INVESTIGATIONS
IN METACOGNITIVE LEARNING PROCESSES WITH COMPUTERS: LEARNER BASED INQUIRIES.

Current research concerning learning highlights the importance of metacognitive skills in promoting successful learning for both adults and children (Baird, 1989; Flavell, 1981; Rowe, 1988). Several researchers have identified particular strategies for use in developing metacognitive skills in the classroom (Baird & Mitchell, 1986; Swan & White, 1990). Claims have been made for the computer as a useful tool in this process (for example, in developing problem solving skills) however there is relatively little research evidence to support such claims. This study addresses this shortfall, building on the considerable research in metacognition.
The project consists of two interrelated studies:

STUDY 1 SCHOOL BASED

PROMOTING METACOGNITION

- WITH PRIMARY SCHOOL PUPILS
- TEACHERS' PROFESSIONAL KNOWLEDGE AND PRACTICE

OUTCOMES

INSIGHTS INTO

- PRIMARY CLASSROOM PRACTICE
- TERTIARY TEACHING

INVESTIGATIONS IN METACOGNITIVE LEARNING PROCESSES WITH COMPUTERS

STUDY 2 TEACHER EDUCATION

- PROMOTING METACOGNITION WITH STUDENT TEACHERS

- LINKS BETWEEN COMPUTERS AND LEARNING

Study 1 investigates the use of computers in primary schools to develop pupil's metacognitive skills and is a collaborative research project involving five classroom teachers and their pupils.

Specifically the study seeks to investigate:

a) the effectiveness of computers as a tool for promoting the development of the pupil's metacognitive skills;

b) the development of the project teachers' professional knowledge about metacognition and the use of computers to promote children's learning;

c) the influence of the project on the teachers' practice.

Study 2 investigates the use of computers as a tool to develop the metacognitive skills of students in a teacher education course. Results of a pilot study (Maschette & Johnson, 1991) indicate that initially students use a limited range of metacognitive strategies as they are preoccupied with the technology in this new learning context. In this project students will be taught to use a wider range of such skills.

Specifically the study seeks to investigate:

a) the effectiveness of computers as a tool for promoting the development of student teachers' metacognitive skills (as compared to the pilot group).

b) the extent to which student teachers apply metacognitive strategies in their teaching as a result of their participation in the

study (as indicated in self reports).

The Computers and Learning in Primary Schools [CLIPS] project commenced in April, 1992, and the researchers have begun analysis of preliminary data. Thus presentations in this symposium are early reports of research in progress. The symposium will have four foci:

1. Professional development of teachers

As the participating teachers have begun to explore issues of children's learning and consider how they might utilise the computer to serve this end, there has been evidence of change in both their practice and conceptions about computers and learning. This paper explores the nature of those changes and makes hypotheses about conditions which contribute to teacher change.

2. Teacher case studies

Three case studies are presented to illustrate some of the issues raised in the professional development paper.

3. Gender and technology

The research has undertaken to explore issues of gender and technology, within the framework of "mainstream" research. This paper explores the teachers' conceptions of gender and technology, and considers the methodological issues of embedding critical pedagogy in relation to gender issues within the conduct of a broader research project.

4. Promoting teachers' metacognition as they learn with computers

Learning logs, a type of reflective journal , have been used over a period of time to encourage teachers who are novice computer users to explore their own learning strategies. The teaching strategies associated with the learning log have been developed over a period of time, and data is being gathered to gain an understanding of their efficacy for promoting the teachers' metacognition. This paper reports on data gathered to date, and reflects on the implications for teacher thinking.

uˇInvestigations In Metacognitive Learning Processes With Computers: Learner Based Inquiries.

Paper presented at the AARE/NZARE Conference, Deakin, Geelong, November 1992.

Investigations in metacognitive learning processes : teachers' professional learning

Maurice Robson, Elizabeth Stacey & Cheryl Woollard

paper presented at the joint conference of the Australian Association for Research in Education and the New Zealand Association for Research in Education, Deakin University, Geelong, November, 1992.

Introduction:

The research project reported in this symposium seeks to advance understandings about how teachers might most effectively develop their classroom practice and the learning of their students. The project is part of a much larger one, entitled Computers and Learning in Primary Schools (CLIPS), which focuses specifically upon the nature of teacher professional knowledge about computers, and ways in which computers might be used to enhance metacognition in teachers and their students. At the same time, the project is the context for the professional development of the participating university teachers and it is intended to make explicit the nature of the learning which takes place because we view the research process as a reflexive one. This paper explains the rationale and structure of the project and reports some of the preliminary findings. This paper seeks to set the CLIPS project within the context of existing understandings about teacher professional development in general, and, more specifically, professional development as it applies to the more effective use of computers in schools to enhance student learning. The project is in its infancy and therefore the paper seeks to report early conclusions from work in progress.

Understandings about professional development

In Australia recent public reviews of teacher professional development have drawn attention both to the complexity of teacher's work in schools and classrooms, and to the need to reconceptualise approaches to pre-service and in-service professional education of teachers (for example, Schools Council, 1990, Coulter & Ingvarson, 1985) . There is a strong belief emerging from such reviews that approaches to professional development remain too narrow and restrictive and that if classroom practices are to be improved then professional development approaches should draw more upon understandings about professional growth and development and, particularly, should be more closely related to teacher's own reflective thinking about their classroom practice.

The on-going professional development for teachers is widely recognised as vital for the continued improvement of classroom teaching practice and, consequently, of children's learning. Further, understandings about how professional development activities might be most effective have been well documented in the literature (Baird and Mitchell,1987; Johnson & Owen, 1986; Robson, 1988; Rudduck, 1988; Smyth, 1987). It is clear from this literature that such activities are most effective and are most likely to lead to longer term changes in classroom practice, where certain key

elements are present, namely :

1. Recognition of existing professional knowledge
2. A collaborative focus
3. Reflection on practice in practice
4. A legitimate context
5. A realistic time-frame

The understandings about professional development emerging from research point clearly to the need for collaborative, essentially school-focussed and long term approaches to the development of teacher professional knowledge.

The insights gleaned from the Project for Enhancing Effective Learning (P.E.E.L.) (Baird & Mitchell, 1987) , in which a university research team worked collaboratively with a group of teachers at a Melbourne secondary school to explore new approaches to developing student metacognitive skills, provided the foundation for the project described here.

The CLIPS project :

Methodology

The CLIPS Project involves five classroom teachers and a team of university teachers. Teachers volunteered to participate following initial explanation of the project and a meeting of interested teachers at which the project was described in detail. The university and classroom teachers then worked in pairs to establish program goals and processes, to select software, and to evaluate their efforts. The whole project team meets monthly to share experiences, to discuss issues related to the use of computers to enhance children's metacognitive learning, and conference possible solutions to difficulties encountered. These meetings are designed to provide mutual support for members of the team and as the basis for the development of professional networks.

Rationale

The project is based upon the key features of effective professional development already described. Those features will be used to provide a useful framework for the more detailed description of features of the project which follows.

1. Recognition of existing professional knowledge

Firstly, there is widespread recognition in the literature that recognition of teacher theories about teaching and learning, and practical knowledge from which they have been derived, is fundamental to developing that practice. This project seeks to build upon existing professional knowledge of teachers as they research their own practice. The five classroom teacher- university teacher teams have established goals which are quite different; for example, one team is exploring the use of the language 'Logo' in a Prep classroom whilst, in another Grade 6 room, the focus is upon the use of 'Hypercard' - a complex program with a wide range of applications. It has been most commonly used in secondary and tertiary settings. Similarly, the teaching strategies adopted by teachers have been equally varied and have included the use of cooperative grouping strategies, peer teaching, utilising children’s questions as the focus for

inquiry, thinking books and classroom meetings. Issues which the teachers have addressed include gender equality, development of children's language

and classroom learning processes.

In addition, the project seeks to legitimate existing professional knowledge and to provide a context marked by an explication of practice and the definition of a teaching philosophy of learning; as such, it can make a valuable contribution to understandings about the nature of professional knowledge.

2. A collaborative focus

The project focuses upon issues and problems which individual teachers encounter as the focus for collaborative , school-based activities. It is clear from the literature that teachers learn where they are involved in determining the context and focus of professional development activities, and where their existing craft knowledge is used as the basis for negotiation of such activities . Richardson-Koehler (1988) suggests that individual teachers accept new ideas and practices on the basis of whether or not the new idea or practice matches their beliefs and understandings, "where new or adapted practices fit the teacher's beliefs, cognitions and/or practical arguments" (p.75).

For example, Daryl, in his initial interview, indicated that he was already using computers in the context of "...peer teaching, working out how to solve their problems. It's a great tool because they can experiment with something. It doesn't matter if they get it wrong. They can go back and do it again and again." The project's goals could be accepted into his current practice.

In the CLIPS project classroom teachers, and university colleagues, work collaboratively to establish and achieve agreed goals; the research is being conducted "with, not on teachers"(Noffke ,1990). For Charmaine, the partnership had a number of advantages:

"My University partner has kept me on track. She has kept me informed and provided me with readings, etc. She has kept it in a postive light . She has provided me with the resources. She has also been a resource in the classroom . She has given me feedback. She has also given me a clarification of thought. She generates new ideas. She is very much a learner herself. We bounce ideas off each other.."

