CAI at school, but none felt that that affected their use of EA in any way.

## 8.5 Final Comments

Results from the MS and PE interviews have been presented together wherever possible throughout this chapter. However, the nature of the final comments received from the two sets was considered too diverse and they are presented separately.

### 8.5.1 MS Final Comments

Many of the comments collected fell outside the categories defined above. Some of the more interesting of these final comments are noted below.

At the MS stage, an important difference in comments received from the two groups was that seven of the nine comments from M group students specifically mentioned that EA had contributed to the learning process. Typical M group comments were:

- “ I can put it together to see if I understood it”
- “ I wanted to test my understanding. Could I do an exam question?”
- “Much better learning than on paper.”
- “Never done CBL before, but it was helpful to me.”
- “...reinforcement of textbook and lectures.”
- “EA contributed to my progress.”

In contrast only one of the final NM responses contained any reference to EA being useful. This student stated:

- “I don't like using computers, prefer not to. Even so, I still find EA useful.”

The final responses from the NM group tended to focus on very different aspects of EA, which could also be described as side issues. The main thrust of comments made was:

- time taken to use EA
- difficulty getting access to a computer
- only 1% was obtained by completing an EA assignment

Final comments from NM group students tended not to pertain to EA itself, but some aspect related to its use, and were often in the form of a complaint.

Some students still had their first impressions of EA uppermost in their minds. It was considered quite surprising to find students commenting on their initial reactions, even though they had had several weeks in which to use EA. Examples of this type of comment were:

- “I was surprised to find it (EA). I was quite upset, I'd never used computers.”

“Not surprised, had one (a CAI package) for chemistry at school.”

Both comments were made by NM students, but exhibit widely different reactions to EA.

Four of the final NM responses referred to the fact that lack of time affected their use of EA.

Typical comments were:

“Just flick through, don’t take it in. Some tutorials quite long, just want to get it over and done with.”

“Wouldn’t do more than 20 minutes on EA. Get tired of answering.”

Overall, a strong impression was received that NM students found EA, at this stage in the semester, just one more thing to do. Certainly, this impression was not formed from the collective reading of M student responses. Rather, an impression was gained that M students were finding EA a valuable learning resource.

### **8.5.2 PE Final Comments**

Students were again encouraged to talk freely and give an overall general comment, or comment on CAI, or any aspect of it that the oral questions had not addressed. Analysis of these comments can be found in Table 8.29, below. Three M, and one NM student chose to terminate the interview at this point, and did not give a final comment. The comments received were evaluated as to whether they were generally positive or negative. Of the seven M comments, five were generally positive, and of the 12 NM comments, 10 were generally positive.

The content of these overall comments was analysed for key words or phrases as follows:

**Table 8.29** *Analysis of PE final comments*

|   | <b>M</b> | <b>NM</b> |
|---|----------|-----------|
| generally positive  | 5        | 10        |
| would recommend it to others  | 2        | 2         |
| need to be computer literate to benefit                                   | 2        | 4         |
| prefer to learn from other resources                                      | 1        | 1         |
| mentioned non-availability next semester                                  | 1        | 2         |
| complements the subject material in some way/provides something different | 0        | 4         |

Those students who preferred to learn from other sources still recognised benefits in the use of CAI.

In the second semester offering of ECON101, it was decided not to make EA available to students. Three students, one M and two NM, specifically commented on this decision as follows:

“surprised to find EA not available”

“students are missing out”

“I think it’s terrible that EA is not available. I wanted to do this interview to help other students, because I thought it was so good”

Such comments support the impression that EA’s worth is being appreciated at a very late stage in the semester.

## 8.6 Summary

The EA usage data (Chapter 5) shows that M students used EA on average twice as much as NM students. The reasons why are not clear. The findings of the MS and PE surveys presented in Chapter 7, showed little difference between the two study groups by the end of the semester in their manner of use, or attitudes towards EA. It was hoped that analysis of the interview responses would clarify the reasons why the difference in use of EA was found.



Both groups of students used EA for very similar reasons. The NM students exhibited a “catch-up” mode of use. There was a clear indication that an introductory guidance session may have increased EA use by both groups. There were apparently different rates of take-up between the two groups which could warrant further study. Such take-up differences may be removed by the incorporation of an introductory session. There was moderate support for further use of EA once initial start-up obstacles were overcome.

