AARE - NZARE Conference

Melbourne, November 29 to December 2, 1999

PROFESSIONAL DEVELOPMENT THROUGH SHARED ADVENTURE ®

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Abstract

This paper comes from a collaborative, school based case study that undertook to answer the question: How can computers be used to promote metacognition in primary school students? For three years I worked with a teacher and her primary school students in a room with computer equipment and facilities. The students used the computers to develop curriculum based projects. The teacher and I worked collaboratively to promote metacognition through our teaching strategies. We discussed our observations, reflected on our practice and acted on our findings in order to promote metacognition through the use of computers. The case study did not focus on technology. The beginning point was the use of the computer as a tool in the learning environment; the essential focus was on the more important issues of pedagogy, learning and teacher professional development.

This paper focuses on the professional development of Margaret, the classroom teacher. While the focus of the study was on promoting metacognition in primary school students, it was clear that the teacher underwent a process of significant professional development which developed into a related feature of the study.

Key issues raised in the paper include: personal challenge; collaboration; shared adventure; purposeful enquiry; reflection on practice; teaching strategies and the teacher as researcher.

INTRODUCTION

This paper comes from a collaborative, school based case study that undertook to answer the question: How can computers be used to promote metacognition in primary school students? For three years I worked with a teacher and her primary school students in a room with computer equipment

and facilities. The students used the computers to develop curriculum based projects. The teacher and I worked collaboratively to promote metacognition through our teaching strategies. We discussed our observations, reflected on our practice and acted on our findings in order to promote metacognition through the use of computers. The case study did not focus on technology. The beginning point was the use of the computer as a tool in the learning environment; the essential focus was on the more important issues of pedagogy, learning and teacher professional development.

This paper focuses on the professional development of Margaret, the classroom teacher. While the focus of the study was on promoting metacognition in primary school students, it was clear that the teacher underwent a process of significant professional development which developed into a related feature of the study.

The teacher's professional development is analysed using the 'Shared Adventure - A Model of Collaborative School Based Research' (Baird, 1993) as a framework. The following key words taken from that model were used as themes in the analysis of Margaret's interview data: personal challenge; collaboration; shared adventure; purposeful enquiry; reflection on practice; teaching strategies and metacognition.

In writing about the PEEL project Baird (1989) points out that

> ...teachers have to go through a process of considerable metacognitive development themselves. Perhaps the focus on the students' metacognitive development ... fosters similar development in the teachers.(p. 57)

This was confirmed in this study. The teacher's professional development was not the initial focus for this study. However, within the first six month of this study I was beginning to notice a significant change in Margaret's knowledge about learning, teaching practice, confidence in using computer technology and ability to talk about her teaching and learning, and I became interested in examining this related process. I was aware of the need for successful models of teacher professional development (King 1993, Thiessen 1992) which enable teachers to increase their knowledge, skills and attitudes to using computers in the classroom and enable them to acquire an appropriate level of confidence in using the technology.

FRAMEWORK FOR ANALYSIS OF DATA

As noted I have used the model of 'shared adventure' (Baird, 1993) as a framework for analysing Margaret's interview data to show her professional development in this study. The keywords used in the analysis of Margaret's interview data have been highlighted below.

The interplay between **personal challenge** and **collaboration** with others leads to **shared adventure**. Challenge and collaboration are the ingredients for **purposeful enquiry.** Purposeful enquiry is what drives this study. Margaret and I were involved in a process of **reflection** and **action** which forms an endless spiral aimed at bringing about better learning and teaching through the exploration of a range of **teaching and learning strategies**. This

process leads to the development of**metacognitive** learning skills which is knowledge, awareness and control of one's own learning.

PERSONAL CHALLENGE AND INTERPERSONAL COLLABORATION

> Two major conditions stimulate purposeful enquiry. These conditions are personal challenge and interpersonal collaboration. When conditions operate to provide concurrently for both personal challenge and interpersonal collaboration, you have a situation of shared adventure. In this situation, individual and joint thinking, feeling, and acting provide a range of benefits for all concerned. (Baird, 1993, p. 13)

When asked early in the study what she saw as her main challenge, Margaret answered:

> I think one of the main objectives I have is that the case study is going to force me to look at learning strategies, particularly with computers. It's because there is a focus for it. Unless there is a focus for it, you may not take it as seriously or do it in as much depth as you might if you didn't have a focus. I think that is my main objective. To try things out, to give things a go and to take a more in-depth look at how children are reacting to the use of computers in their learning. My aim is to force myself and to do more reading on the subject.