In addition, necessary materials (books, computer software) have been made available to teachers and they have been encouraged to visit others involved in the project to follow-up aspects of practice discussed in monthly meetings.

3. Reflection on Practice

An important feature of the project is the regular monthly meetings of university staff and the project's teachers. At these meetings classroom practice is discussed and reflected upon. Teachers find this one of the most valuable parts of the project. For Julie, the meetings provide a valuable context both for reflection on her own beliefs and practices and for encouragement:

" ...It is talking about people's experiences that enables you to learn. I

have learnt things about myself from other people. It's nice to hear other people saying 'Oh yes I've been thinking about that' "(Interview 2)
Margaret echoes this when she says :
"I think it is wonderful to have that opportunity to talk with people from other schools and hear what they are doing."
As part of resourcing classroom teachers in the project, relevant reading material has been made available and this has also provided the focus for reflection on current practice. This has been a valuable part of the meetings as Daryl comments:
"...The readings have helped me... You are building on what someone else has explored. It also gives you a vocabulary to think with. Sometimes it is very hard to put an idea ...To communicate an idea effectively....I have also been inspired by something I read...something which made me think about how this work was developing...helping children to learn about their own thinking and think about their own thinking seem very interesting to me because some of the things I read in the Peel Project set off a spark in me that said 'Hey,this is just on track ...it is on the right lines...it is something I can believe in. It sits really well with me.'
These readings are usually recommended by the University staff. This is an important role that the University staff plays and this is recognised by

the teachers in their comments
"...I think it is very useful to have the University lecturers (at the meetings). They may have read something or may have an outlook on something which you may not have thought of." (Margaret)
Collaborative approaches of the kind involved in this project facilitate teacher 'reflection-on-action' (Munby & Russell, 1989) in which " the puzzles and uncertainties of practice are addressed dialectically, not logically" (Munby & Russell, 1989, p. 72) and which is likely to lead to improved practice. For some teachers, the keeping of a reflective journal has developed as a focus for reflection with their university 'partner' and this practice is being encouraged for university teachers also.
4. A legitimate context :
It is now widely recognised that in order to secure longer term change in classroom practices and, thereby, enhance children's learning, professional development activities ought to take account of the context in which children learn. It is argued that learning takes place in a complex environment against an equally complex background of individual histories, prior experiences and expectations (e:g: Jackson, 1968; Robson, 1988).
Most of the early research on computer applications in education took place outside the classroom and, subsequently, drew criticsm for failing to recognise the significance of the context in which computers were being used (Miller, 1988; Genishi, 1988).
An important feature of this project is that its focus is the classroom. The learning activities taking place within it are based upon existing practice and influenced by the particular circumstances relevant to it.
The classroom teacher and university teacher meet regularly in the classroom and, in some cases, the latter teaches in the classroom, depending upon the specific needs of that classroom. It is recognised in

the project that the nature of learning environment in which computers are being used is critical to the effective use of the technology. In particular, where the focus for computer use is in developing children's metacognitive skills, it is as particularly important that the classroom context be one which supports exploration, where open-ended enquiry is encouraged and where the teacher stimulates metacognitive responses for example, by using appropriate questionning techniques or encourages reflection on the process of learning to use a particular item of software. An examination of context has, consequently, been an important part of discussions at classoom level, and in the monthly team meetings. Charmaine's comments indicate the value of such discussions for her thinking about her practice:

"Before, I tried to learn the software and became software knowledge oriented, which I thought was the thing to do. Now I am more aware of the type of learning I am trying to generate and the software is very incidental."

4. A realistic time-frame :

Fourthly, the process of professional development is recognised as an individual and on-going one, characterised by the careful and reflective working through of new ideas and practices over time. (Munby & Russell, 1989). Further, research on the nature and development of professional knowledge suggests that changes to key beliefs and practices is unlikely to occur unless individuals are given appropriate levels of encouragement and support as they seek to hold their practice up to scrutiny. That process is necessarily time-consuming.

The CLIPS project began in April, 1992, and in many cases, the focus for the research in individual classrooms has only recently been more fully determined. The project in each classroom has not been static, however, and the modest successes achieved so far have frequently resulted in a change in direction or, perhaps more properly, a refinement of goals as the following extracts illustrate.

In May, after Daryl has taught a unit based around the software 'Detect-a Pet', his university partner joined him to conduct a discussion with the Grade 2 class. Drawing out the children's reflections on their group skills began the process of change in Daryl's classroom has which developed over the year. In his journal of 31st May he reflects:

"...Group dynamics are the most interesting aspect of the class discussion which highlighted the need these children have of learnign how to

cooperate on group tasks. ...I feel I've learned that these children need more direction in organising tasks to be performed within groups. the need to learn how to work effectively with others...we need to discuss ways in which everyone can have a meaningful part to play."

In June, he reflects on the CLIPS meeting observing that:

"...most teachers present felt that children being able to cooperate with others on a common task was a major challenge for younger primary

children... this made me focus on the question of what sort of priority we as teachers should give to developing children's ability to cooperate with each other..."
By the August meeting he was reporting that :
" their group skills are much better. They are taking turns so much better... they have decided within their groups that each child has to take responsibility for a section of the work."
In the subsequent interview he elaborates further on the change that has taken place over three months :
".... they are learning to work better with other children... the whole approach to the classroom has been giving the children a lot more autonomy and power in which they choose their tasks. they are working far mor independently than they used to, because they are not so teacher dependent..."

5. Conclusion
This paper has sought to focus primarily upon the organisation of the project and some outcomes as they relate to teachers' professional learning. Preliminary analysis of the data indicates that teachers have begun to develop their professional knowledge about computers and to change their classroom practice in ways which more effectively utilise the technology. Further, it is argued that the classroom practice of teachers in the sample is changing; changes which can be attributed to the colloborative action research strategies which form the backbone of the project.
As Baird recently observed:
" We can achieve worthwhile changes in educational perspectives and practices, and these changes can be instigated and sustained at the school and classroom level, by teachers and students. What drives these changes are teachers' and students' needs and concerns, and what sustains the changes is the strength of the benefits experienced by these teachers and students. Out- of -school educational researchers have a crucial role to play in achieving these changes."
(Baird, 1992)
Importantly, observations also indicate that the collaborative research model has also been professionally beneficial to the university teachers in their understanding of children’s learning and the place of computers in classrooms. Our experiences so far lead us to the belief that greater significance should be attached to the educational perspectives and practices of the researchers as well as the researched.

The project is significant in that it seeks to contribute to understandings about metacognitive learning and computers in the primary school context. Current research concerning learning highlights the importance of metacognitive skills in promoting successful learning for both adults and children (Baird, 1989; Flavell, 1981; Rowe, 1988). Several researchers have identified particular strategies for use in developing metacognitive skills in the classroom (Baird & Mitchell, 1986; Swan & White, 1990, White & Gunstone, 1992). Most of this research has been conducted in secondary schools and more primary school based research is

needed.
Further, this study is unique in its focus on the teacher as the critical factor in using appropriate software to promote metacognition. Insights gained through this study will make an important contribution to the literature and teacher practice. Many claims have been made for the effectiveness of computers for promoting learning and thinking. However, research which substantiates this claim has been limited and generally linked to specific software, notably Logo.
The results from a preliminary data analysis also support research which indicates that the way teachers use computers is idiosyncratic (note the wide variety in ways in which individual teachers respond to the ideas discussed in the monthly meetings), that one day staff in-service programs are inappropriate and ineffective in changing classroom practice

and that teacher change is a slow process which is best identified in longitudinal research projects.
Further research
A 1993 research project will extend the work of the present studies by grouping the teachers with others in their schools, and matching all teachers with pairs of post-initial university students. Thus in each school a team of teachers, university staff and post-initial students will work together in an environment where the conditions noted for effective professional development will operate. It is hypothesised that this will be an effective model for developing all participants' professional knowledge and practice in relation to using computers to promote children's metacognition.

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Investigations in metacognitive learning processes: perspectives from learners

Maurice Robson & Julie Parton
Richard Johnson & Margaret Pickburn
Prue Anderson & Jill Holmes

paper presented at the joint conference of the Australian Association for Research in Education and the New Zealand Association for Research in Education, Deakin University, Geelong, November, 1992.

Introduction

A previous paper in this symposium has outlined the broad structure of the CLIPS Project (Children and Learning in Primary Schools) both in terms of its methodology and the literature base from which it has grown. The results from preliminary data analysis were also presented. In this paper we present three brief case studies to fill out some parts of the framework and, particularly, to show the differences in the nature and outcomes of the research in individual classrooms as well as to highlight important similarites.

Case Study 1

"I want to be a learner too!"