Whilst it appears that EA was found to be helpful by students, caution should be exercised in the introduction of CAI into a subject. The context should be taken into account and potential interactions between CAI packages carefully evaluated to ensure CAI packages do not adversely impact on each other.

Analysis of the interview data did not yield the information expected. At this point, it remains unclear why the increased use of EA, as presented in Chapter 5, was made by M students.

## CHAPTER 9 — CONCLUSION

### 9.1 Conclusions

It was necessary to define the term “Mature” before this study commenced (Chapter 4). It appears that the adoption of the criterion of a two-year break in formal education would be sufficient to categorize students as Mature or Non-Mature in future studies involving mature students. This would reduce the amount of demographic data necessary. The definition can be considered experimental in itself and it may be useful to re-examine the data to investigate the proportion of NM students who possibly should be classified as “Mature”.

The study contained in this thesis has revealed some significant differences between the two groups, M and NM, suggesting that the criteria adopted have indeed captured the essence of maturity, and validated the definition of “mature” used in this study.

Some differences in the backgrounds of the two groups do exist, for example, M students appear to have had more tertiary education, but less computing experience than NM students have. These differences were not considered to have an impact on the outcomes of this study and it appears that lack of prior computing experience has not influenced the use of EA by M group students. However, M students have more children and jobs than NM students do, which may well influence their learning behavior.

Patterns of EA access across the semester were very similar for both study groups; use of EA peaked in weeks which corresponded with an assignment due date. There was a decline in use for both study groups towards the end of the semester. Interesting points to note were that the mature students “got to grips” with EA from the first week of the semester, and appeared to discover for themselves how to use it. Findings from the interview data corroborated this; M students found the instructions “clear enough” whereas NM students appeared to need an introductory session and an explanation of EA’s features in order to get them started on using EA.

There was a strong indication that an introductory session would benefit both groups. The impression was gained from the interview data that NM students considered use of EA as just “something else to be done” as well as undertaking study from the text book and lecture notes and not as a substitute for learning from these resources. It is possible that an introductory

session would improve NM students' appreciation of the reduction in study time afforded by CAI use.

Findings of the MS survey and interviews suggest that, at the MS point, M students were finding the interactive and graphical manipulation features of EA helpful. Having familiarised themselves with EA earlier than NM students, M students seem to have discovered the value of EA use to their study of economics. This is something of a contrast with NM students, who appeared to use EA just as a revision tool. This impression is borne out by the EA usage data; it shows high use of EA by NM students on days designated for progressive tests. Again, an introductory session may modify this use by NM students.

Throughout the interviews, the impression was gained that M students found EA helpful. They appear to use the tutorial mode more than NM students do, and this is consistent with the finding that the graphical manipulation feature of EA was of value. The impression was gained that NM students came to appreciate the value of EA "after the event".

In general, M students appeared to have an enhanced opinion of EA. This may arise from their early use of the package, and thus an earlier appreciation of its value. The overall picture obtained is that NM students "catch up" with EA use by the end of the semester. There was only one significant difference, that of purchase of EA for home use, between M and NM students at the 1% level across the MS and PE surveys.

M students appear to have found EA of sufficient value to purchase copies for home use. This, however, does not appear to be so much a reflection of the helpfulness of EA, but rather a reflection of their different life style. The impression was also received that M students appreciate the control offered by CAI.

The results detailed in Chapter 5 do verify the impressions gained from the pilot study. On average, M students were found to have used EA for approximately twice the amount of time it was used by NM students. This finding suggests therefore, that the anecdotal evidence of M students' greater use of CAI packages, and the indications of that use from the pilot study, is indeed real.

The reasons for this difference in use are not clear, however. There were no significant differences found in the mode of use of EA, in the patterns of access to it, or in any other usage characteristic. There is a generally held opinion amongst tertiary educators that mature students "work harder". This ethic could explain the increased use of EA shown by mature students. Equally, it could be explained by the fact that M students may place higher demands upon

themselves, and appeared to be less satisfied than NM students with their grades. This difference suggests that M students may make use of any learning resource available to them in order to achieve good grades. This may contribute to the explanation of why M students used EA more than NM students. Another reason for this difference may be that M students started the semester with the perceptions that EA could be helpful to their studies, whereas NM students took longer to develop an appreciation of the worth of EA.

