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## Life in an Educational Computing Laboratory (ECL)

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### Abstract

*In this paper I will discuss the strategy which is being used to introduce educational computing into the School of Education at Deakin University. This is followed by a description of the Educational Computing Laboratory (ECL) within the School in terms of its physical layout, the provision of information, staffing and hardware. I then argue that this type of information is however only a partial description of the ECL. If we are going to have a more complete understanding of educational computing within the School it is necessary to describe and understand the meanings that users of the ECL attribute to their use of computers. It is clear that there are many different factors which effect the way in which students perceive the ECL and thus computers. The paper concludes with some suggestions for the way in which we will modify our teaching and management strategy in 1988.*

### Introduction

Uri Leron in a paper presented to the Logo 85 Conference at MIT makes the following comment:

*In our Logo work with children, we encourage exploration, experimentation, playing with half-baked ideas, making mistakes and leaning through debugging. Socially, we encourage a free and open discussion and exchange of ideas, including ones which are only partially understood. While the spirit of this kind of learning can be seen everywhere in our reports of children's learning, I believe the Logo community has largely denied itself the benefits of these principles in its own learning ... (Leron 1986, p. 45)*

Behind Leron's comment is a conviction that it is important for us to view ourselves, not only as teachers and researchers, but also as learners who will benefit from the same social learning environments which we aim to provide for children.

Over the last four days I have been impressed by the ways in which this conference has provided a context where people have been able to share their "3/4 baked knowledge" and experiences - Leron uses the term "3/4 baked knowledge" to add respectability to ideas which "half-baked knowledge" seem to lack. From the Powhiri (on Sunday) to the piper (on Wednesday) the organizing committee has clearly shown that:

Educational computing is primarily about people and ideas and only secondarily about computers.

## **Educational computing within Deakin University.**

The School of Education is a primary teacher training institution with about 300 on campus students. In addition to the three year B. A.(ed) program the school offers a number of other educational programs. While students in all programs have access to the Educational Computing Laboratory (ECL) within the School, the majority of students who use the ECL are from the on campus B.A. (ed) program.

Prior to 1984 several staff worked part-time in the area of educational computing. In 1984 , with the employment of a full time lecturer and my re-employment as a senior tutor in Educational Computing, we were able to form the Educational Computing Research Group (ECRG) and begin to formulate a long term strategy to:

*... establish a climate within the School which supports the growth of an information technology ethos throughout the School .... This rationale is based upon the premise that information and computing technology cannot be established within the University by merely supplying equipment. A climate needs to be established in which staff and students make use of the technology as a natural tool in their teaching, learning, research and routine communication. The strategy ... is designed to sow the seeds for a broadly based information technology culture within the School of Education. (ECRG 1984, p. 1)*

Because of the amount of writing done by both students and staff the word processor was chosen as the "natural tool" with which to establish this information technology culture. For students this facility was provided in the form of a network of BBC computers within the Educational Computing Laboratory (ECL). For staff, word processing facilities were provided in the form of Macintosh computers.

Before describing this strategy in detail it is important to highlight our basic assumptions about teaching and learning. Many speakers, in this conference, have characterized different educational philosophies on a continuum from "teacher-centred" approaches on end to "learner-centred" approaches on the other. Bill Higginson (1987) has used the terms "neo-classical behaviourist" and "constructivist" respectively.

In the "neo-classical behaviourist" model the teacher is seen as possessing knowledge and skills and it is the teacher's role to digest, break down and order this knowledge into suitable units which are then "injected into" the learner. A measure of the effectiveness of the teacher (and the student) is the extent to which the knowledge is transmitted from the teacher to the learner and then back to the teacher without being changed.

Freire highlights the passivity of the learner in the following quotation.

*A careful analysis of the teacher-student relationship at any level, inside or outside school, reveals its fundamentally narrative character. This relationship involves a narrating Subject (the teacher) and patient, listening objects (the students). ... Education thus becomes an act of depositing, in which the students are the depositories and the teacher is the depositor. Instead of communicating, the teacher issues communiques and 'makes deposits' which the students patiently receive, memorize and repeat. This is the 'banking' concept of education, in which the scope of action allowed to the students extends only so far as receiving, filing and storing the deposits. (Freire 1972, pp. 45-6)*

The "constructivist model" on the other hand emphasizes the importance of allowing and encouraging the learner to be an active participant in the construction of their own learning. Instead of being a mere depository for pre-digested knowledge packages the learner is actively working to "make meaning" of their own experiences.

The distinctions between these two educational models and the recent widespread support for the second is well documented and will not be argued here. Suffice it to say that the strategy adopted by the ECRG is clearly on the "constructivist" end of the continuum.

## **Educational computing courses within the School.**

An unfortunate feature of many conference presentations is that the audience is only told about the ideas that "have worked" and not about the "3/4 baked ideas" which were part of the overall developmental sequence. After clearly identifying myself with the constructivist philosophy of education it would be hypocritical if I was to pretend that that my own perceptions of educational computing have not changed and developed over the last 5 years.