Maurice Robson and Julie Parton

Context :

Julie has been teaching for eight years and currently teaches Grade 3 in an independent girl's school in Melbourne's eastern suburbs. After completing computer units as part of a Bachelor of Education course she became interested in exploring new ways of using computers in her classroom. With a colleague in the adjoining Grade 3 class she had planned to introduce a keyboarding programme in order to improve the word processing skills of her grade which , in turn, would improve access to the computer. Twelve Apple IIe computers had been given to the school and these had been located in a small laboratory to enable a keyboarding program to take

place. It was hoped that having them available would enable individual children to have greater access to a computer than was currently available. Planning for this program was well advanced when I began working with Julie.

In addition there were two Apple 11e computers in the classroom when we began working together. The computers were located in a back corner of the classroom, each attached to a separate printer. Julie had set the classroom up in this way to minimise distraction for the computer users whilst allowing for teacher supervision of their activities from the front of the classroom. Julie explained that this arrangement was

"in order to distance the computers from the mainstream... it works very nicely... I can have people working there not being distracted by what's happening here"

The two computers were used to support the existing curriculum but Julie was concerned about the difficulties in enabling individual children to have enough computer time to complete tasks

"...I use computers to complement my teaching. Sometimes I don't see how they can contribute to effective learning as I just get so frustrated with the time management that it all requires"

Nevertheless, they were seen to provide important contexts for learning, and Julie indicated that she saw the research project as a means of exploring additional ways in which computers could be used to enhance learning:

"I use [them] for problem solving, maths and language ...so I feel I integrate computer activities accross the curriculum... that's how I use computers now. How I would like to use them is another matter, and I'll use this project to show me more effective ways to use them (and to) open it up just that much more to me..."

Expectations :

Julie saw involvement in the project as closely tied to her ideas of a 'good teacher'. A teacher , she believed

" needs to be open to being a learner. I feel I am a learner by nature

seeking out worthwhile in-service activities to extend my understandings and to be introduced to new teaching strategies... and I want to be a learner too!"

Julie saw the project as a means of obtaining "sound professional advice" , as an opportunity " to look at an issue really constructively", to " share ideas and learn from oneanother", to "learn how to integrate computers effectively" and "to see how they can be used to enhance thinking skills". This was in contrast to previous inservice programmes which were perceived to be of less value because they seemed remote from Julie's practice

"...you hope they will meet your needs only to find they you leave totally unenlightened and frustrated. I entered this project knowing that I could direct the learning along the course sought by my class and I, and still be working within the structure of the project. Here was a chance to be inserviced without leaving the classroom!"

Julie began the project with clear objectives in mind. She wanted "to provide each child with access to a computer on a regular basis"; to use

the computer "as a means of encouraging exploration and discovery learning; and to use the computer "to facilitate greater problem-solving and high order thinking skills".

Beginning to work together:
It was arranged that I visit the classroom for approximately one-and-a-half hours per week. After discussion about possibilities it was agreed that my role, initially, would be to support the children's use of 'The Children's Writing and Publishing Centre'; a new word processing program which Julie had just introduced. This was seen to be an easy to use, effective and stimulating program, because computer graphics could be incorporated with text.
For the first three visits my role was as an extra pair of hands to assist with troubleshooting and to support the introduction of the new word processing package. It was agreed that I would work with two small workshop groups, each of four children, observe their learning and assist where required. Importantly, this was a time for me to familiarise myself with the class and their levels of expertise. Julie had identified access to time on the computer as a particular concern
"I am still looking for an efficient method of ensuring that each child gets a fair turn on the computer on a regular basis. They expect a lot of themselves and want to achioeve a great deal in a short time....."

and this was established as a focus for further discussion after I had observed the small groups. My first task, however, was to establish why one of the two computers in the classroom would not accept the software being used. It was discovered that the that computer lacked sufficient memory.
Those initial observations and discussions with Julie led us to focus first on the small group dynamics and to provide feedback on children's performances. These observations raised several issues, principally the difficulties the children were experiencing in sharing roles and tasks in the group
"Miss Parton, it's two against one for printing now!"
and the dealing with the associated group conflict, and the physical location of the computers in the room. Julie observed that
"...cooperative strategies were put to the test from the beginning as the enthusiasm became quite overwhelming. The students, recognising that they must collaborate and accept each other's opinions, struggled to use these strategies"
and she proposed that she focus on the development of group skills, particularly cooperative group skills , the use of smaller groups, and a means of sharing computer time .
It was also considered important for Julie to observe the activities at the computers so that we could discuss appropriate strategies on the basis of commonality of experience. This we felt was particularly important so that I was not cast in the role of 'expert' (unwillingly) and so that, in the longer term, Julie could develop strategies which would enable some observation of learning taking place at the computers without the presence of an 'outsider'. I therefore exchanged roles with Julie on some

occasions. Sharing the teaching responsibilities in this way has been significant in assisting me to understand Julie's perspective as we examine what has happened and develop goals and strategies.

More recently, discussions have become concerned also with ways of using computer software to develop children's thinking skills, particularly their problem-solving skills. Following whole team meetings in which another teacher explained his use of "Slide Shop" we have begun trialling that program. In order to promote problem solving and metacognitive learning it was agreed that I would guide two groups of two children in learning the software, encouraging them to utilise their existing learning as they tried to use 'Slide Shop" . In turn, they would then each assist another group of two children to learn the software. At the time of writing, the second iteration of this process is in progress with evident success.

Observations and outcomes

To the time of writing Julie and I have worked together for a little over one school term and it is appropriate to draw only tentative conclusions from the experiences so far; both about the way we have worked together, and about the learning outcomes for children.

It is clear to us that working very flexibly does present difficulties in organising time on the computer and challenges the ways Julie is used to working. For example, the school timetable includes daily reading time for everyone immediately following morning recess. This left the computers unused for a time and so Julie has recently changed this to encourage individuals to organise their daily reading themselves. At the same time, a roster for the computer enable greater access to the computer throughout the day.

Other positive outcomes are emerging. The children are more willing to explore the computer software and to take risks in their learning. Regular access has meant that children are increasingly confident with the software and are beginning to make links between different software, seeking out common features. This exploration is also marking our work in the classroom, and, frequently, the monthly meetings of the CLIPS team provide new ideas for us to follow up. The use of 'Slide Shop' is one example of this and, as npted earlier in the paper we are now exploring its use in order to develop children's problem-solving skills. This indicates something of the dynamic nature of the project.

For us, the process has been professionally very valuable. For Julie it has provided a large reference group for the exchange of ideas and an incentive to examine specific aspect of her work with children. For me it has provided a valuable context within which to explore ideas and issues embedded in both the context and the process of my teaching. It has also challenged my beliefs about ways of working collegially in schools and provided a wealth of experiences upon which I can draw in my university teaching.

Case Study 2

title
Richard Johnson & Margaret Pickburn
CASE STUDY
COMPUTERS AND LEARNING
Richard Johnson and Margaret Pickburn

BACKGROUND

Margaret Pickburn and I are working as a School/University team in the Computers and Learning in Primary Schools (CLIPS) research project: Investigations in Metacognitive Learning Processes with Computers: A Focus on the Professional Development.

I am working with Margaret Pickburn of Bennettswood Primary School and her Grade 5/6 students.

I have worked with Margaret on several projects over the past four years. Margaret is well aware that for some time I have been keen to get her and her colleagues at Bennettswood Primary School involved in classroom based research especially related to the use of computers. As Manager of the Bennettswood Technology for Learning Centre, I have felt the need to work more closely with the teachers at Bennettswood Primary School so that they could use the facilities of the centre more fully. I also see it as a great opportunity for me to work with teachers and their students to improve my understanding of how children learn and how teachers develop their professional knowledge.

When I talked to Margaret about her involvement in the research project, the question about children's learning was our first point of agreement. Margaret made it clear that she was interested in focussing on improving children's learning. She felt that in order to improve children's learning she would need to explore ways of improving her own teaching. Margaret has been interested in computers for some time and with her recent move away from teaching the younger children, she felt that focussing on how computers can be used to enhance learning would be worthwhile. The Bennettswood Technology for Learning Centre gives us a common facility for our work.

AIM OF THE STUDY: METACOGNITION AND COMPUTERS

Our study aims to develop teaching and learning strategies to link computer software with the curriculum and past experiences of the learner so as to teach metacognitive skills.

METACOGNITION

Metacognition as used in this study refers to the knowledge, awareness and control of one's own learning and involves conscious decisions made by the learner regarding approach to, progress through and completion of a task.