In summary, it was found in this study that M students did indeed use EA more than NM students. It should be kept in mind that no logging of home use of EA could be undertaken. M student use was approximately twice that of NM students. It is likely, therefore, that this difference in amount of use would be even greater.

## 9.2 Further Research

It appears that NM students “catch up” with the M students in their appreciation of EA by the end of the semester. This suggests that further studies of this nature do not need to incorporate a mid-semester survey. Neither does it appear necessary to collect data on prior computing experience; the lack of this amongst the M group students appeared to have little impact on their use of EA.

The definition of the term “mature” warrants further study to ascertain whether a 2 year break in formal education could be used alone as the criteria for classification. There was a strong indication that this factor is a useful discriminator between the two groups.

Indications were also received that further study involving mature use of CAI should focus as much on lifestyle as on the contributions CAI is known to make to the learning process. There is evidence that it is not these CAI characteristics that encourage mature students to make more use of CAI; rather, it appears that convenience and control are more powerful influences.

Mouse click and key press data was automatically collected along with the data required for this study. It was anticipated that such data would give a measure, although somewhat crude, of the levels of interactivity with EA. This data has been given a cursory examination at this stage. It appears that, as might be expected, the numbers of mouse clicks and key presses follow a similar weekly pattern as that given in Chapter 5. The number of mouse clicks and key presses are related to time, as might be expected. However, initial analysis suggests that time accounts for only 60% of the variation observed, and that further in-depth analysis of this data may yield

differences in behaviour between the two groups and, thus, help to explain the differences in usage data obtained in this study.

It would be helpful to have an understanding as to the reality of student perceptions. To this end, it is planned to match individual student survey responses to the EA usage data. Most M students indicated that they used EA six or more times during the semester. A useful measure of the reliability of student perceptions of use could be obtained from this exercise.

This study investigated only one instance of CAI package use. It would be of value to repeat this study with other packages, and in other tertiary institutions, to validate the differences found here between the two groups.

It appears that mature students appear to appreciate the control offered by the inclusion of CAI packages as learning resources. These students would benefit from further studies involving subjects offering increased CAI resources, as an alternative to formal lectures and tutorials, thus lessening the requirement for attendance at formal lectures. Self-checking features also aid in the development of M student confidence, providing benchmarks for their progress in a subject. There appears to be differences in the way mature and younger students go about their studies.

Any further study of differences between mature and nonmature students should incorporate a structured introductory to the CAI package, such that students are made aware of its operation, and also of its value to their studies. This would help ensure that both study groups began CAI with a similar understanding of its worth.

With expanding numbers of mature students in tertiary education, the need to provide flexibility of learning is becoming increasingly demanding. CAI may have an important role to play in the provision of tertiary education, and may well prove to be an attractive option for mature students. Any study that provides information on the way mature students interact with CAI, or on their perceptions and attitudes to its inclusion in their learning, must be considered to be of importance.