### **A specialist educational computing course in third year.**

In 1982, we introduced our first educational computing course, as an optional unit available for third year students. Students entering the unit had little previous experience with computers and the unit was a little like a patch-work-quilt covering a little bit of Logo, word processing, BASIC programming, data base, computer

assisted instruction, authoring and evaluation of software etc. With the benefit of hindsight the unit was a relatively bland and uncritical overview of the field of educational computing (the unit was offered for the last time in 1986). While it is easy to be critical of the unit it did serve the useful function of legitimating the need for resources (staff, hardware, software and space) within the School. More importantly the unit provided the experiences from which we are able to "reconstruct" (in the Freire sense) our own understandings of the place of computers in teacher education.

This "reconstruction" involved a gradual but fundamental change in the pedagogical models that we applied to computer use within the school. Rather than conceptualizing our work as providing prepackaged answers about how computers should be used we began to think of it as providing the context where students have direct experience using computers and are able to formulate questions and understandings about the place of computers in educational settings. Freire (1985) calls this the change from a "pedagogy of answers" to a "pedagogy of questions". A further change involved computing moving from an optional or specialized course for third year students to a compulsory or competency type course for first year students. Thus in 1982 using a word processor would have been a task that only some third years students would do (and then only in weeks 3 and 4 of the computing course) while in 1987 the vast majority of our students would use a word processor as just another way of preparing an assignment.

## **A computer competency course in first year.**

In 1985 a computing section was introduced alongside the English and Maths sections in the compulsory competency program, undertaken by all first year students. One objective of this section of the course was to provide a starting point for students to begin to develop skills in the use of word processing and Logo and thereby begin to construct their own understandings of the application of computers in education.

While the mechanics of running this program have changed over the last 3 years, the objectives and the philosophy of the course have remained much the same. Within the computer section of the competency program students are expected to attend 5 one hour practical sessions. In the first session they are taught (in a relatively teacher centred fashion) how to begin to use the word processor. In this and the subsequent sessions students work at establishing their word processing skills by doing their own writing (a colleague in another first year course sets an assignment that must be prepared using the word processor) or by working with the self help resources within the ECL.

During these practical sessions we also explain the following principles to students:

- learning to use the word processor is a skill which will be useful to them both for the preparation of written material but also as an entry point into "the computer culture",
- during the year they will be required to prepare several assignments for other courses using the word processor,

- it is largely their own responsibility to learn how to use the computer and the best way to do this is by using the word processor to do their own work - "you learn to use the word processor through your finger tips",
- they should keep a journal to record the things that they have learn about the word processor and also their thoughts and feelings about the ECL and,
- we attempt to plant the seeds of a collaborative culture by encouraging them to learn to use computers by using the ECL and helping one another.

Later in the year each first year student is "taught" how to use Logo by a second year student, however this aspect of the competency program will not be discussed in this paper.

Thus the computer competency section of the course aims to provide a very brief introduction to the use of the computer (as a word processor and also with Logo). The competency course is also important for another reason - it provides students with a model for the introduction of computers into an educational context.

## **Principles for educational computing with in the school.**

Throughout the competency course and also in other educational computing activities within the school we attempt to observe these general principles:

- Computing is introduced as a "tool" to assist in tasks that the student is doing i.e. emphasis the emancipatory potential of the computer.
- The teaching and learning principles used in the introduction of computer based tools should be compatible with the emancipatory potential of computer based tools - it would be ironic if we used rigid behavioural CAI materials to "teach" students about the word processor!
- People should learn about these computer based tools when needed and they should "learn by doing". This can clearly be contrasted with teaching a rigid set of computing skills.
- Computers should be accessible to all students and not just a minority.
- The computer room should be a pleasant work environment and,
- Computing should occur in a social environment and be integrated the other activities which students are doing.

Given these principles what type of computational environment would facilitate their realization?

## **Management of an Educational Computing Laboratory.**

It is important to realize that the way a computational environment is managed has an effect on the types of people who have access to that environment. For example an environment which would be quite suitable for computer science students (perhaps a

programming manuals next to each machine) might not be very inviting or supportive for a computer shy humanities student who requires simple access to a word processor.

Of course, careful management of a computer laboratory is also necessary to ensure that the resource is used in a cost effective way and that people are not exposed to dangers of using computers (e.g. ergonomic considerations).

One of the most heated management issues in many educational settings is: "Should the computers be housed in a central laboratory or should they be distributed around the school"?

Often answers to this type of question are not determined by educational concerns but rather other issues. One such issue is clearly power and control - if computers are centralized then this might facilitate "ownership" and control of this resource by one group within the school. One possible reaction against this possibility is stipulating that computers should always be distributed throughout the school. While I have sympathy with the sentiments behind this "democratization" of the resource there is a danger in always following simple answers to such complex questions.

It is clear that there are good educational reasons for either having computers distributed throughout the school (the computer is seen as just one of a number of educational resources) or also having a centralized resource. In differing educational contexts different reason will be more salient. Within the School of Education we have chosen to use a network of computers and to locate them in one room for several reasons.