STRATEGIES

I helped initiate classroom meetings in Margaret's grade. Margaret and I had been talking about the value of classroom meetings for some time. I suggesting meetings in the belief that they are another way of giving students a greater say in what they do. It makes them more responsible. They can participate in their learning to a greater extent. That is, of

course if classroom meetings have that as an objective.
It so happened that on Wednesday evening, after school, I was talking to Margaret about the research project and her Bachelor of Education Units when we got into a discussion about the problems the two Grade 5/6's were experiencing or causing. Michael, the other Grade 5/6 teacher over and we got involved in a three way discussion of the problems. The problems were of teachers across the school not being consistent in their expectations of students' behaviour, students not taking pride in their work or their school, there being a them and us mentality with one teacher being played off against the other. I was a perfect opportunity for me to register a plug for classroom meetings. Margaret agreed, we were to have our first meeting on Friday at 9.00 am.
A question for me is: Why am I there? How is conducting a classroom meeting related to my research?
If I am to investigate the issue of computers and learning, then I must establish my credibility in the classroom. I could not be involved in a project which meant being involved with the group for forty-five minutes each week. Using computers to enhance learning would have to be a project aimed across the curriculum and not just something done by an outsider. The fact that the students know me and the fact that I am working with Margaret is significant. Working on the initiative of the classroom meetings was a good context for me to get involved in an area other than computers. The content and context dependency of metacognition implies integration of

metacognitive training with curriculum content (Gunstone, R., & Baird, J.,1988).
If I am to ask students about their learning, I must have credibility. I must have their trust. If I am to investigate students' learning, and write about teaching strategies that can be used to promote metacognition, then I must use those strategies in the classroom. I tried to interview students but found that I could not get where I wanted to go. The frustration of observing, commenting, interviewing and analysing led me to be involved in the teaching.
I found that the following model was not working:

Figure 1
This is the model I am now trying:

Figure 2
The classroom meetings provide a context for my involvement in the classroom. By being involved in the meetings I am not just seen as the "computer person". I am also hoping that the meetings will provide a forum for the students to talk openly and to express their metacognitive thinking skills.
I also teach Margaret's grade how to use HyperCard once each week for forty-five minutes.
Why HyperCard?
HyperCard is the most pliable computer program I know. It is easy to use and it is the easiest program that allows the user to be in control. It

would be misleading to describe it as a particular application. It can perform several functions. Importantly, it comes free with the Macintosh . The flexibility of HyperCard allows students to approach it in several different ways. You could play, explore, follow a linear path, branch, link, draw, create etc. HyperCard could promote metacognitive learning practices.

The Hypercard classes

Computer software plays an important part in this study:

Figure 3

For the first two lessons, I decided to observe while a colleague taught the grade. It was frustrating for me to just observe because I had a research and teaching agenda. I feel that in this study I need to make the links between computers and metacognition if I am to investigate that area. It may have been different if I were working with a teacher who was doing this in an expert way and my role in the classroom were to observe the teaching strategies used and monitor their effectiveness. That is not the case.

On the third week I decided to do the teaching. This happened to be the same week as our first classroom meeting. It helped.

The mood for HyperCard (or maybe just to work with computers generally) was positive and after a short introduction they were left to themselves. They worked in pairs. In my introduction I showed them how to make animations with HyperCard. That caught on Within ten minutes three groups had programmed their first animation.

Now what?

With reference to figure 3, I have not linked with the curriculum context. I realise it is still very early for that. However, I have some questions before me. Do I need to make the links between the HyperCard lessons and the classroom curriculum or should Margaret be doing that? If the computer is to be a tool in the classroom, should the students be shown how to use the tool and be left to make the links themselves? How do I teach metacognitive learning strategies in the context of this study?

What of professional development?

The professional development advantages for me have been clearly expressed in this case study. What of Margaret?

Margaret has maintained a reflective journal throughout the year, and has participated in the CLIPS teachers' meetings. She has continually grappled with the question of how to promote active learning in her classroom, and in particular to encourage student questioning. The interviews with Margaret indicate that she is more and more viewing the computer as a learning tool, integrated with the classroom curriculum. She has become a "learner watcher", committed to making her practice more learner centred.

Case Study 3

title
Prue Anderson and Jill Holmes

Jill has a small composite grade one-two. She has been teaching the children to become more independent in their learning and to build their understanding and sense of themselves as valued and skilled members of the grade. Her use of computers was initially with adventure games which provided opportunities for co-operative pair work, simple logical problem solving and which encouraged the children to learn to work independently of the rest of the class and without alot of teacher direction. Software was changed as the children's interest waned. Computers were a peripheral tool which fitted in with Jill's educational philosophy. As Michaels (1990) argues technology does not create change but is a useful tool for those predisposed to change who have a positive attitude to technology. Unlike the rest of the teachers in the corridoor who also have access to the machines Jill was the only teacher willing to experiment with ways of incorporating the computer into her curriculum.
My role in the grade was to work for two hours, one a week, with children on the computer observing and making detailed notes. My agenda was to use the computer to promote children's thinking and their ability to reflect on their learning. I was not satisfied, after four weeks of observation that the adventure games in use provided sufficient challenge to encourage the children to think at a deep level. Shaw (1991) found that adventure game problem solving does not develop skills or strategies which are applicable to more general problems. As the context of Jill's classroom was one in which children were encouraged to work independently with open ended activities and particularly through Jill's use of Children's Philosophy to construct meaning, it suited the introduction of logowriter (Genishi 1990). Emihohvich and Miller (1988) also emphasize the importance of a classroom context in which processes of metacognitive processes is essential if children are going to benefit from logowriter and be able to transfer problem solving skills.
It took about six sessions for me to introduce the children to basic logowriter commands. I would work with different pairs each week encouraging them to use the charts I placed on the board listing commands, and teaching each pair different skills which they could be responsible for teaching the other children. This strategy gave the children a great sense of ownership of the program especially as Jill was not familiar with the program and they really did have to solve any problems themselves or formulate questions to ask when I next came. The children initially found the number of commands and the consequences difficult to remember or anticipate and the geometry of moving the turtle too complex. As frustration was high, interest dropped. Palumbo (1990) and Cohen and Giva (1989) argue that logo is conceptually too challenging for lower primary through Cohen and Giva support modification to logo to make it suitable. As I had intended to challenge the children's thinking through their gradual understanding that they could simplify long strings of commands by

writing procedures, I was reluctant to make thinks too easy to begin with and remove the impetus for their discovery of the power or procedures. Logowriter is a modified version of logo with word processing facilities and some graphics and it was this which the children were able to master. Once colour and shading and the modification of graphics were introduced the children found plenty of challenge but were able to gain sufficient mastery to be delighted with their results. The children's learning now started to carry over into their other classroom activities as they shared their new knowledge and expertise with others and as some very proudly wrote long descriptions of their new found knowledge in their daily journals. Technical problems had prevented any of the work from being printed until this point, so this generated even greater enthusiasm and interest. Bailey (1992) found qualitative reports of valuable improvements in attitude, self confidence and co-operative skills and capacity to sequence and remember information can be generated through children

learning logo, which Jill would concur have been the outcome for those children who are becoming proficient with logowriter.

Howard (1989) describes the role of the teacher as being the middle ground to make the links between the child's inner world to the external world and to develop self knowledge of learning habits. The computer has been a useful tool in both to me, as the observer and with help to the child as there is a need to give very specific commands especially using logowriter. The role of the teacher is critical in actively incorporating new ideas and showing students how to master the computer (Weir 1989). Jill has consistently challenged the children to define their new knowledge and skills to explain their actions and to share their expertise with others. Logowriter is not a program she would have chosen especially as it does require some proficiency to introduce but she appreciates its benefits as a more challenging piece of software then adventure games. The partnership we have established has had many benefits for both of us and the children in our work to extend the children's thinking skills.

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AARE 1992 C.L.I.P.S. SYMPOSIUM
EVELYN T J BRANSGROVE
"TEACHER'S UNDERSTANDING OF GENDER IMPLICATIONS FOR LEARNING WITH COMPUTERS - RESEARCH IN PROGRESS"

LITERATURE REVIEW
Technology is regarded as significant for gender. Many have argued that technology serves to compound gender inequities. (Clarke 1990) (Siann 1988) (Porter 1988) (Bigum 1987) (Anderson 1984) Indeed Cockburn's frequently cited feminist critique of technology claims that: "machines are male territory ... control of technology is one key element of male power" (Mackay, 1991:10) Similarly Wajeman (1991) offers a feminist commentary on technology saying that looking for gender issues in technology is difficult given the success of gendered socialisation. Wajeman's analysis centres on the relationship she observes between technology and masculinity. While traditional definitions of technology are rejected as stereotypically linked with singularly male pursuits, she reasserts the value of subjectivity and irrationality in technological development. In this way focussing technological concern upon computers alone is viewed as discriminatory.
Nevertheless C.L.I.P.S. seeks to examine the gendered learning environment of the computers in spite of the "obvious irony that the computer is intrinsically non-discriminatory" (Schubert, 1984 : 28) While gender equality in computing is an important element of State and Federal Education policies, it is agreed that "changes in legislation ... have not really improved the situation for girls." (Reimann 1986: 337)

A gender exclusive curriculum in computing is described in the literature. Sexist software is seen as a central concern with symbols and images in software packages criticised as exhibiting sex bias which is exacerbated by the evident sexist use of generics in language. (Rose, 1984) Such software leads to girls feeling computing is not for them - that computers are not merely uninteresting but in fact quite meaningless. Fisher (1984:24) concludes that the consequences of sexually inappropriate software as "The general message ... comes across loud and clear - computers are for boys." In addition computer books/texts which are commonly found in Australian schools were found by Fitzgerald (1988 : 42) to portray the sexes differently:
"We found seventy two pictures depicting people interacting with computers. Altogether sixty nine males and fifty females were

pictured. Males were using the computer in thirty nine pictures, females in seventeen pictures, and both males and females in sixteen pictures. In most instances, males were alone when using computers (89 per cent) whereas females were typically in groups (33 per cent). Of the sixteen pictures with males and females, seven were males in the dominant role (e.g. using the keyboard, fixing the computer) and the females passively watching. There was only one case when the female was more active, and eight were neutral. Typically, males were portrayed as controlling robots, fixing computers, using (not watching) and working alone. Females were pictured as passive, looking at computer print outs, receiving messages and working in groups"