For Margaret there needed to be a personal challenge for her to be involved in this study. This was related to the purposeful enquiry that she describes as there having a 'focus to it' with 'depth'. She also describes the personal challenge as 'forcing' herself to do more. In explaining her emphasis on developing teaching strategies, Margaret explained the area of professional development that she favoured:

> Trying to develop strategies where the children question themselves more - what they're learning, and what they've gained. They're forced into the situation of looking at what they've done and why...So, the learning strategy side of it is important to me as well. Children questioning their learning. I think, perhaps, from my point of view too, it's going to make me think more carefully when I'm planning work and what they're going to gain out of it. Because of this focus, I am going to perhaps look at more carefully, at what the children are going to gain from a unit of work I am planning. Also looking at what the children have learnt in the past which may help them. They are the areas of learning strategies that I'm particularly interested in. Getting them to question themselves, and to question myself. To get an interaction going between the children and myself, so that the learning process becomes more

understandable to them, while they are doing it. I think that's interesting.

It is interesting that, in Margaret's objectives, the computer was not the focus. Good pedagogy was the focus. She described her challenge as being able to see how computers could be used to promote good pedagogy. I do not know of any computer related professional development programs that address such a wide range of concerns and I cannot see how a short-term professional development program can address all the issues outlined. In talking to Margaret she often described the longitudinal nature of the study as being an attraction. She saw it as not hurried and giving her more time. When asked about the professional development in this study, she summed it up by saying that 'it is ongoing'.

Margaret's interviews show that the collaborative aspect of the study was important to her and that she learned a great deal from it. The most positive aspect of the collaboration for me was that we never discussed ownership of ideas. We were learning together and from each other and from the students. When I read Margaret's interviews I can identify the ideas I introduced, and yet she refers to them as if they were hers or ours. Clearly, it did not matter to her and she saw us working together. In her interviews Margaret often uses 'we' when she refers to classroom strategies:

> In our computer project **we** have been encouraging the children to assist one another, and to actively seek help from other children rather than from adults.

> **We** have established a *HyperCard* Club for the children to use during lunch time. That's to allow the children time to continue their work with the program. This came about because **we** were just finding that the 45 minute session each week was not enough. The children were getting frustrated because they were not moving along fast enough. So Richard suggested we allow a lunch time.

In her second interview (August, 1992), when she describes some of the changes that have taken place, she does not mention me. She talks of encouraging children to reflect (not a part of her early objectives) as if it were her own idea. Often, it is as if I was not there. In the following quote Margaret says: 'the children are being encouraged to reflect on where they are going with this *HyperCard*...' Who is encouraging the students? I believe that that is evidence of the level of our collaboration and 'Shared Adventure'.

> The other thing that has changed, is that the children are being encouraged to reflect on where they are going with this *HyperCard* program. We have asked them twice to write about where they could go with what they are doing. It is forcing them to look at what they are doing right now and where they are going to take it. I was a little bit concerned, that some of them, initially, were just playing around...

When asked which aspect of this study helped her most of all, Margaret said:

> I would say my university partner would be my greatest asset. He has a broad range of knowledge, motivation and enthusiasm to do things. Without Richard there, I would know very little about *HyperCard* or other programs. Together, we come up with ideas, but I would have to say that he has helped me enormously with this whole project. He is very stimulating and supportive. He is great with the kids. It works very well.
>
> The other thing is being able to talk to other teachers at the meetings. I just find the professional development is really important....to be able to talk to other people about what they are doing and what is happening. On your own staff, you tend not to do that. You tend to talk about things other than teaching. I think it is nice to hear what is happening at other schools. I find it really stimulating and good for professional development. ... I think it is very useful to have the university lecturers there as well. They may have read something, or may have an outlook on something which you may not have thought of. So, I think that is useful too. I suppose it is good for the lecturers to listen to classroom teachers talk about what does and doesn't work for them. It works both ways...it is good for them and us.