Firstly the features of the network allow us to "hide" many of the technical aspects of computer use from people who are just beginning to use the word processor. For example students who have not used computers before do not need to be concerned (or even aware of) disks, where the software is stored or whether a printer is connected to their computer and they are able to save or print their documents at any time simply by typing SAVE or PRINT. Another important advantage within the context of the "information technology culture" strategy is that the ECL becomes both a work environment and a social environment where people are able to learn from each other how to use computers. In Mindstorms, Papert describes the "samba schools" of Rio de Janeiro as places where people, young and old, novice and professional-

*... dance together and as they dance everyone is learning and teaching as well as dancing .... Much of the teaching, although it takes place in a natural environment, is deliberate. For example, an expert dancer gathers a group of children around. For five or for twenty minutes a specific learning group comes into existence. Its learning is deliberate and focussed. Then it dissolves into the crowd. (Papert 1980, pp. 178-9).*

While I would not like to imply that the ECL is a learning environment to rival the samba schools of Rio there are significant similarities - learning from peers, learning by doing, learning skills when the need arises and learning in a social context. In contrast to the centralized nature of the ECL, the Macintosh computers, which are

used by staff, are generally distributed around the school with only some computers housed in the ECL.

## **Description of the ECL within the School of Education**

### **Physical layout of the rooms**

Currently the ECL consists of two rooms. One room containing mainly BBC computers is used predominantly for word processing while the other contains mainly Apple computers which are used for Logo and some other software packages.

In both rooms, computers are located around the edges of the rooms and also on "islands", made up of three or four desks, in the middle of the room. We have found it necessary to provide at least 2 meters of work space for each computer and this allows enough room between the computers for people to spread out their notes and other resources. It also allows a number of people can sit around the one computer and work together on a particular project. The "islands" also provide some measure of privacy.

In designing the room we have also tried to follow the dictum that "for every bit of high technology there also needs to be a bit of low technology". Thus the room contains many pot plants, informative and colourful posters on the walls and also a large fish tank.

In 1986 both the Apple and the BBC computers were in one room and this resulted in the room being very noisy at times (especially when our students were working with primary school children using Logo). While partitioning the ECL into two rooms, each containing different computers and used for different purposes, has resulted in a quieter and less crowded environment it has, I think, had an unanticipated negative effect. There appears to be much less "incidental learning" where someone learns how to use an Apple program by looking over another student's shoulder while they are waiting for their document to print on the BBC printer. On one hand the use of the computers requires concentration and thus a level of quiet and order. On the other hand we want to encourage a lively exchange of ideas between the people who use the ECL. Loop and Christensen (1980) in their study of microcomputer learning environments found that "a delicate balance had to be maintained between too much structure and chaos" (p. 48).

### **Information in the ECL.**

If people are going to be able to learn to use the equipment in the room then they must have access to the necessary information. Throughout this paper I have emphasized the importance of "socially transmitted" information. However it is also necessary to provide other sources of information and the traditional method of packaging this has been the "reference manual". Unfortunately the reference manual does not appear to

be a very effective way of providing information in a form which is accessible to people who are just beginning to use the room.

In our experience documentation has to have the following attributes if it is to be useful (especially for the computer novice):

- easy to locate the relevant information,
- easy to read and understand,
- written from a functional perspective (how person can get the computer to do a task) and not how the computer performs that task,
- provide all the information required for the task and not refer to other documentation for the necessary information,
- not include any extraneous material and,
- be sensitive to the needs and skills of the user.

We have found the HOWTO sheet to be a limited but useful way of packaging information. The HOWTO sheet is a brief, one or two page, description of "how to" perform a particular function. Usually a HOWTO sheet contains a description of the task, the dialogue which appears on the screen as the task is done (with the material that the user types underlined) and a final section that describes common difficulties and solutions. The HOWTO sheets are indexed and multiple copies are stored in the HOWTO cabinet. Students usually remove the sheet from the cabinet, return to their computer to use the sheet and then return it to the cabinet when finished. Currently there are about 40 sheets covering most of the common operations in the laboratory. For example we have HOWTO sheets that cover:

- logging onto the BBC network
- creating a word processing file
- printing a word processing file.
- archiving files from the hard disk to your own floppy disk
- using the ECLNET system (a bulletin board)
- sending and reading mail
- etc

If the sheets are to be effective it is important they be easy to find, well indexed and also be written from the user's perspective. One strategy to ensure that this happens is to encourage students to suggest any improvement to the sheets. Because they are stored on the BBC network we are easily and quickly able to correct these deficiencies and place the new copies in the cabinet.

One of the biggest impacts of the HOWTO sheet has been to release staff and students from the tyranny of the "high priest syndrome" of computing. If the procedure required to get the computer to perform a particular task can be written on one side of a photocopied piece of paper then they are no longer magical incantations but rather simple procedures which any person can easily learn!

## **Staff in the ECL.**

While the HOWTO sheets have reduced the need for staff to be available in the room to assist students there are still situations where students require assistance. Much of this assistance is provided by other students who are in the room and in addition we also employ some students, called NEDDIES, which are available for part of the week to assist. (The names "ECL" and "Neddy" are of course references to Eceles and Neddy Seagoon, from the BBC Goons show). Each Neddy has their photo placed on a notice board and thus they have become identified as people who "understand computers" and this often results in them being asked questions, often when they are not on duty.