According to Michael Young in Mackay (1991) much current discussion of gender and technology now resides in the modernist/post modernist debate. Post structuralists are seen by Young to be more critical of the ways technology is interpreted to students. Nevertheless most in the post structuralist feminist academy concur with Wajeman (1991) who contends that a unified feminist theory of technology is not possible - not merely because this is new empirical ground where any contributions have focussed on the historical context. She comments that feminists cannot construct a metanarrative theory of gender and technology in the modern era. The transformative power of postmodernism can be questioned therefore given that the terrain is contested with contradictory possibilities. Henry (1992) offers some hope however for the agenda of feminists. While she rejects obligatory references to gender by the contemporary researcher as tokenistic, she argues that the role for the second wave feminist is to uncover the range and the complexities of gender in the pedagogical site. Her post structuralist metaphor of a kailedoscope, indicating simultaneous uncerntainties and hopes, is one with potential for the feminist researcher.

C.L.I.P.S. FINDINGS ON GENDER TO DATE:

1ST STAGE INTERVIEWS

C.L.I.P.S. teachers were interviewed initially on a range of questions including gender issues. Interviews sought to reveal whether these teachers perceived any differences between boys and girls in their learning with computers and how they usually dealt with any recognised differences in learning.

There is a paucity of research on gender differences in learning with computers. (Fitzgerald, 1986:39) However Webster (1992) makes some helpful observations about adults here. Webster believes that women utilise the computer as a tool and thus underuse the full capacities of the technology, whereas men seem to need to explore the uses and power of both the software and the hardware. Webster explains this by claiming that men

have more opportunity and more time to 'play' with the technology which increases their confidence and experience. Somewhat pessimistically Webster concludes that the curriculum does not offer any alternatives or challenge this trend.

Without exception, these teachers began by stating adamantly that in their

experience gender differences in computer learning do not exist. However these responses which initially refuted an essentialist view of gender were negated somewhat.

For instance having denied the significance of gender in learning one teacher went on to tentatively suggest some observed differences saying :

"Their purposes were perhaps a little bit different. Perhaps the girls wanted the end result ... at first... It's not obvious at first. There are probably subtle differences. The only common thing that I have used over 3 years, is the male idea of having to get to the end of the game. They would really try to beg and barter with anybody for the computer time. It's not true of all of them. It is probably the only marked difference. Initially they probably use it differently, but then it evens out. Girls are usually quicker at looking at the word processing. That is a starting difference that fades. They are usually equal in the games".

While hesitant and believing that any observed differences are neither absolute or permanent, this teacher implied that her pupils seemed to have gender differentiated goals for computer learning. Apparent female aptitude with word processing may have potential for gender stereotyping the labour process of technology (Wajeman 1991). In addition acknowledging differing uses of computers by the sexes may prove a gender inclusive method of catering for differences in learning style. Rather than seen as 'weakening' data, these hesitancies, qualifications and even apparent contradictions themselves are not without significance for gender in post structuralist feminist discourse analysis. Yet another teacher who previously disclaimed gender as a pertinent variable seemed surprised to concede;

"The only thing I find is that boys tend to want to dominate being on the computer. That is what one has to be aware of and to make sure that the girls get equal access to them, so I just have to be aware of that. The boys do tend to muscle their way in and try to take over."

Thus she identifies a central issue for girls in their learning with computers. Equal opportunity principles and liberal feminists are cognisant of the fundamental priority of the need for equitable distribution of

desirable resources such as computers and the role of harassment identifying sexist classroom relations. (Spender 1984)

Interpreting the rationale for C.L.I.P.S. teachers on the one hand deflecting gender as an influence in computer learning and yet on the other describing such phenomena is interesting for feminist theorising also. One teacher stated that the reason why gender differences in enthusiasm for computers may not be evident in her current class was probably because of an unusually high proportion of girls in this grade. Another teacher reasoned similarly citing access to computers as a problem in her classroom as primarily due to the grade having many more boys than girls.

Certainly these ideas accord with feminist positionings on the value of single sex classes and the relative merit of single sex schooling, which evidence the particular and additional disadvantage girls experience if they are outnumbered significantly by boys Reimann (1986:240) concurs saying that "there is an initial need to have single sex groups so that girls... can have access to computers in a non-threatening environment". Other reasons employed by C.L.I.P.S. teachers to justify their comments centred on extended rejections of male - female dichotomies underscoring the belief in equal capacity for competence with computers irrespective of sex.

However, the controversial issue of whether schooling practice takes up this challenge and translates equal opportunity into equal outcomes with computers has not yet been considered by these teachers in this forum. The developmental contention evident in another teacher's rationale is to be qualified then too, given that she implicitly notes that sex differentials are not present in the Junior Primary levels. Although contradictory tensions must be noted here as this teacher also argues that any observable gender differences "even out".

In addition although research has shown otherwise, (Gribbin, 1984) some

C.L.I.P.S. teachers noted that any potentially socialising and sexist stereotypes are no longer applicable as most children have access to computers in the home anyway. Gribbin's (1984 :16-17) study of "primary aged children in London showed that the majority of girls who wanted a computer... did not get one (the reverse applied for boys) and some of these girls stated that their brothers (not always older brothers) got a computer instead, meaning they had occasional use of it" may be a relevant consideration.

Added to this is Gribbin's study of boys who when interviewed replied that computers in the home would be predominantly for male use. Sexist role modelling in the home may add further qualifications given his conclusion that "these girls who did get a computer were all taught to use it by their fathers." Fitzgerald's Australian research corroborates this finding "fathers

were not likely to encourage daughters to use computers in the home" (1986:12) as does Willis in Bigum (1987:66) who reports "the number of times I've heard 'my brother has a computer at home but I'm not allowed to touch it'".

The C.L.I.P.S. teacher's statements of the strategies they employ to deal with observed gender differences in computer learning is thus a problematic site. Given that these teachers are not convinced that gender is an issue for learning means therefore that they may not be expected to either articulate or develop appropriate strategies to accomodate these 'hypothetical' differences in learning. However in subsequent interviews, a few counter sexist strategies were described. Nevertheless the most representative response of these teachers maybe described as a rejection of

interventionism:
"How do I deal with it? It is not really my place ... Just watch it a bit more as an interesting thing and leave it alone."

SECOND STAGE INTERVIEWS

As a way of monitoring teacher development, follow-up interviews focussed more on teacher concerns about gender issues in computing than on perceived gender differences in learning. Nevertheless some teachers responded by echoing previous sentiments reiterating a rejection of gender differences with computer learning -

"I don't think I could make any gender claims ... I don't have to be worried about the girls having equal access. I do like girls and boys working together"

A feminist critique of this classroom would want to examine whether mixed sex pairs consistently allowed girls real access to computing given results showing the contrary. For instance Underwood's (1990) research found that while teacher's preferred mixed gender groups, this clearly disadvantaged the girls. This was expressed by male dominance, a fall in female motivation and a very rigid task demarcation between the sexes.

A male teacher continued this emphasis on gender differences again. His response emphasised earlier statements about perceived gender preferences in software selections where he proposed that his female pupils seemed to prefer software which gave them more freedom to create pictures. Indeed females preferring graphics types of software has been observed. (Moontd:1984) (Reimann, 1986)

However some C.L.I.P.S. teachers did respond as anticipated to the follow up interviews by revealing their concerns. For instance one teacher says:

"I don't think I have any real concerns about it. The only real difference is that the girls enjoy the word processing more. They also appear to be more efficient. I wouldn't have been able to make that statement 2 years ago. I find that gender differences fluctuate. With the current educational trend, the awareness is there. It would probably be a question to ask at the older levels."

Another teacher offers a more extended glimpse of her possible concerns:

"I am quite happy with how the dynamics in the classroom work with computers. I put a very strong emphasis on equal access... I have been really aware of, and concerned about those issues. I have stressed that girls would have the same opportunities as boys. In some respects the girls have gone on and got on with the job of learning this ... a lot better that the boys. The boys tended to clown around for a few weeks... whereas, the girls just went on with what they wanted to do. They knew exactly what they wanted to do. They got on with it. Maybe that is a concern the other way .. that the boys had taken longer to settle in to what they are doing. In terms of their actual learning, I think much the same is happening. Girls are a lot more mature at this age. You give them

a task to do, and they take that on .. they have a more mature attitude to it. I have some boys who are doing wonderful things with it. They are creating an adventure game and are totally absorbed by it. There is a small group of boys who still don't have a focus of what they are doing and where they are going, yet... Some of the boys may take a little longer to decide on a topic, than the girls. I think, basically, it is much the same. They seem to be producing much the same output."