## BIBLIOGRAPHY

- Anon. "Economics in Action (1993)" Economics Software Reviews, College of Business Administration, University of Nebraska  
<http://www.cba.unl.edu/additional/econed/ncree/reviews/18.htm> (9<sup>th</sup> March, 2001)
- Burgess, Y. & Trinidad, S. (1991) Perceptions of Computers. What do five year olds think? *Australian Educational Computing*, May 1991, 16 - 18.
- Chang, V. & Palmer, J. (1997) Three Instructional Principles Applied to Computer-based Learning (CBL) in Subjects with Large Enrolments. Curtin University of Technology  
<http://hsb.baylor.edu/ramsower/ais.ac.97/papers/chang.htm>
- Devlin, M. (1996). Older and Wiser?: A Comparison of the Learning and Study Strategies of Mature Age and Younger Teacher Education Students. *Higher Education Research and Development*, 15: 51-59.
- Durndell, A., et al. (1990). Gender differences and computing in course choice at entry into higher education. *British Educational Research Journal*, 16, 149-62.
- Dundell, A, & Thomson, K. (1997). Gender and computing: a decade of change? *Computers and Education*, 28, 1-9
- Kemp, J. E. & Smellie, D. C. (1994). *Planning, Producing and Using Instructional Media*. New York, NY : Harper Collins College Publications.
- Knight, S. & MacDonald, R. (1982) Adult Learners in Higher Education : some study problems and solutions from Australian experience. *British Journal of Educational Technology*, 3, 13, 237-46.
- Kulik, C. C., Kulik, J. A., & Shwalb, B. J. (1986) The effectiveness of computer-based adult education : A meta-analysis. *Journal of Educational Computing Research*, 2, 2, 235 - 252.
- Lapin, L. (1990) *Statistics for Modern Business Decisions*. 5<sup>th</sup> Edition. Harcourt Brace Johanovich U.S.A
- Latta, J. & Bransgrove, E. (not stated) Gender and Technology Literature Review  
<Http://rice.edn.deakin.edu.au/RJ/LitGen.HTML>
- Lightbody, P. & Durndell, A. (1996). The masculine image of careers in science and technology: fact or fantasy? *The British Journal of Educational Psychology*, 66, 231-46
- Lowden, K., Munn, P., & McDonald, C. (1990) Attitude and Access to Adult Education : A review of the literature with special reference to vocational education and training. Edinburgh : *The Scottish Council for Research in Education*
- Munn, P., MacDonald, C. & Lowden, K. (1992). Helping Adult Students Cope: Mature Students on Science, Mathematics and Engineering Courses. *Scottish Council for Research in Education Report No. 39*. pp 60 ISBN-0-947833-70-6.
- Najjar, L. (1996). Multimedia information and learning. *Journal of Educational Multimedia and Hypermedia*, 5, 129-150.
- Rachal, J. R. (1984). The Computer in the ABE and GED Classroom : A Review of the Literature. *Adult education Quarterly*, 35, 2, 86 - 95.

- Rachal, J. R. (1993). Computer-Assisted Instruction in Adult Basic and Secondary education : A Review of the Experimental Literature, 1984 - 1992. *Adult Education Quarterly*, 43, 3, 165 - 172.
- Reisenberg, L. E., & Gor. C. O (1989). Farmers' Preferences for Methods of Receiving Information on New or Innovative Farming Practices. *Journal of Agricultural Education*, 30,3, 7 - 13.
- Richardson, J. T. E. (1994). Mature students in higher education: academic performance and intellectual ability. *Higher Education* 28, 373-386
- Richardson, J. T. E. (1994). Mature students in Higher Education: I. A literature survey on approaches to studying *Studies in Higher Education* 19, 3, 309-325
- Richardson, J. T. E. (1995). Mature students in Higher Education: II. An investigation of approaches to studying and academic performance. *Studies in Higher Education* 20, 1, 5-17
- Sadler-Smith, E. (1996) Approaches to studying: age, gender and academic performance *Educational Studies*, 22,3, 367-379
- Salehi, Saeed, & others (1989) Maryland's Statewide Educational Technology Network : Description and Evaluation. *Research and Evaluation Report*. Baltimore : Maryland State Department of Education.
- Saputo, H. N., & Frieman, L. C (1984). Overcoming the problems of adult WP students - but not overlooking them. *Business Education Forum*, 38, 4, 21 - 24.
- Schwier, R. A., (1993). *Interactive Multimedia Instruction*. Englewood Cliffs, N. J. : Educational Technology Publications.
- Selby, L. & Ryba, K. (1994) Creating gender equitable computer learning environments. *Journal of Computing in Teacher Education*, 10, 7-10
- Stuedahl, D. & Braa, K. Where have all the women gone - from computer science? Department of Informatics, University of Oslo.  
<http://www.ifi.uio.no/~systarb/Jenter.og.IT/tmv-artikkel.html> (9<sup>th</sup> March, 2001)
- Trueman, M. & Hartley, J. (1996). A comparison between the time-management skills and academic performance of mature and traditional-entry university students. *Higher Education* 32: 199-215
- Weems, W. (1996) Academic Medicine Article. Learning and Technology Working Group <http://www.uth.tmc.edu/hpermal/learn-tech/0020.htm>
- Zeffane, R. & Cheek, B. (1993). Profiles and correlates for computer usage: A study of the Australian telecommunications industry. *Computers in Industry*, 22, 1 53 - 69.