## Hardware in the ECL

In the same way that different management strategies will effect the way the laboratory is used and thus the overall success of the facility, so to can the type of hardware effect the success of the laboratory. There are currently two main types of computers in the laboratory each of which are used for different applications.

The 18 BBC model B computers are networked to a 30-megabyte fileserver and also central printer. Currently the major use of the BBC computers is word processing of student work and running of some packaged software. Students are also able to communicate with each other using either a mail system or a bulletin board. The 12 stand-alone Apple II computers are used mainly for Logo programming, the running of packaged software and some data base and spread-sheet work.

While I could talk about several aspects of the hardware and the impact that these have on the use of the room I will discuss only one - the BBC network.

The BBC Econet networking system is, a powerful networking system which provides the user with a flexible way of gaining access to the features of the BBC and also the network. Once a person is familiar with the operation of the network then they will be able to use the power and flexibility it provides to do the jobs that they want to do. Thus a person would use these commands to gain access to the network before they would start to do their word processing:

```
*I am S.EVANS SECRET
  to log into my directory (where S.EVANS is my username
  and SECRET is my password).
MODE 3
  to enter mode 3 (80 character line)
*FX 5, 4
  to send output to the Econet printer rather than the local printer
(RS432)
*FX 6
  allow a line feed to be sent to the printer after a carriage
return
*PS 254
  to select the printer server on station 254 rather than the
default of 235.
*WORD
  to enter the VIEW word processor
PRINTER DRAFT
  to select the DRAFT quality printer driver.
```

Once in the word processor they would need to set the page length, the left hand margin etc before they would be able to begin to actually start to type their own work.

While tedious to type, this sequence of commands will not cause difficulty to the experienced user - in fact it would be important that students who were learning about computers and networks were aware of these commands and their purpose. On the other hand this sequence of commands might effectively prevent or discourage many of our "computer shy" students from using the facility.

Fortunately it is possible to customise the appearance of the BBC computers because of the "good" version of BASIC, the presence of function keys and the high level of integration between BASIC, the VIEW word processor and low level procedures present in the operating system.

Currently people gain access to the BBC computers by pressing the SHIFT and BREAK keys and this starts the "logon" procedure (which is stored as a public access program on the hard disk). They are then prompted for their username and password. If either the username is unknown or the password is incorrect then they are given an appropriate message and asked to try again.

They are then logged into their directory and their computer is configured for use on our network (eg output is switched from the local printer to the printer server on station 254, etc). After being shown a screen containing a message to all users (eg closing times for that week etc) and a messages appropriate to their year they are shown the following menu:

```
You have 38 K of free space in your directory
i.e. about 12 pages of text.
      Main menu.
1  You have new MAIL
2  Send mail to someone
3  Use the ECLNET system
4  Use the word processor
5  Use the WHO program
6  Use BASIC
7  Archive or transfer files
8  Do a self test
9  Transfer a file from a NEC
    What do you want to do...
```

If they chose to use the word processor then the word processor is initiated, the function keys are programmed to activate the draft quality, letter quality and proportional letter quality printer drivers, 80 character mode is selected and the page length and left margin are set to appropriate default values.

With these modifications the BBC network and the VIEW word processor is an ideal vehicle for introducing students to the emancipatory potential of word processing. While I have not attempted to use a BBC network that has not been customised in this way I would imagine that the extra demands placed on the user would effectively inhibit or block the realization of these aims. The combination of ROM based software, immediate response times, and easy access to both hard disk storage and printer means that students are free of many of the traditional weaknesses of both

time-shared mainframe computers and also stand-alone floppy disk based microcomputers.

A further hardware feature of the ECL is that there are 9 NEC PC-8201A lap computers available for loan to students and staff. These little computers are about 300 by 215 by 60 cms large and weight about 1.7 kgs. They have a small (40 columns by 8 line) LCD screen, a full QWERTY keyboard, 32 k of RAM (28 k is available for storing text - about 12 pages) and are powered by either a small 6 volt transformer or 4 "AA" pencil batteries. The machine contains a small lithium battery which will maintain the contents of the machine when the main power source is turned off. The ROM based software includes BASIC, TEXT (a simple word processor) and TELCOM (a communications package which allows files to be send and received via the RS-232 port).

Students and staff can borrow these computers for a period of upto 48 hours and they are used to allow the person to enter their text wherever and whenever they want. Once they have entered their text they return to the ECL, plug the NEC into a cable which is connected to each of the BBCs and using a simple procedure transfer the file from the NEC to the BBC. As the file is transferred to the BBC it is translated into a form which the BBC word processor is able to read. Once their file is stored on the BBC they are able to use the superior word processing power of the BBC to format their text and print it.

While the NEC PC-8201A computer is not, from a technical perspective, a very powerful computer (it was first marketed in 1982) it is well suited to our needs. In fact if it was more powerful, e.g. contained a more comprehensive word processor, then some students might want to do all their word processing on the NEC and not use them as a remote text entry device into the BBC.