In the section above Margaret refers to the monthly meetings which were an important part of that project. The collaboration that took place between the whole group - the school and university teachers at the monthly general meeting was a feature of the project. This was an important component of the professional development of the university and school teachers. In December 1993, Margaret sees the advantage of the interviews.

> I think what I have got out of this case study is that it has made me actually stop and think about what is happening in the classroom beyond the academic level. It has made me actually stop and think because of things like interviews and writing things down for Richard and planning with him on what we are doing, so that has been ...I mean it is very easy to be focusing on the more academic side of things and meeting parents' expectations of home work and projects and so this has forced me to look underneath it a bit more. So, that has been important. I also think just the professional development of discussions at the meeting has been interesting too and has been very worthwhile.

Some may interpret Margaret's references to 'stop and think' as having the time to stop and think through the resources of this study. That is not so. My presence in the classroom did not mean that Margaret had more time and therefore the luxury to 'stop and think'; nor was she given time release from her classroom duties. In the passage above she is referring to the orientation that this study gave to her classroom practice in terms of a different focus. Our focus in this study was on students' learning and how it could be improved through the use of computers. It was based on a model that

promoted reflection on practice and it is that to which Margaret is referring. It is a statement that strongly supports school based collaborative research. On her partnership with a university teacher (me), Margaret comments:

> I just learnt an enormous amount just having someone to work with who has the knowledge with the computers, that Richard has. So, I mean, obviously it really is a big frustration to a lot of teachers having computers in the classroom because invariably they don't do what you want them to do. You are constantly hearing people complain about that in staff rooms. It is easier not to use them sometimes, because the technology just doesn't work for you sometimes. It is really great to have this constant contact with someone who I can ask, 'Why is that happening?' or 'Why isn't this happening?'. There is obviously a benefit from the partnership.

Here, Margaret reflects on an important advantages of a collaborative study where computers are being used - the teacher gets help with the use of hardware and software. This is an example to educational authorities who sometimes believe that having sophisticated computer equipment in a school leads to teachers and students using the equipment at an advanced level. That does not happen automatically. There needs to be a plan put in place for teachers to have the time and opportunity to be confident in using the hardware and software, and exploring its possibilities. They need assistance, and if that assistance can be provided on an on-going basis, it has advantages for teachers' and students' learning.

My professional development has been significant through my 'shared adventure' with Margaret. I have consistently said that the most enjoyable part of my professional week was the time I spend working with Margaret in her classroom. I feel fortunate to have a 'ready-made' context within which to investigate the use of computers to promote better learning. While Margaret and I brought different sets of skills and experiences to our work, we had a common objective which we shared.

REFLECTION ON PRACTICE: PROFESSIONAL DEVELOPMENT IN METACOGNITION

Here I use Margaret's interview data to show her views on learning in the early stages of this study (April 1992) and her comments on learning in subsequent interviews. Her interview data suggests that there is a development in her views on learning. Her response to the question of who is a good learner in an early interview changed appreciably in subsequent interviews. The focus of this study widened her view of a good learner and her use of the computers to address the issue of good learning enabled her to re-define her position on good learning. I show how she discusses students' learning and reflects on her own learning and metacognition; she demonstrates her knowledge, awareness and control of her own learning.

> One of the reasons a child is a good learner is because of self-discipline. They understand that part of the learning is their responsibility. They probably are a

> more mature child, in some cases but not always. They have a purpose. They feel as though there is a purpose to what they are doing. They go on and they do it, perhaps going a little bit further, whereas, some children just do what is expected of them, and that's it. They don't do any more. That's how I would look at children who are effective learners. They extend themselves a little bit further...They are probably motivated too. They must be enjoying what they are doing in order to want to go on.

Margaret was asked whether she thought that the skills of an effective learner could be taught to all learners. She replied as follows:

> I'm not sure. After having done this work that I am about to do with my own class, I might have more of an idea on that. But, I think you can certainly try to teach these other children the strategies that they might be able to use to become better learners. Unless you make them aware of the strategies they can use, maybe they'll just go on, never developing those strategies. It maybe that you can make them aware and try to improve those skills and they still may not be effective learners, but at least you're exposing them to that. You have to give it a go. They're probably children who may not have been such good learners, but are better learners, as a result of having these strategies (offered to them).