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# APPENDICES

## Appendix 1

### ECON101 Assessment Timetable 1995

| Week          | Day      | Date     | Time    | Assessment Type      | Weighting (%) |
|---------------|----------|----------|---------|----------------------|---------------|
| 2             | Monday   | 6 March  | 11:00am | EA Test 1            | 1             |
| 4             | Monday   | 13 March | 11:00am | Written Assignment 1 | 5             |
| 5             | Thursday | 23 March | 5:30pm  | Progressive Test 1   | 10            |
| 6             | Monday   | 27 March | 11:00am | EA Test 2            | 1             |
| 7             | Monday   | 3 April  | 11:00am | Written Assignment 2 | 5             |
| 8             | Monday   | 10 April | 11:00am | EA Test 3            | 1             |
| 9             | Thursday | 4 May    | 5:30pm  | Progressive Test 2   | 10            |
| 10            | Monday   | 8 May    | 11:00am | Written Assignment 3 | 5             |
| 11            | Monday   | 15 May   | 11:00am | EA Test 4            | 1             |
| 12            | Monday   | 22 May   | 11:00am | Written Assignment 4 | 5             |
| 13            | Monday   | 29 May   | 11:00am | EA Test 5            | 1             |
| 14            | Monday   | 5 June   |         | No assessment        |               |
| Study<br>Week |          |          |         |                      |               |
|               | Friday   | 23 June  | am      | Final Exam           | 55            |

## Appendix 2

### Study Schedule

| Week Number          |   |   |   |   |   |   |           |   |   |    |    |    |    |    |            |
|----------------------|---|---|---|---|---|---|-----------|---|---|----|----|----|----|----|------------|
| Data Collection Type | 1 | 2 | 3 | 4 | 5 | 6 | 7         | 8 | 9 | 10 | 11 | 12 | 13 | 14 | Study Week |
| Check Points         |   |   |   |   |   |   | <i>MS</i> |   |   |    |    |    |    |    | <i>PE</i>  |
| Automatic data       | ➔ |   |   |   |   |   |           |   |   |    |    |    |    |    |            |
| Survey 1             |   |   |   |   |   |   |           |   |   |    |    |    |    |    |            |
| Survey 2             |   |   |   |   |   |   |           |   |   |    |    |    |    |    |            |
| Survey 3             |   |   |   |   |   |   |           |   |   |    |    |    |    |    |            |
| MS Interviews        |   |   |   |   |   |   |           |   |   |    |    |    |    |    |            |
| PE Interviews        |   |   |   |   |   |   |           |   |   |    |    |    |    |    |            |

## Appendix 3

### Survey Questionnaires

#### Survey 1

##### ECON101 Class Survey

The information from this questionnaire will be used to assess how computers can be used to help students with their studies in ECON101 and other subjects.

Please complete this questionnaire by circling the appropriate option, ticking a box or boxes, or filling in the blank.

1. Sex M / F
2. Age. Are you...
  - 1  under 21
  - 2  older than 20 and less than 25
  - 3  25 or older
3. What degree are you studying for, (for example, B.C.M.)? \_\_\_\_\_
4. Did you go to primary school in New Zealand? Yes / No
5. For how many years did you attend secondary school? \_\_\_\_\_
6. Tertiary education.  
Please tick the following boxes if they apply to you. Tick none, one, or all boxes.
  - 1  I have completed one or more university degrees
  - 2  I have partially completed a university degree
  - 3  I have completed one or more polytechnic qualifications
  - 4  I have partially completed a polytechnic qualification
  - 5  Other tertiary education, please specify \_\_\_\_\_
7. Will you be studying ..... Part time / Full time
8. At **any** time between **starting** secondary school and now, have you had a break of **2 years or more** from formal education? Yes / No
9. Do you have a dependant child / children? Yes / No
10. To attend Lincoln University, do you have to take time off work, which either must be made up, or is allowed by your employer? Yes / No

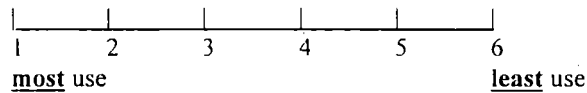
**Please turn over**

11. Please tick **only one** of the following statements about "Economics in Action". Choose the statement that best fits you.