A quick calculation shows that so far each of the NEC computers has been borrowed about 180 times (three times a week for 30 weeks of the year for two years) thus giving a cost to the school of less than \$3 per two day loan (the machines cost \$500 in 1985). The transfer program records the size of the files that are transferred and the average is about 15 k or about 6 pages of text (but some people completely fill the 28 k of space which is available for storing documents). While the purchase of the NECs could be justified on this cost/utility criterion alone a more important justification is the way that they have been used and their impact on students within the school. As an example while there have been no formal instruction on the use of the NEC computers approximately 70% of students have borrowed them at least once. This is a good example of the way we want information about computing tools to spread within the school. If we provide tools that are useful and the context within which people can learn to use them then people will learn the skills when they are required. Thus the use of different computers to take advantage of the unique features of each computer and the transfer of text between computers is seen as a "normal" part of the life of a student within the School.

It is interesting to note that several people have decided to learn to use the NEC computers before they used the BBC computers. Perhaps the "human size" of the NEC computer, the fact that they could "play around with it" in the security of their

own home, rather than the ECL, or even the simplicity (and lack of power) of the NEC were important factors in their decision.

Thus far I have described our goal of establishing an "information technology culture" within the school, the way students are introduced into this culture (the competency sessions) and also a description of the ECL within the School. In the remainder of this paper I will argue that while this type of description is useful it is not, of itself, an adequate description of the ECL and the people who use it. What is the culture of the ECL?

## A "richer "description of the ECL

Papert (1985) has coined the term "technocentrism" to refer to a danger of concentrating on the technical aspects of a phenomenon to the exclusion of other aspects of the phenomenon.

*Egocentrism for Piaget does not, of course mean 'selfishness' - it means that the child has difficulty understanding anything independently of the self. Technocentrism refers to the tendency to give a similar centrality to a technical object - for example computers or Logo. This tendency shows up in questions like 'what is THE effect of THE computer on cognitive development?' or 'does Logo work?' ... such turns of phrase often betray a tendency to think of 'computers' and of 'Logo' as agents that act directly on thinking and learning; they betray a tendency to reduce what are really the most important components of educational situations -- people and cultures -- to a secondary, facilitating role. The context for human development is always a culture never an isolated technology. In the presence of computers, cultures might change and with them people's ways of learning and thinking. But if you want to understand (or influence) the change, you have to centre your attention on the culture - not on the computer. (Papert 1985. p. 55)*

Over the six months I have been using an ethnographic approach to begin to describe and understand the ECL from the perspective of the first year student. This has involved me stepping outside my role of being involved with the management of the ECL and spending time observing students using the ECL and asking them to tell me about their experiences of the ECL. Not only is it important to talk to students who use the ECL but it is also important to talk to students who don't. The remainder of this paper reports some of the data which I have collected during this study.

When I embarked on this project I was surprised by the range of different perceptions which people had of the ECL. Rather than there being a single reality called "ECL" it was instead a collage of different perceptions, skills, attitudes, fears and tasks that they want to do in the ECL. Not only was there a vast difference in the meanings that people attributed to the ECL but also the meanings held by an individual changed in quite significant ways over time.

As an example the way that students viewed the ECL at the beginning of the year depended to a great degree on their previous experience using computers and also their attitudes towards computers. As they gained more experience using the computers in the ECL these attitudes and perceptions sometimes change in quite significant ways.

## **Initial attitudes to the use of computers.**

It appears that a large percentage of students entering the School of Education initially view "computers" and the possibility that they will be expected to use computers with some degree of fear and apprehension. The following statements, collected near the beginning of the semester, graphically highlight the feelings that many students have towards the computers.

*If I touch that button will it self destruct? ... That was my initial fear! Computers, to me, were very foreign and an unavoidable obstacle [which] I had to confront. I had a lot of hang-ups about computers ... when I came to the class I felt that everything would go wrong ... I also felt that computers were creations from another planet and that there was no way that I could possibly be able to understand any of it's phenomena. Computers - that word sounded complicated. I didn't want to touch one... It's too fragile, too expensive and too scientific. All I wanted to do was get a pass and leave. I HATE computers and they HATE me.*

and from an older student-

*It was a bit like the first time you started using the telephone. You are scared stiff of this thing sitting in front of you and if you push the wrong button then the whole thing is going to blow up ... Its almost this monster sitting here in front of you.*

I was surprised by the depth of the "computer phobia" which exists in the student population. I naively thought that as the number of computers in secondary school increased so too would the general level of "computer awareness" and thus the confidence people had using computers. Over the last three or four years I have not noticed this trend in students who are entering the School of education. Why might this be so?