Margaret was asked whether the process of learning was making her think more about her teaching and the whole learning process.

> That's something I wrote in my journal. I am going to go through the same process as the children are going through. I am learning just as they are.

Margaret's professional development was her focus from the beginning. In her explanation of why she wanted to be part of this study, her own professional development was a high priority. In response to a question on her learning she responds:

> I have learnt that you cannot just give a once-only explanation to children of this age group and I suspect that that is the case for quite some time. You can't just tell them this is how you do something and forget about it. You have to continually come back and revisit things. That is not only when you are teaching factual information or mathematics in the classroom, or something like that. It is even when you are giving them strategies to use for learning. You can't make the assumption, 'Well you know, we have talked about this. They'll remember that'. I think that has been an important learning point for me. You have to come back and keep discussing it and letting them hear each

> other's ideas as well and other's point of view, and what they have done to get their project finished, or to start planning for their story. 'How did you go about it?', and let other children hear it, because they might only have come across one method of planning and so it is good for them to hear from each other, I think. I think that an important factor too, is allowing children to learn from each other. I think they learn, a lot more from hearing one anther's ideas as they are standing out in front of the group and talking to them about something. I mean, there are certain things, obviously that I have to ... they are the ones who tell them, but certainly in planning and use of strategies, I think it is terrific if they hear one another's ideas. I think they have been some of the major things I have learnt from working with them in the Technology Centre.

The above quote is an example of Margaret's metacognitive thinking expressed in the context of this study. She is discussing the students' learning but at the same time she is reflecting on her own learning. Margaret's experience of students learning from each other came directly from the experience of this study and I observed her classroom teaching, away from the use of computers being directly influenced by that experience. When asked (in December 1993) how her experiences of 1993 would influence her teaching in 1994, she said:

> I think I would probably just continue ... the strategies I have been using this year have been I guess evolving over the last few years, and I have been really interested in people speak on learning and all of that type of thing. I probably will just continue to try and use a lot of the strategies I have been using this year, again. I think next year, I will try and develop them even more. I would like to do the revisiting more often than what I have done this year, for instance and make that part of my program more regularly than what it has been, because I do think that that helps. But it is so easy to get caught-up in a busy week at school and things just sort of get on a tread mill and suddenly you get to the end of the week and you realise you haven't done as much as you like. So I think that is something I would like to look at more next year. Depending on what level, of course. It will be different at different levels. Obviously what you can do with a Grade 6 you would have to adapt to do with Grade 1 for instance. But no doubt you can still have discussions and talk about their learning but you just do it on a different level.

My discussions with Margaret confirmed her growing interest in learning. Not only was Margaret interested in hearing about learning but she read in the area and was increasingly comfortable talking about her own learning and that of her students. She also alludes to adopting 'reflection on practice' as

part of her teaching repertoire. She refers to doing the same thing again and improving on it the second time.

In the following section Margaret reflects on teaching strategies she would like to use in 1994.

> Obviously working together in the groups helps. So I would like to do a lot more with that as well. Again, it didn't work so well in some instances with the class I had this year, because of the dynamics within the group, so I couldn't mix the groups as well I would like to. I would like to be able to mix them. You tended to have to let them be single sex groups. Not that that worries me. If they want ... if girls in particular want to work together, that's okay but, I do think mixing them is also good. It doesn't have to be all the time. But I would like to perhaps do a lot more of that next year, if I have the opportunity.

> The other thing, I guess would be, perhaps to do a bit more of the planning. I think that is important. I think that has worked really well and I probably would like to do ... to carry that over to next year with ... it has been successful with their story writing, because it has made them think before they start what they are going to do. Also with project and research work as well, I think it is good for them to think about it and plan it first, because it did help them have focus and when they went into the library they knew what they had to look for and what sort of questions they had to answer. Sometimes if they don't plan, they waffle on about things that are totally irrelevant to what they are being asked to do, because they haven't got any focus of where they are going. So, yes, I think that is probably another important strategy I would like to continue with.