- 1  I do not intend to use it at all.  
 2  I will only use it because it is worth 5% of the subject marks.  
 3  I intend to use it for more than just the 5%.  
 4  I plan to use it a lot.

12. Do you intend to buy, or have you already bought, a copy of Economics in Action for home use? Yes / No

13. Please write a number in the box beside each of the following according to how much you expect to use them to help you learn about Economics in this course. Use the scale below. Use each number **once only**



- 1  individual help from tutor  
 2  textbook  
 3  library books or other sources of information  
 4  lecture notes  
 5  Economics in Action  
 6  Other, please specify

14. Please tick one of the following statements that best describes your computer experience.

- 1  I have never used a computer.  
 2  I have used a computer only a few times.  
 3  I have used a computer quite often.  
 4  I am a very experienced computer user.

15. Are you taking COMP101 this semester? Yes / No

If you answered **No**, is that because you...

- 1  Have a credit for, or have already passed, COMP101?  
 2  Do not intend to take COMP101?  
 3  Intend to take it later?

**Please turn over**

The following information will be kept confidential. There will be no use of names or personal details in any subsequent research reports.

15. Student ID : \_\_\_\_\_

Name (optional) : \_\_\_\_\_

Thank you very much for completing this questionnaire.  
Helen McFarlane, CCB

February, 1995.

## Survey 2

### ECON101 Class Survey

This survey is a follow-up to the one conducted at the beginning of the semester. The information from this questionnaire will be used to assess how computers can be used to help students with their studies in ECON101 and other subjects.

Please complete this questionnaire by circling the appropriate option, ticking a box or boxes, or filling in the blank.

1. Age. Are you...
  - 1  under 21
  - 2  21 - 24
  - 3  25 or older
  
2. Are you enrolled in a Commerce degree (e.g. B.C.M., B.Com.(Tourism), etc.)? Yes / No
  
3. Have you come to New Zealand especially to study? Yes / No
  
4. Do you have Economics in Action at home? Yes / No
  
5. Think about how much you expected to use Economics in Action at the beginning of the semester. Do you use it...
  - 1  less often than you expected?
  - 2  the same as you expected?
  - 3  more often than you expected?
  
6. Think about how helpful you thought Economics in Action would be at the beginning of the semester. Is it...
  - 1  less helpful than you thought?
  - 2  equally as helpful as you thought?
  - 3  more helpful than you thought?
  
7. Which option in Economics in Action helps you learn best? Please tick only one.
  - 1  tutorial
  - 2  free mode
  - 3  quiz

**Please turn over**

8. When you do a **tutorial** in Economics in Action, do you change the variables in the graphs as suggested by the "ACTION" statements?
- 1  no
- 2  sometimes
- 3  most of the time
- 4  always
9. When you do a **quiz** in Economics in Action, do you change the variables in the graphs to help you answer the questions?
- 1  no
- 2  sometimes
- 3  most of the time
- 4  always
10. How many times have you used Economics in Action since the start of the semester?
- 1  never
- 2  only once
- 3  two or three times
- 4  four to six times
- 5  more than six times
11. Do you think using Economics in Action has helped you to get better marks in your assessments so far? Yes / No
12. Would you like a computer package like Economics in Action to be available for your other subjects? Yes / No
13. Do you have a copy of Economics in Action for home use? Yes / No
- Please turn over**



14. Please tick **only one** of the following statements about "Economics in Action". Choose the statement that best fits you.

- 1  I do not use it at all.
- 2  I only use it because it is worth 5% of the subject marks.
- 3  I use it for reasons other than just the 5%.
- 4  I use it a lot.