Approximately 75% of our students are female and Sandra Wills (1987), in a presentation at this conference, has already highlighted the fact that females are under-represented, compared to males, in a large number of activities which involve the use of computers. These situations include computer electives in secondary school, summer computer camps and home computer ownership. Clark (1986) provides a review of this literature and suggests that based on the anticipated outcomes of engaging in computing activities female students tend to "select themselves out" of these activities. She suggests that this is due to several factors including the stereotyping of computer activities as being "male", social pressure for girls not to use computers and the competition for limited resources in the classroom. Thus:

*... in many instances women and girls are not gaining the opportunity to have sufficient direct experience with computers to discover that computers can be fun, easy to operate and as suitable for women and girls as for men and boys. (Clark 1986, p. 71)*

Thus female students may believe that computers are both difficult to use and understand. Because of these beliefs they then do not choose situations which would provided them with direct experience using computers. One student graphically demonstrated this by saying:

*I wish I didn't have to worry about learning to use them now, when I have avoided them for so many years.*

When I asked students about the factors which contributed to their negative attitudes towards computers several students made specific reference to experiences which had occurred in school.

*... [We used computers] a couple of times in Year 10 computer studies. I hated it because we were all thrown in to the deep end. I drowned. During years 10 and 11 at high school, I had access to computers. Despite this, I very rarely went near them, and when assignments were due in, I usually found other people who would print them for me. ... only copied programs out of books ... made no sense at all The teacher did not understand computers himself and that made it more confusing for us students.*

This situation is ironic when we consider that the intended purpose of many of the experiences with computers in schools would have been to provide students with skills and awareness to use computers. Clark (1986), using prediction based on cognitive dissonance and self perception theories, suggests that engaging in "compulsory" computer activities might not encourage students to form positive attitudes towards computers. Thus, if the activities are compulsory their effectiveness in changing attitudes might be less than expected and if the activities are optional then females might elect not to participate

Clark concludes:

*If the interpretations proposed in this research as valid, and gender differences in computing participation reflect gender differences in anticipated outcomes from engaging in computing activities, this suggests the direction which needs to be taken to increase students' participation, and particularly girls participation, in computing activities. It is essential to make involvement in voluntary computing activities more appealing. (Clark 1986, p. 221)*

Other students were not able to be so specific about factors that contributed to their attitudes to computers.

*I just don't like computers and I don't like the idea that my kids are going to grow up in a computer age ... I don't like the impersonalized*

*nature of computers ... they don't interest me at all. When I first became aware of the fact that I was going to have to learn how to use computers, I was rather apprehensive. Computers had always been seen as a form of technology that replaced jobs, and made people lazy.*

Not only do many students believe that computers replace people in jobs but there also seems to be a feeling that computers will take over the job that the teacher does i.e. computers will start teaching children.

*I can't really say that I would enjoy having computers in the primary school because teachers are supposed to teach children and not computers. I don't believe we need to do computing for primary teaching. Although computers are becoming more common, there is relatively little that I think a computer can teach a child. A child still needs to read and write which can't be done on a computer.*

One member of staff suggested that:

*... students within the school of education generally see themselves as 'people people' and not 'thing people'*

When pressed on the meaning of these two terms it appears that they refer to the distinction between people engaged in the sciences on one hand and the humanities on the other with the majority of students within the School seeing their skills in the humanities area - talking to others and sharing ideas.

If some students perceive using computers in such a negative way then why do some invest so much time and energy learning how to use the computers?

## **Why do students use the computers in the ECL?**

For a small number of students the major motivation, at least initially, was that they were told that they had to use the computers i.e. it was compulsory to either come to class or present some of their assignments using the computer.

*I feel that if it had been left up to ourselves not many people would have bothered. I didn't bother pursuing it because I can write much faster than I can type and I feel I would get things done in have the time so I don't worry about using computers unless I have to. Last year at [another tertiary institution], we also had a computer familiarization course [Logo and word processing]. ... Thinking back the Apple lab could have been really useful to do all assignments etc, but otherwise it was never used. Only first year students used it and only in first semester, yet anyone could use it - so it was really wasted. ... This year because not only do we have to do things with computers but also because other subjects make it compulsory to use the computers there is more compulsion to use the computers. People are deciding to do all their assignments on the computers, so they are getting better at using computers and more competent.*

While this extrinsically imposed direction is an important reason to start to learn about computers it is soon replaced other motivations. As students gain more control over the word processor some begin to see computers are a tool that allows them to work in more effective ways.

*I never thought that I would like computers. I really didn't see a need in them because I have a typewriter, so I just type everything. [Now] on a computer it is very handy to be able to change, add and delete things without having to redo the whole paper. ... when I first started , to put it honestly I hated computers - they were no use what so ever! Now when I type something up I would not go back to a typewriter for nothing!*

Other students saw computers as becoming increasingly important and pervasive in our lives and this was the most salient reason for them to learn to use the computer.

*Catching up with the rest of the world! Everyone else around me knows how to use them and I had absolutely no idea how to use them until this year and I just wanted to put myself back on the map and catch up with the rest of the world.*

Thus there is a sense that without some awareness of computers or the ability to begin to use or "understand them" they would be disadvantaged. We often hear people in their 40s comment that they are too old to learn about computers but this comment on a new urgency when uttered by a 18 year old person.

*... I wish I was introduced to computers at an earlier age then I wouldn't feel so incompetent now!*

Some students expanded this notion of disadvantage by pointing out that it was important for them to learn how to use the computer so that they did not further disadvantage their own students when they were teaching in schools.