This discussion offers much for feminist discourse. Again while beginning with a denial of gender related problems much could suggest otherwise. At the very least Equal Opportunity Units hypothesise that there is nothing to suggest that the work of Spender (1984) does not apply to computing when she indicates that significant gender discrimination occurs when males construct the classroom agenda by their negative behaviours. This can lead to girls receiving less teacher attention meaning lower self-esteem and a reinforcing of sexist stereotypes of behaviour - which for females is passive. Certainly Clarke (1990:57) believes that girls receive less positive rewards in co-educational computer classes. As in previous interviews this teacher is reflecting a more liberal feminist definition of gender equality which depends upon equality of access and opportunity rather than equality of outcomes. Such a liberal feminist definition of gender equality is criticised by Willis in Bigum (1987:63).

6.

These second stage interviews also tried to trace relevant aspects of teacher cognition, asking them whether they had been thinking about any concerns about the differences between girls and boys in their learning with computers since the previous interviews. In most cases teachers indicated that they had been thinking about C.L.I.P.S. and gender:

"I think I find myself thinking about it a lot ... constantly. I don't know if it is anymore than in the start. I have done a lot of reading on it."

This was somewhat of a surprise given that nearly all other responses were prefaced with an apparent denial of gender different concerns. However not all responses may be deemed positive for gender:

"When I really think it through, I can't make a blanket statement. If you start saying those things you can lock children into it, so I shy away from making blanket statements... All I can say is that it is true for this group at this given time. I basically see children as individuals. My concern is that it could swing to an extreme situation.... I am concerned that the pendulum could swing in favour of girls in every situation. I am very much in favour of equal opportunity."

In this response we could assert the relevance of Clarke's, (1990) discussion of the popular celebration of the individual as antithetical to gender equality. Apart from not wishing to generalise and reduce the debate to sex dualities of male and female, (which is indeed topical in the feminist academy) this teacher has definite concerns about any frameworks for gender equality which venture beyond notions of access and merit. Gestures favouring females are regarded as extremist.

These follow up interviews highlighted another site for feminist analysis. Gender issues have not yet been exposed in the single sex school participating in C.L.I.P.S. and for feminists gender issues in computing

certainly do occur in an all-girls' school. While not directly asked about gender concerns, on analysing the interview transcripts the feminist lens can see some potential questions. For instance is the emphasis upon word processing a concern? How will Lawrence's (1985:10) image of girls as conspiculously absent in the computer era except when they use computers as "glorified typewriters be avoided." Certainly many (for instance Reimann 1986:339 and Willis in Bigum 1987:72) agree with Webster (1992) who establishes the need for a feminist critique demonstrating how gender shapes technology and how technology shapes gender ought to be included in all girl's schools especially if technological determinism is not going to merely reproduce the sexist division of the labour process via word processing classes. Wajeman (1991) elaborates further by outlining gender inclusive

strategies. These include noting how and why the contribution of women to computing is omitted and now social relations influence some technologies to be fostered and others inhibited.

CLASSROOM OBSERVATIONS

Data which warrants gender scrutiny also developed from the extensive observations implemented by one member of the University research team. Gender profiles can be constructed from these excellent case studies investigating computer learning in this Grade Two classroom.

One particular case study of a girl identified as B's is especially interesting. Again employing a post structuralist stance, one can see a complex and contradictory series of images where a change in the learning relationship seemed to occur with the change in gender of B's computer partners.

Analysing B's learning with computers in a single sex pair identifies both girls talking vigorously, taking turns, working co-operatively and covering a lot of conceptual ground. An apparently positive result for gender. Yet these observations also show that B dominated her female partners with them having to insist on access to the keyboard and resisting B's continual ideas and suggestions. As a result B's female partners had to interject or interrupt given her persistent control of the keyboard. Indeed in this single sex pair B would ignore suggestions provoking disagreements with B usually winning. This description of a girls only pair is hardly a triumph for gender.

And yet observations of B with a male partner identified as A poses gender dilemmas too. On the one hand gender equality seemed evident as B began computer tasks enthusiastically, taking risks and generally showing persistence and confidence in her decisions. Consultation was observed with this mixed sex pair reading the screen together, discussing strategies at length and making plans and choices co-operatively. Indeed B's male partner A was willing for B to make mistakes even though he presumed or

realised errors in her logic. This was even accompanied with tolerance and a lack of judgement about and criticism of B, restricting comments to reminders. When successes eventuated both seemed to delight in their computer learning.
However in this context B did not achieve equity - particularly in comparison with the single sex pair. For instance in this mixed sex pairing the male pupil frequently pressed keys without explanation and took a dominant advisory role suggesting how B should proceed. At first B was unable to gain access to the keys and seemed happy to rely on her male partner's instructions. Initially A confused B and though puzzled she was willing to accept his directions, while he actively searched for a solution. B's suggestions were covertly ignored and in spite of obvious and inevitable

failures, B was prepared to persist. B's partners interjections and insistence that his advice be followed was remarkable not only because his advice was clearly erroneous to B but because of the degree to which she was complicit with his considerable influence. Fisher (1985:25) comments that boys are more likely to intimidate girls with interference observing

that "boys commonly would reach over to press keys on the computer when a girl was using it. I never saw a girl press keys when it was a boy's turn". This mixed sex pairing resulted in B displaying obvious anxiety as she struggled to form her own concepts, in contrast to her male partner. He became increasingly confident and was happy to dismiss errors as red herrings. His role of instructor even included his checking each of B's steps to ensure her accuracy. Although A claimed that he had not used this software before it was evident to the researcher that he had done so. No doubt this helped his confidence and developing competence and familiarity - a clear difference with B's learning strategies. Indeed her role seemed to be limited to agreeing with his strategies by repeating them and encouraging most of his suggestions. Even the described successes need to be clarified as they were marked with B's male partner exhibiting apparent victory. This was accompanied by his emphatic, "I said... I knew I knew
What this data demonstrates is that significant gender issues may have existed in the computer learning of this classroom. This gender profile can be supplemented by reviewing observations of other children in this grade. Firstly a textual analysis of A when working on his own shows the level of his confidence:
"I was going to make a city kind of thing. I'm going to start on the road. LT 90 yeah that's what I want. How far should I go? Do 80 see how it goes. Oh no do some more. Oh well I didn't think it would do that. That's a good building now, I can just draw a line down there."
As established in his working with B, he does not look for errors and quickly and happily accomodates them. This is confirmed in research cited by Clarke (1990:58) explaining that "girls attribute failures as indicative of their own lack of competence .. boys attribute their successes to their

good strategies; girls attribute them to luck ... girls are gaining little positive benefit from their success and a lowered self image from their failures". Teague's study of tertiary computer science students suggest significant and long term implications for learning here. Her research concluded that males were twice as likely to state that they had not experienced failures having "higher expectations of success and greater confidence in their computing ability, but there were in fact no significant gender differences in academic results". (Teague, 1991:378)

Other single sex pairs working with computers in this classroom extends the case study of B too. Girls were observed as taking care to show their female partner how solutions could be obtained. A high incidence of agreement and discussion was observed with equitable turns of the keys. Consultations with each other were characterised by private whispering of suggestions when the other girl was in difficulty. And yet progress in learning seemed very tedious.

Another observed single sex female pair did not seem as collaborative in their learning as may be seen from the researcher's observation notes:

"I had to remind D several times to let E have a turn using the keyboard which she would do, coaching from the sidelines until she couldn't stand E's hesitancy and would take over again. E seemed happy about this arrangement."

However it is very important to note that the researcher's interventions over the sessions succeeded in a co-operative partnership developing between these two girls. This highlights the importance of the teacher's role in promoting gender equality in computing which Clarke (1990:54) implied when she concluded that male domination is most apparent in computer activities where there is little or no teacher supervision.

Another mixed sex pair observed is interesting also. Although this pair showed some evidence of working together, the general pattern does not seem to reflect gender equality. For example minimal discussion or co-operation between the children was evident even though the researcher attempted to make the children at least explain their choices to each other. Demarcation was intensified when the male pupil announced his ability to master this software package. Voluntary consultation of his female partner never occurred and when insisted upon the researcher noted his added

reluctance even disinterest in his female companion. This was combined with his racing through instructions on the screen even though on questionning he had to admit that he did not know what some of these instructions included.

These observations of this male pupil are especially poignant when placed in the classroom context. According to both the class teacher and the researcher this child is not an effective learner. Yet he is very interested in computers, willing to take risks and adaptive upon making errors. Even though he has been described as taking a long time to produce

very little he frequents the computer corner of the classroom. This strategy and added experience seems to give him a lot of extraneous information as he watches others with the computer programs. Clarke (1990) has noted this strategy of male pupils describing boys as more likely to 'tinker' with computers.

10.