It was gratifying to see that the emphasis on planning was carried through other areas in the curriculum.

> This project has made me observe the way kids learn using computers and certainly through the use of*HyperCard*, just the different aspects and the ways in which the computers can be utilised I think.

The emergence of computers in the curriculum has given teachers an opportunity to refocus on the learning that is possible through the computer. As a consequence of refocusing on learning, flow-on effects should benefit all other areas of the curriculum. In one of my discussions with Margaret she pointed out that it was not possible for primary school teachers to focus on learning in just one area of the curriculum. Because most primary teachers teach several subjects, the focus on learning was carried through to other subject areas. In the following quote Margaret continues to reflect on her learning and demonstrates her metacognitive skills.

Because you are constantly meeting and discussing children's learning, it constantly keeps coming to the forefront of your mind. It is just something that keeps bringing it back to you all the time; to think about what you are doing in terms of how the children are learning because it is so very easy in a classroom to get so bound up with all the little administrative tasks that you forget about one of the important functions of a teacher - to improve children's learning...

So, I think when I am planning my curriculum I keep those sort of things in mind, and the focus on metacognition has been important because I am finding I talk a lot more to the children about their learning and thinking, so I think that is important too, because I think that has been something that has come in to my teaching.

These last two paragraphs in particular reflect how significantly Margaret has adopted the 'shared adventure' model (Baird, 1993) and committed herself to the spiral of observation, reflection and action.

DEVELOPING TEACHING STRATEGIES

Margaret wanted to develop effective teaching strategies for the use of computers. This formed the focus for Margaret's purposeful enquiry. The process followed was of reflection - action - observing/engaging - asking questions - selecting procedures - applying procedures - evaluating results - making decisions -enacting decisions etc. (Baird, 1993). Margaret and I worked through this metacognitive process which was the core of the professional development aspect of the project. We tried a range of teaching strategies to promote better learning through the use of computers. Here, in the context of Margaret's professional development, interview data has been used to show her development in relation to teaching strategies.

One of the main areas I have been trying to concentrate on is the introduction of more cooperative learning activities... We have been encouraging the children to assist one another, and to actively seek help from other children rather than from adults... In the classroom I have been trying cooperative group work and stressing to the children that cooperative group work isn't just talking to one another while they work, but it is a system of helping one another. The talk that is going on while they are working is about their work, rather than their social life.

I think the children are starting to understand the actual idea of cooperative work, and helping the person next to them. I can just see that the groups are now working together and the groups are jelling together far better than they were. I still have problems getting the boys and girls to work together.

> The children are also involved with a cross-age tutoring program. That has also encouraged them with their cooperative work in that they are working with younger children. They are encouraged to use their*HyperCard* session to plan work to do with their Prep or Grade One Tutee. That's helping too because it is giving them a focus or a purpose. You could see them thinking: `Am I doing this for myself or am I going to do something that will help me with my cross-age tutoring?'. Some of them are making books and some of them are making games. Some of them know exactly where they want to go, whereas, some of them are doing good things, but they are not quite sure where they might go. Now they know exactly what the program has to offer, I want them to sit down and reflect again on where they might go. Some of them might be a bit fanciful like they want to create a cartoon, but at least they are thinking about what the program has to offer.

It was very important for Margaret to see early success in relation to what she wanted to achieve through this study. She wanted to promote cooperative work and that is what she could see happening as the result of this study. We discussed the factors that contributed to the development of cooperative work and attributed that to the learning environment, the use of computers, the program *HyperCard* , the cross-age tutoring project, and our general approach to allowing students to consult, talk to and learn from each other. In Margaret's third interview (February, 1993) she focuses on students' learning which reflects her emphasis on particular strategies of her teaching.