*Giving children the option and the ability that they can latter build upon. Not closing that door [meaning access to computers] in their face at that stage [in primary school].*

Thus while some students feel apprehensive about learning to use the computer there is also a perception, by some students at least, that it is an important skill. The tensions between these two views is captured in this quotation from a student talking about walking into the ECL for the first time.

*Mt first reaction would probably have been "this could be interesting" and the second one, about four seconds after I sat down in a chair, was "Oh no, uck!"*

## **About the format of the competency sessions**

Given that people had very mixed attitudes to using computers, how did they react to the format of the competency classes i.e. we will provide some support for your learning but it is largely your responsibility to learn how to use the word processor.

*We should have been given proper classes. I believe this would have helped us more. We only got more confused.*

Within the context of other comments made by this person it is clear that they would have preferred more authoritarian classes where they were told what to do and also told what they were going to learn.

In contrast other students believed that the way in which they were introduced to the computers was "generally good" and that once they began to get some confidence they enjoyed and learnt more by working by themselves.

*I nearly died when we were told that we had to teach ourselves. But now I am glad that I did because I think of it as a personal achievement.*

While some people have found that "autonomous learning" nature of the competency program to be a good environment for learning how to use the word processor others found it not as helpful. Why is this so? One possible answer is provided by a first year student.

*Using the ECL as well as in other subjects, I've found it difficult to adjust to teachers not telling me what to do, when to do it and how to do it. ... I still think I need to ask the teacher every single question when I in fact am quite capable of thinking through things. I really tried to work at the computer and have found that I'm beginning to understand it.*

A second year student expands this theme:

*The philosophy behind the set-up of the ECL is one of self-help where students are expected to set their own goals and then set about accomplishing these goals using the resources available. It is an environment whereby it is up to the students to take control of his/her own learning. The learning environment from which most students come to the ECL though, is very different. Students generally come from an environment, where for thirteen or more years learning has been presented as a teacher directed activity. It has been the teacher who decided what should be learnt, s/he has been the one to set the goals, s/he has then explicitly guided students through learning experiences to achieve those goals. In this respect learning to the students has been a passive experience, sitting back and taking in what is offered. Learning is something that you do for the teacher and not for yourself.*

## **Pressure in the ECL.**

*The first tute group was pretty bewildering.... The fact that it was in an organized group with people who had varying degrees of understanding about computers and there was a limited amount of time to take a lot of information in meant that , to me, it was a 'pressure' situation. I was very uncomfortable and did not look forward to future lessons. Very little was actually learnt in that session - in fact my apprehension about using computers probably increased.*

When asked to expand what they meant by "pressure" in the first couple of lessons many students talked about feeling that they thought that everyone else was able to use the computers and it was only them that was having difficulty.

*... it's almost impossible to feel really good about that I did in the ECL as I'm continually worrying about what others are doing. Have I missed out on something? There is so much to learn, and having people typing at 65 words per minute surrounding you doesn't help your self esteem. I can't help feeling that I don't know a lot and I almost always feel intimidated in the ECL. My little accomplishments don't really rate with what else is going on.*

One student even asked when was the "magic class", which she had missed, where everybody else learnt about using the computers.

## **Learning outside class time**

As suggested in the first tutorial one of the best ways of learning how to use the word processor is to practice using it outside of class time. Many students who did this commented that ECL seemed to be "more relaxed" outside of classes and they seemed to be more in control of their learning and learn more.

*The optional sessions seem to be less 'pressured' and were more conducive to discovery of how to use the computers With more time spent in the ECL, especially our own time where there isn't any pressure it is possible to learn and grasp new ideas... The easiest way to learn is by spending time on the BBC by yourself and persevering. I couldn't agree more with the comment about spending time in here out of class. I have learnt heaps more in these times than in the computer lessons. Because I have started to gain a bit of confidence I enjoy being here, and therefore I am more likely to spend time in here than it I didn't like it. It's a vicious circle. If you don't come, you don't learn, if you don't learn you don't enjoy therefore you don't come in your own time.*

In addition to the "lack of pressure" another reason why learning to use the word processor outside class time might be more powerful is that the activity that you are engaging in might be more personally meaningful. One student explained this in terms of "two stages" of learning. In the first the emphasis is on trying "to learn all the different buttons and what each button did" while in the second stage the emphasis is

more on using the computer to do a job that you want to do and "The other bits just fit in as you need them and then the whole thing starts to make sense".

However some students commented that they felt inhibited to go into the ECL outside class time.

*I suppose I haven't used the computers as much as I should be doing but I am so rushed for time. I try and make it into the computer room as much as possible but I tend to treat it as a second priority. I feel like everyone around me are experts and I don't like to look like a beginner. I definitely need to spend more time in the computer room!*

## **Interaction between students**

We have also attempted to engender a co-operative learning style by encouraging students to ask for and give assistance to other students. Several students commented on the positive aspects of being able to help someone else.

*... a guy needed help with his own assignment. It made me feel really good that I was actually able to show someone else something. ... I was in the ECL, but at work when I heard a friend cursing aloud. I turned around and saw that she was in trouble. I got up to help and to my amazement I fixed her problem. That made me feel good - I was able to contribute to someone else's knowledge. Because I had done it in the first week he asked me to show the guy next to me how to use it. It felt really funny showing this guy how to do his password because I had only learnt how to do it the previous week!*

## **Learning histories in the ECL**

Below are comments from four students who have overcome "hurdles" to begin to use the word processor.