15. Please place a **cross** on the line beside **each** of the following according to how helpful each one is to your learning about Economics in this course.

|   | <u>little</u> help                          | <u>lots</u> of help |
|---|---|---------------------|
| individual help<br>from tutor/lecturer                      | -----                                       | -----               |
|   | 1      2      3      4      5      6      7 |                     |
| textbook  | -----                                       | -----               |
|   | 1      2      3      4      5      6      7 |                     |
| library books   | -----                                       | -----               |
|   | 1      2      3      4      5      6      7 |                     |
| lecture notes   | -----                                       | -----               |
|   | 1      2      3      4      5      6      7 |                     |
| Economics in Action   | -----                                       | -----               |
|   | 1      2      3      4      5      6      7 |                     |
| previous tests and<br>papers                                | -----                                       | -----               |
|   | 1      2      3      4      5      6      7 |                     |
| help from others, e.g. parents<br>fellow students, friends. | -----                                       | -----               |
|   | 1      2      3      4      5      6      7 |                     |

**Please turn over**

16. Why do you use, or not use, Economics in Action?

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17. I would very much like to talk to you personally about your opinion of Economics in Action, be it good or bad. Can you spare me ten to fifteen minutes at a time that suits you?

Yes / No

**CONFIDENTIAL** \_\_\_\_\_

The following information will be kept confidential. There will be no use of names or personal details in any subsequent research reports.

Student ID : \_\_\_\_\_

Name (optional) : \_\_\_\_\_

Thank you very much for completing this questionnaire.  
Helen McFarlane, CCB

April, 1995.

## Survey 3

### ECON101 Post-Exam Survey

This survey is a follow-up to those conducted during the first semester. The information from this questionnaire will be used to assess how helpful computers were considered to be to students in their study of Economics.

Please complete this questionnaire by circling the appropriate option, ticking a box or boxes, or filling in the blank.

1. Age. Are you...
  - 1  under 21
  - 2  21 - 24
  - 3  25 or older
  
2. Are you enrolled in a Commerce degree (e.g. B.C.M., B.Com.(Tourism), etc.)? Yes / No
  
3. Have you come to New Zealand especially to study? Yes / No
  
4. Do you have Economics in Action at home? Yes / No
  
5. Think about how much you expected to use Economics in Action at the beginning of the first semester. Did you use it...
  - 1  less often than you expected?  
Why not ? \_\_\_\_\_
  - 2  the same as you expected?
  - 3  more often than you expected?
  
6. Think about how helpful you thought Economics in Action would be at the beginning of the semester. Was it...
  - 1  less helpful than you thought?
  - 2  equally as helpful as you thought?
  - 3  more helpful than you thought?

**Please turn over**

7. Which option in *Economics in Action* helped you learn best?  
Please tick only **one**.
- 1  tutorial
- 2  free mode
- 3  quiz
8. When you did a **tutorial** in *Economics in Action*, did you change the variables in the graphs as suggested by the "ACTION" statements?
- 1  no
- 2  sometimes
- 3  most of the time
- 4  always
9. When you did a **quiz** in *Economics in Action*, did you change the variables in the graphs to help you answer the questions?
- 1  no
- 2  sometimes
- 3  most of the time
- 4  always
10. How many times did you use *Economics in Action* during the first semester?
- 1  never
- 2  only once
- 3  two or three times
- 4  four to six times
- 5  six to ten times
- 6  more than ten times.

**Please turn over**

11. Do you think using Economics in Action helped you to get better marks in :-

- a) your tests? Yes / No
- b) your final exam? Yes / No

12. Please tick **only one** of the following statements about "Economics in Action". Choose the statement that best fits you.

- 1  I did not use it at all.
- 2  I only used it because it is worth 5% of the subject marks.
- 3  I used it for reasons other than just the 5%.
- 4  I used it a lot.