On the other hand a female pupil in this grade who has also been regarded as less competent with her computer learning presents as a very different learner. She is observed as highly passive and relying on others - working best when she works with the support of her female friends. This has been noted by Clarke (1990:58) who states that "Females ...rely on others to assist when they experience difficulties, believing that ... others ... have the information they can use." Reimann (1986:340) proposes a similar hypothesis suggesting that an important reason for gender inequities in computing was girls being dependent on others for information and feeling intimidated by computer knowledge. Although many feminists would argue that such blaming of the victim is indicative of a female-as-deficient model, most would be more likely to agree with Moontd when she comments (1984:42) that "boys seemed to feel their own power in relation to computers more than girls did ...[and] only girls showed strong negative feelings about computers". While some strategies of this female pupil to seek help are viewed as efficient, overall she was seen by the researcher to 'freeze' with a nervous grin in front of the computer screen - unable to take any risks or manage any unexpected results. Reimann (1986:340) describes sex differentials in responses to difficulties with computing proposing that boys will be more aggressive and demanding in their need for help whereas "girls will sit and wait for assistance." Clarke (1990:59) commented that poorly performing boys were less likely than poorly performing girls to admit to being scared of a computer or uneasy about using them.

(Acknowledgement for this section on classroom observations is due to Prue Anderson for her excellent field notes).

POSITIVE STRATEGIES

It is not without significance that this aspect of the paper is the most hypothetical. Given that this symposium is reporting on research in progress and that a long term view has been adopted, it is probably still useful to indicate positive strategies planned rather than fully implemented.

To date strategies to facilitate positive teacher change have been dependent on the individual teacher/researcher's interest and thus be somewhat benign. At times whole group meetings have produced discussions on gender issues. A few researchers have discussed gender as it applies to the specific classrooms and of course the interview questions on gender may have had some impact. More formal professional development workshops have been offered for when the research team feel the timing is appropriate. A comprehensive listing of possible strategies has been circulated to the researchers to prepare for the in service activities. These strategies to

promote gender equality in computing include information on classroom dynamics, role models, policies, inclusive language, software guidelines,

parental involvement and counter - sexist resources. Thus these solutions involve individual, school and systemic ideas based on the gender inclusive

curriculum model. A significant gathering of resources has occurred of gender inclusive curriculum exemplars relevant to computer learning in primary schools.

CONCLUSION

MAKING C.L.I.P.S. GENDER INCLUSIVE

In conclusion some personal reflections of the research process of C.L.I.P.S. will be considered. This paper has outlined one example of how a research project may begin to become more gender inclusive. For this discussion a definition after Fowler (1983) is employed where a gender inclusive approach is one which deliberately and positively incorporates gender issues in both its contents and methodologies. Thus a gender blind framework is rejected. As Edwards (1990) postulates gender is not an object of study but is a part of the research process itself. In accepting feminist debate a false claim of gender neutrality is avoided also, as feminist studies have provided much evidence establishing that all research is gendered in some way (Spender 1992) (Grosz 1988) (Lather 1990).

The issue of researching teacher development in particular largely remains gender neutral or more accurately gender blind. Robertson (1992:43) shows this in powerful ways and argues that "gender issues and teacher development are almost always dealt with as mutually exclusive fields of enquiry... such an artificial neutrality perpetuates androcentrism, or male centredness." She substantiates this by asserting that this ignores non-concious beliefs and motivates mainstream research to ignore the substantial body of feminist research or at the most treat gender as an after thought. Robertson provides many specific examples which are challenges for C.L.I.P.S.. For instance she states "the inference that gender is irrelevant to student response to curriculum... is fallacious... Gender neutrality obliges educators to ignore male/female differences in learning styles." (p.53-54) Robertson's relevance is not limited however to a critique of the invisibility of gender in the discourse of achievement, as she proposes gender-related variables which may inhibit the progress of the research team.

The almost intuitive grappling with the research dilemma has grown out of the very act of researching. Certainly there is a rapidly expanding field of feminist theorising of research. However while significant contributions are noted feminist researchers which are perceived to be occupied with so called separatism are not yet recognised as having appropriate answers for the broader research community. In addition

feminist researching quite properly is concerned essentially with the feminist cause itself. Given this how can the more 'mainstream' research process be influenced? How can

feminist contents and methodologies be activated so as to be concurrent with more traditional contents and methodologies? Is this possible given that gender is the primary lens for feminists and that of course there are many feminisms? It is possible to go beyond what Kenway and Modra (1989) describe as modern theorists of education treating gender politely "making occasional co-optive and burying reference to the most upmarket feminist theorists/researchers" whilst remaining essentially unconvinced of the need to examine embedded gendered assumptions in the subtext of the research act."

In reflecting in this manner it is evident that series of dichotomies are drawn so that mainstream research is set up is some ways against feminist research. Whilst this may be necessary for simplification, such dualistic paradigms are antithetical to many in the feminist academy who spurn bipolarist thought as reductionist. (Davies 1990)

With these clarifications in mind, what may be regarded as some of the values and techniques which contributed to C.L.I.P.S. starting to becoming more gender inclusive?

One of the most enabling aspects for gender inclusiveness was the jigsaw approach which existed as a part of C.L.I.P.S. from the outset. The utilisation of this structure allowed a non-hierarchical model of shared 'expertise' with each research member contributing uniquely and yet in a co-operative spirit. This method seemed to allow gender per se to be viewed as a distinctive element of the research project.

In this way the C.L.I.P.S. team was offered strategies which attempted to begin to raise an awareness of how gender may intersect with C.L.I.P.S.. This included compiling a bibliography of Gender and Computing with annotations pointing to the usefulness of selected resources for teachers/researchers. Indications of the respective relevance of texts were noted also in relation to the identified interests of various group members. The purchasing, gathering, highlighting and holding of pertinent resources operated as a potential service to C.L.I.P.S.. In addition a literature summary for circulation was conducted. Keeping abreast of current literature and debate on Gender and Technology was maintained as a way of developing an expertise which could be recognised and shared with C.L.I.P.S. members.

It must be reiterated that this paper is reporting on research in progress. The task is not yet complete. So reflections of the feminising of the research process indicate future directions. However it may be that this conclusion points to the anticipated focus of the research effort. That is a more direct and explicit examination maybe needed to investigate how

gender may be integrated more fully into the research process itself or

else C.L.I.P.S. may fall into the trap aptly described by Kenway and Modra (1989) after Freire as the wishful thinking of conciousness raising. What has been learned so far is indeed obvious for many in the feminist academy. While difficult and as yet largely undertheorised, so called 'mainstream' research must become more gender inclusive in the post positivist era. For after all "Engaging in theoretical debate with 'the converted' is an occasional luxury subsumed within the wider task of constructing a discourse with sufficient ideological power to change the practice of teachers and policy makers - many of whom are men and most of whom are not feminists. For this audience gender must be largely presented as an educational rather than a feminist or a political issue" (Kenway and Modra, 1989:14)

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"Teacher's Understanding Of Gender Implications For Learning With Computers"
Evelyn T J BransgroveIntroductionClassroom ObservationsPositive Strategies

Conclusion
Making C.L.I.P.S. Gender Inclusive

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C.L.I.P.S. Findings On Gender To Date:
1st Stage Interviews
Second Stage Interviews

Investigations in metacognitive learning processes with computers: the teacher as learner.

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Background
“I don’t know what to write. I just look and listen. I can’t keep writing that every week”. (Teacher, when asked to write a weekly learning

reflection in an introductory computer unit.)

Learning is the raison d'etre of teaching; the basic focus of our craft. Yet learning is elusive and as Marton and Ramsden (1986) point out, frequently presumed to be synonymous with recall and memory. They argue that "the purposive elements in learning - the students' perceptions and decisions - and the world as seen through the eyes of the learner" (p. 270) are the more salient features of learning with which research ought to be concerned. By implication, these should also be the concern of teachers. Teachers ought to have insights into the nature of learning, learning styles and appropriate and inappropriate learning strategies if their teaching is to be more effective. They ought to have a well informed philosophy about the conditions which support learning. Because these concepts and philosophies grow and develop with time and experience, it is important that teachers constantly revisit and explore them. This is the nature of reflective teaching. Teacher reflection about learning, with the self as subject, is the nature of the research described in this paper. The context is an Introduction to Computers in Education unit in which the students are qualified teachers, many currently practising, with little or no computer literacy.

Using computer technology as a novice is, for many, a challenging experience. Fundamental questions about learning are raised in a personal sense as teachers confront their own experience as a learner. This is a very healthy situation; a starting point for reflecting on the nature of learning and teaching in a novel way. Teachers often liken learning to use a computer to learning to drive a car or water ski. Initially, they may feel unable to draw on previously learned skills and concepts, and they wonder about their ability to learn, fuelled by a perceived lack of control. Others feel empowered. For each the experience is different. In this research the opportunity for these adult learners to reflect on the path they take in learning new knowledge and skills is investigated.