One person, who had used computers quite a lot in a previous job commented that she found it very hard to start to use the word processor. With the word processor she had to decide what to do while in her previous job, as a data prep operator, she just needed to "punch a few keys" when the computer asked her. Her reaction to the last of structure and freedom of the word processor was to "freeze up" and it was only once someone had spend a little while talking to her and provided her with an entry point where she was able to start to learn how to tackle the word processor. Now she is "quite confident with the BBC ... I feel very safe with the BBC. I don't feel daunted by it any more."

Another student, who believed "that you had to be particularly clever and have years of training to be able to even turn the jolly thing on ..." had been using the BBC computers for a couple of weeks but was neither finding it very useful or very understandable. Then she borrowed one of the NEC computers and used it at home. She continues...

*I enjoyed having the time to play without feeling that I was throwing something away [wasting time while at university]. Whereas when we were given time to play in here on the BBC, I did not know quite what to do or what to play with. Just writing silly things like a letter to my brother and then being able to find it again and just playing for the sake of it, I began to realize just exactly what you could do with it. .... And then I brought it back and virtually without any hassles at all managed to plug it straight back in and get it up there on the screen [transfer the file from the NEC to the BBC]. I was hook, line and sinker after that!*

Based on this experience she then arranged to borrow an Apple computer and proceeded to teach herself how to use both a word processor and a data base package. She commented that when she was learning at home she was doing what she wanted to do and that she had time to feel free to play and explore rather than feeling pressured to learn. In the context of the ECL she felt overawed by the complexity and the power of the computer but at home she interpreted the same complexity in terms of all the future possibilities for the things that she would be able to get the computer to do.

Another student explained that he initially used the computer because staff had suggested that all assignments should be word processed. A friend then suggested that he compose an assignment using the word processor. To his amazement he found that when he sits down in front of the blank screen of the word processor the computer virtually tells him to "start thinking" and get his ideas onto the screen. Now he prepares all his assignments using the word processor.

A fourth student decided early in the semester that the costs (time and energy) required to learn how to use the computer would not outweigh the advantages. Thus she did not use the computer at all in first semester. In second semester, after choosing not to submit an assignment which had to be prepared using the word processor and also talking to teachers who used computers in schools she now sees some benefits of using the computer. She has now arranged for a friend to teach her how to use the word processor.

## **Summary**

In this paper I have discussed how first year students learn to use one computer based tool, the word processor. In limiting the discussion to the word processor I do not want to imply that the word processor is the most important computer based tool - it is just the entry point into the "computer conscious culture" within the school of education. In second semester students use Logo and in second year most students have used data base management systems and many other types of software.

It can be seen that there are vast differences in the way that students within the School perceive the ECL and thus the use of computers in educational settings. It is clear that the perceptions that an individual holds at any one time is affected by a number of different factors e.g. their initial attitudes, their experiences in the ECL, their

motivations for learning to use the word processor, their experiences of learning in a "constructivist" model to name but a few.

It is also clear that the perceptions which an individual holds affects the way that they perceive the relative costs and benefits of learning to use computers. One way of conceptualizing the way that different people behave in the ECL is in terms of their expected benefits and costs (in terms of time and energy) of learning to use the computers. Some people do not perceive great benefits of using the computer and thus put little effort into learning how to use them. On the other hand, other people believe that it is important to be able to use the word processor and thus they are able to invest much more time and energy into their learning.

Within the context and the constraints operating within the School of Education I think the ECL is set-up and managed in basically the "right way". Also, I believe that the "information technology culture" strategy is a valid and useful way to introduce the use of computers into the School. While the overall strategy is correct I think there are some important lessons to learn from the comments which students have made. Largely these lessons relate to the way the strategy is implemented rather than the philosophy behind the strategy.

One lesson is that if we are going to follow a constructivist approach and require students to be in control of their own learning then we need to provide students with the support that they need to take advantage of this freedom. For example it is important to provide students with a broad overview of the different skills that they can learn using the computer. Once they are aware of the different things that they can learn then they will be able to make a more informed decision about the things that they actually want to learn.

We should also be aware that the approach that we are following may be "out of step" with the other educational experiences of the student. If we do not clearly state the assumptions that we are following then students may have difficulty reconciling their educational experiences with the approach that we are taking. It would also be valuable to allow students to discuss their reactions to the "computer culture" model that we are providing.

Some students may prefer to learn in a more "teacher controlled" context rather than the existing more "autonomous learning" environment and we should provide some level of support for these students. Perhaps regular classes could be held initially in the semester and once these people have some skills then they will be able to work in a more autonomous way.

Our students enter the School with attitudes and views about the use of computers in society in general and education in particular. It is clear that these attitudes have an impact on the way students approach learning to use the word processor. Based on the information I have collected this year it would be valuable to discuss these attitudes as people are learning to use the computer.

We intend to implement these changes in the competency program in 1988.

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