> There is a girl whom I will call X and 2 boys Y and Z. All of these children's confidence has increased through the *HyperCard* sessions. Their confidence has been improved not only in the area of using the computers, but within themselves as well...at being able to achieve so much. As I said, there were others there too, but these three came to mind. I chose children who were in my Grade 5 last year. I felt that the computer was a tool with which they could learn at their own pace ...where they could seek help when they required it and were able to progress steadily at their own pace. Each of the children increased their knowledge of the workings of *HyperCard* and increased the numbers of ways in which they could work with the program, to their own advantage. So that was what I felt was the highlight of their learning. Their learning also improved through their exploration of the program...just by trying things out, by working with others...they might have worked with a particular person for a couple of weeks and then maybe with someone else. Ideas and skills were also reinforced each session, so what they had learnt the week before, they built on the next week. A lot of them made games last year so, they had to go back through it, to a certain point, each time to find where they were.

So, they were reinforcing what they had already learnt. Problem solving was an important part of the sessions, particularly when games were being created. The children, I felt, benefited enormously from this...plotting out where they were going to go and what was going to happen next. Children with specific skills, and I had quite a few children who obviously had wide computer knowledge, were asked, by the less competent children, to share their skills with them. I felt that was really effective.

From the confidence that they gained through the use of *HyperCard* they became more confident within themselves and this was reflected in other areas of their learning as well. They weren't particularly confident learners earlier in the year, but I now feel that they will tackle things and have a go of things far more readily. I believe that that is partly attributable to this exploration and having a go at this program and feeling confident.

Margaret encouraged students to work at their own pace and to work in small groups. I observed Margaret taking a less conservative role when working with computers. Her need to be in control of the students' diminished and she gave them the opportunity to work in groups and consult each other and decide on the theme and direction of their project. She also tried teaching strategies that were presented through readings.

I have been reading an article written by a primary teacher, Sue Swan. She has used thinking books as a strategy in her classroom. At the end of the day, children are asked to reflect on what they've learnt during the day. She found that, initially, some children found it a bit of a struggle, for various reasons, whether it was academic or language, or they didn't understand the task. They would write, `Today we did some work with ice'. She collected their books and would write, `But what did you learn from this activity?' They set up a two-way communication.

The idea is, using the computers, we can have 'thinking discs' for the children to type up what they learnt. [These were not used.] So we are hoping to get them thinking about their learning, and getting them putting it onto computers. They'll learn to use the appropriate software. I think it will work out well. They'll print it off and I'll reply in much the same way. I think its important for them to get feedback. From the teacher's point of view, I think it's important to see that they are actually developing the skills of thinking. Unless you follow it through to see whether they are developing those

skills, it's something they could just keep answering in the same old way, during the year.

Margaret shows through her discussion of the thinking books that her strategies were related to promoting metacognition and that this study was truly collaborative with shared understandings of common goals. We discussed the issue of planning and the important part it plays in promoting metacognition through purposeful decision making, through making links and reflecting and projecting ideas. Margaret comments on her teaching strategies:

I showed them the one I had seen to give them an idea...just so they could visualise what I had in mind. Richard also had a similar program on birds. It was probably far more technologically superior but it gave them an idea of what we were looking for. So, I said they would need an introduction of what you are going to do and then you need a picture of the animal you are going to do. Decide what type of things you are going to talk about. This may include habitat, what it eats, what its enemies are maybe, where it is found. You will need to research information about that. So they would need to go to the library and look at home for information and then think about how they were going to present it. We had a few ideas. We had a rolling scroll screen. Some of them just typed the information at the bottom, for instance if they had a button on the shark's fin for instance then they gave information about what it is, why the shark needs it and what it uses it for. Basically I guess I asked them to think about what they wanted to talk about. They could have gone on forever because there is such a broad range of things but I asked them to select 4 or 5 things that they might want to talk about. Then they had to think about the appropriate use of language because a lot of the books they got the information from had fairly difficult words in them so they had to think about the use of language too. We tried to get them to visualise cards because of the *HyperCard*. Some of them started using a book for their planning and some of them actually started to draw cards and write in them what they were going to put. Some of them started to branch into concept maps, some of them brainstormed ideas...listed ideas. That's basically how we went about it. We gave them time to do that. I gave them time in the classroom. Some of them took it home and worked on it at home. We probably had a couple of sessions in the classroom planning it. Some of them wanted to draw the pictures. Some of them just wanted to write one or two words so they remembered what they wanted. The idea was to get them to think about what they wanted to do and write it down so they didn't forget.