Metacognition refers to the knowledge, awareness and control of one's own learning (Baird, 1990, p. 184). It is the ability to plan and monitor learning strategies while learning. The desired outcome is learning independence, the ability to accept responsibility and assume control of one's own learning which Rowe (1989, p.1) has labelled "self regulation". Metacognitive strategies have been variously described in the literature as "checking, evaluating, monitoring, planning, testing and changing strategies" (Rowe, 1989,p.1); purposeful enquiry, asking evaluative questions, conscious decision making (Baird, 1990); making links with previous knowledge or other experiences, questioning (Swan and White, 1990). Baird (1990) goes beyond these 'awareness' and 'control' (strategy) components of metacognition and also includes a knowledge component which features knowledge about the nature and processes of learning, learning characteristics and effective learning strategies. More recently, attention has also been paid to the affective domain of metacognition. Davidson (1992) refers to 'commitment' and 'motivation' as components of metacognition which have attracted attention in the literature, while Baird (1992) has speculated about the importance of challenge in achieving better learning. In this study the knowledge, awareness, control and affective components of metacognition were all considered important foci for teacher

reflection.

Pilot Study

The early work, commenced in 1990 required teachers to maintain a learning log with weekly reflections of themselves as learners in the computer unit. Students were asked to briefly describe what they learned as a context for reflecting on issues such as:

Knowledge of one's own learning.

What sort of a learner am I?

What other sorts of learning styles are evident among the other students? What could I learn from these?

Which conditions best support my learning, and which hinder it?

Are others important in my learning processes, and if so, who are they?

Awareness of one's own learning.

What questions do I have about the content and processes in this course?

Are there any links between the new material I am learning, and my previous knowledge and experiences?

Control of one's own learning.

What errors have I made? What can I do differently the next time?

Affective influences on one's learning.

What influences have factors such as fear, confidence, success, motivation and commitment had on my learning?

Another important focus of reflection was the implications of these factors of learning for teaching. The teachers were asked:

As I reflect on this experience as a learner, what implications could be generated for the act of teaching?

The teacher cited at the opening quote of this paper explicitly and honestly expressed the apparent difficulty may teachers experience with such an undertaking. She saw herself as having only two strategies for learning in this context; looking at demonstrations and listening to the instructions. She appeared unaware of the complex repertoire of strategies for learning she was using, and one wonders whether this apparent lack of awareness might inhibit her ability to teach effective learning strategies to her students. Perhaps surprisingly, this was a very experienced teacher who, at the time of the course, was teaching children with learning difficulties! Her learning log, like those of many of the teachers, consisted mainly of descriptive passages indicating which new procedures had been learned during a session. For example:

can be used to find the names of all the people living in a particular street. A database allows the user to look for the relationships between facts. Classes can use databases to make graphs to show comparisons of particular information. They can also use databases to begin learning how to male inferences from given facts...

This example typifies many of the entries teachers made in their learning logs. The writer does not attempt to evaluate the degree to which she has understood the new concept of database nor the strategies she used to attempt to make sense of the information. For example, did recording the information in this way help her to understand the concept of database or would it be used for revision before the next class? Did she attempt to

generate other examples of databases she had seen in her experiences, since the telephone book example was provided by the teacher? Would she have better understood the concept had she attempted to do this? Did she ask herself if a database could have helped her in her learning or teaching? Did she experiment with a number of possible structures for a database and evaluate their appropriateness?

Perhaps the structure of the early learning log was inadequate for promoting the kind of reflection which had originally been hoped for. However, there were some good examples of metacognitive thinking. In particular many teachers expressed their knowledge about conditions which support learning and the affective components of successful or unsuccessful learning. Some made thoughtful links between their own learning experience and that of their students.

t and become familiar with the instrument. I have learnt from the first two sessions that being allowed to experiment can promote understanding and confidence, and I believe that this is important, whether it be in a computer session or music or story writing...

e, I am going to encourage my class this year even more to go to each other. Other students are a great source of information and I am also going to place on the wall beside the computer a set of simple instructions that will help the children if they get into trouble, rather than continually coming to me...

who does not know what to do. It's not a very comfortable feeling. However what outweighs this is when all of a sudden bits begin to come clear and you begin to understand. Each week you begin to add to the information that you have learned until all of a sudden you feel confident in using the computer to suit your ends and you are not sitting there with the machine beeping at you...

Over five semesters the learning log was the only strategy used to promote reflection on learning. The teachers were simply asked to record their reflections on what and how they learned. They were given a rationale and some guiding questions. Feedback on their reflections was also given midway through the course. Despite this, it became evident that more explicit strategies were required to elicit a broader range of metacognitive responses and increase reflection. Expressions of metacognition were largely confined to metacognitive knowledge with limited examples of metacognitive awareness and control as defined by Baird (1990). However, reflections on the affective component were generally well expressed as a subset of metacognitive knowledge.

The results led to a re-examination of the learning log as a strategy for promoting teacher metacognition. Course evaluations also indicated that the teachers required more direction about how to reflect on their learning. New strategies were planned to supplement the existing strengths of the learning log and this formed the basis of the second stage of the research.

Research in progress

The current research investigates the use of computers as a tool to develop

the metacognitive skills of 15 teachers enrolled in Introduction to Computers in Education as a unit in their fourth year of study. In this project the teachers are being taught to use a wider range of metacognitive skills, relative to the pilot group. The study seeks to investigate:

1) the effectiveness of computers as a tool for promoting the development of teachers' metacognitive skills (as compared to the pilot group).
2) the extent to which teachers apply metacognitive strategies in their teaching as a result of their participation in the study (as indicated in self reports).

In semester one, 1992, a number of strategies for developing the teachers' metacognition were trialed. Four teachers were interviewed at the beginning and end of the course, and these interviews, together with all teachers' learning logs provided data upon which the current strategies are based. Strategies currently being used are learning plots, concept maps, teacher modelling and learning discussions in addition to the written reflections which were used with the pilot group.

The learning plot was designed to encourage teachers to be more evaluative about their learning, to probe their understandings about specific strategies or conditions which may have contributed to a learning episode. It enables the teachers to graphically plot their learning, thus facilitating reflections on critical incidents. This encourages thinking both about conditions which promote learning and specific learning strategies. The learning plot resembles the Fortune Line described by White and Gunstone (1992).

Figure 1 is a teacher's learning log with notes. Here the teacher generates two components of learning, the cognitive and the affective. Within the cognitive component she identifies her monitoring and control strategies of consolidation, practice and linking learning with practical applications. The importance for her of learning from others is also highlighted.

Figure 1

Initial analysis of the teachers' learning log reflections indicates that the teachers have been more reflective than their counterparts in the pilot study. Their reflections appear to be anchored in learning episodes, with the learning plot as a point of reference. There has also been more evidence of metacognitive awareness and control, with the examples of purposeful goal setting and experimenting identified.

The first week we went into data bases in depth was also a critical point. I felt "overloaded". But I think because I had gained confidence with the word processor, I didn't let it get the better of me. I knew it was only a matter of time, practice and questioning before I would get the hang of

it...ˇ
y enjoy using the word processor and I enjoyed working through the database. ˇˇ To get to this stage, I spent a lot of time learning to touch type and playing around with the different commands, problem solving. Familiarity has bred confidence. I interviewed teachers to discover their views on using the computer in the classroom and how they use them in the curriculum. I also asked many questions over the weeks of various people to try to make the more technical points clear in my mind.ˇ..
ontinue to print in bold until either a boldface end command or until a carriage return. I succeeded in my challenge to find the pattern...ˇ
The metacognitive strategy of linking new learning with previous experience has been extensively described in the literature (Baird and Mitchell, 1986; Costa and Lowery, 1990). Concept maps have been used in this research to enable teachers to link key ideas in their readings and, wherever possible, make links with their experiences. This has resulted in the teachers' reading about computers in education being more purposeful than in previous courses. There was some evidenced of teachers integrating concepts from their reading into their learning log reflections.
A recently introduced strategy has been for the teacher to model self reflection, and provide the written reflections to the teachers. Progressively, more time has been spent on classroom discussions in which understanding oneself as a learner and learning how to use a computer have been a focus. These strategies have been introduced, in part, to encourage greater valuing of the reflective process.

Currently, ten of the teachers involved in the Introduction to Computers in Education course are being interviewed to provide additional data as to the effectiveness of the strategies described to promote their awareness of their own learning processes. The first interviews have been conducted, and preliminary data analysis indicates that, like many of the teachers in the pilot study, they initially tend to be more descriptive than reflective about their learning and express a limited repertoire of learning strategies. It is anticipated that, at the conclusion of the course, they will be more aware of their learning processes, and may provide examples of relating their understandings to their teaching.
The limited time spent in a one semester course is probably insufficient for teachers to link understandings of their own learning to their teaching. The next stage of this research (1993) will address this issue. It is proposed to make the unit school based, and integrated it with other units, including one which has as a focus the teaching of thinking. Thus, the teachers will become co-learners with children, and both will be a focus for their reflections.
This paper began with the proposition that teachers' conceptions and philosophies about the processes of learning and teaching continually evolve, and that revisiting these is a worthwhile venture. The teachers in this study have often commented on the value of this exercise, despite their initial difficulties with self reflection. The initial experience with computers is a significant opportunity for teachers to reflect on their own learning, and appreciate their own students as learners. The

strategies developed continue to evolve making this a dynamic, longitudinal research project.

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