13. Please place a **cross** on the line beside **each** of the following according to how helpful each one was to your learning about Economics in this course.

|   | <u>little help</u>                  | <u>lots of help</u> |
|---|-------------------------------------|---------------------|
| individual help   | ----- ----- ----- ----- ----- ----- |                     |
| from tutor/lecturer   | 1                                   | 2 3 4 5 6 7         |
| textbook  | ----- ----- ----- ----- ----- ----- |                     |
| library books   | 1                                   | 2 3 4 5 6 7         |
| lecture notes   | ----- ----- ----- ----- ----- ----- |                     |
| Economics in Action   | 1                                   | 2 3 4 5 6 7         |
| previous tests and papers                                   | ----- ----- ----- ----- ----- ----- |                     |
| help from others, e.g. parents<br>fellow students, friends. | 1                                   | 2 3 4 5 6 7         |

**Please turn over**

14. Please tick **only one** of the following statements about how well you did in your overall grade for ECON101. Choose the statement that best fits you.
- 1  I did not sit the exam
- 2  I received a lower grade than I expected to.
- 3  I received the grade I expected to receive.
- 4  I received a higher grade than I expected to.
15. Please tick **only one** of the following statements about how you think "Economics in Action" contributed to your overall grade. Choose the statement that best fits you.
- 1  It made it worse.
- 2  It was no help at all.
- 3  It helped a little.
- 4  It helped quite a lot
- 5  It helped a great deal.
16. Did you use Economics in Action to revise:-
- 1  before Test 1?
- 2  before Test 2?                      Tick 1 or more of these statements
- 3  before the final exam?
17. If you had used "Economics in Action" more, do you think you would have done better in:-
- a) the tests?                                      Yes / No
- b) the final exam?                                Yes / No
18. Would you like a computer package like Economics in Action to be available for your other subjects?                                      Yes / No
19. I would very much like to talk to you personally about your opinion of Economics in Action, be it good or bad. Can you spare me ten to fifteen minutes at a time that suits you?                                      Yes / No

# CONFIDENTIAL

The following information will be kept confidential. There will be no use of names or personal details in any subsequent research reports.

Student ID : \_\_\_\_\_

Name (optional) : \_\_\_\_\_

Thank you very much for completing this questionnaire.  
Helen McFarlane, CCB

July, 1995.

## Appendix 4

### Questions used in the Interviews

#### *Questions in MS Interview Category 1: Reasons for using EA and its helpfulness*

1. Did you use EA to?
  - gain assessment marks?
  - because it's helpful?
  - both?
2. Why did you use it only to gain assessment marks? or Why did you find it helpful?
3. Did you first use EA because you needed to, to do the first assignment, or because you wanted to see what it was like?
4. Did you think it might be helpful then?
5. Has it lived up to your expectations?
6. Has your opinion of EA changed over the course of the semester?  
Why?
7. What do you think is the most helpful thing about EA?
8. If you don't pass ECON101, and you repeat it, would you use EA again?

The questions in PE Interviews Category 1 remained the same as for the mid-semester interviews except for the necessary re-phrasing of Question 9, and the addition of Question 10, as follows:

9. If you **didn't** pass ECON101, and you repeat it, would you use EA again?
10. Did you get the grade you wanted for ECON101?
  - if answer was Yes      How did EA contribute to your grade?  
What else do you think might have helped
  - if answer was No      Did the grade you got reflect the effort you put into ECON101?  
What do you think went wrong?  
Do you think EA helped you get the marks you did get?  
How?

#### *Questions in MS Interview Category 2: Access to EA*

1. Do you have a computer at home?
2. Do you have EA at home?

3. Why did you buy/not buy EA.

PE Interview Category 2 was expanded by the addition of the following questions:

4. Would unrestricted access to a computer have affected your use of EA?
5. How?
6. Are you in the Halls?  
if answer was Yes                      Would having a networked computer in your room have affected your use of EA?  
How?
7. Is investment in a PC worthwhile to make use of CAI packages?

A sub-category of *Access to EA* was created in order to accommodate two further questions that also dealt with an aspect of the environment in which EA was used. The extra questions in this sub-category, Category 2a: *Factors affecting EA use*, were:

- 1            How closely did EA follow the lecture material?  
Was that good or bad?  
Why?
- 2            Did the change of lecturer during the course affect you use of EA?  
In what way?

***Questions in MS Interview Category 3: Applications of CAI***

- 1            What other subject would you like something similar to EA to be available in?
- 2            Why?

PE Category 3, *Applications of CAI* was expanded by the addition of question 3 below:

- 3            Did you use any other computer-based learning or assessment packages?  
What were they?  
Did using that affect your use of EA?  
How?  
Did you use any at school?  
Did that affect your use of packages here at Lincoln?