In the above section Margaret describes the result of our discussions on whether we should use *HyperCard* programs developed by others as models for the students to follow. The drawback that I anticipated in using this strategy was that we would be encouraging the reproduction of those ideas. We decided to use the strategy because we decided that at that stage of *HyperCard*programming that the students were at, they needed to have ideas that would take them beyond what they were doing. Our timing was right and the strategy worked. The notion of visualisation was an interesting approach to planning that was related to the 'Stepping Stones' and 'Story Card' strategies of planning which we were using with the students. The students reacted to the visual aspect of planning very well and we found it to be particularly suited to planning in the making of a computer program. Margaret also encouraged students to discuss their plans and their completed programs with others in the class.

> Another strategy I use, probably in more depth now, is just discussing with the children, what is happening with their learning. I think that can be over looked. You can make assumptions that they are learning or they know what they are doing or what is happening. I don't think, in a lot of cases, that children really do understand what they are doing in terms of how they have gone through the process of achieving what they have achieved. So we are starting to discuss it a lot more so the children can be thinking about 'what have I learnt from what I have done?' either directly or indirectly.

> For instance, with a maths problem, you present a problem, they work through it, you discuss it and get the answer. Now, in some cases that might be as far as it goes, but in this case I would say to them, well how did you get your answer? Of course, this group's answer may be different to that one's because there is more than one way of solving the problem. Perhaps there isn't only one way that might be right. As long as they come up with the same answer although they may have come up with different strategies. That type of thing. Getting them to think about what they actually did do to get the answer.

At no time during this study did I observe Margaret's interest flagging. This may have been because the study was grounded in classroom practice and the development of teaching strategies was certainly high on Margaret's priorities. We often discussed the benefits she felt she acquired through the development of teaching strategies with a focus on enhancing metacognition. She found herself asking questions like 'what have I learnt from what I have done?' which became part of her professional practice. The challenge was then to continue the teaching strategies used in the Technology for Learning Centre in the classroom and to make links between what was done in the Centre and classroom curriculum.

MAINTAINING LINKS BETWEEN THE COMPUTER PROJECT AND THE CLASSROOM CURRICULUM

Early in the first year of the project I felt somewhat uncomfortable about the students enjoying their work and using a program that had such potential, and yet not doing something that was directly related to the classroom curriculum. The challenge was to bring the *HyperCard* project and the classroom curriculum much closer. I felt confident enough that the students were enjoying exploring and exploiting the potential of the program and the enjoyment that they were expressing was not related to the fact that they were not engaged in a curriculum activity. Margaret shared the concern about making links with the curriculum.

> ... we moved on to working on a science project. We went on our school camp to Queenscliff. We went to the Marine Discovery Centre. The follow-up of that is that we are trying to link the Technology Centre with what is happening in the classroom. I asked the children to use their skills with *HyperCard* to create a program about a marine animal.

> ...It is just something that is evolving. I am not saying, 'Now I want this to link with what you are doing in the Tech Centre'. We haven't actually talked about that. It is just evolving because they are hearing it here in my room and hearing it in the technology Centre, so the two things are just starting to flow. If we just back off for a month or so and don't mention the planning and see what happens.

The challenge was also to move the students along in their programs and possibly introduce new challenges and direction into their work. We tried showing them good models of programs that also represented new possibilities that *HyperCard* had to offer.

> One of the teachers on the staff had done a *HyperCard* project as part of her university course last year. As part of her study she made a program about a frog. I had seen this and I thought it would be an excellent way for the children to use buttons with their animation etc...using those skills and linking them with what we had done. Instead of doing a normal research project and presenting it they did it on *HyperCard*. They had to research the information and then they had an illustration of whatever animal it was and they had various buttons they had placed so the information would come up about the animal. They were asked to create the program for a child who was around the Grade 3/4 level. So, they had to look at the language and appropriate graphics. Most of them have moved on from that and we have asked them to write a story suitable for a Grade one or two. Again they are going to write the story themselves and do the graphics and include animation or sound effects. It will be a story where, for example, the child can press a button and a door will open...that type of thing is what we are looking at...the writing and planning stages of the story.

As we anticipated, the reference to the classroom curriculum did not take anything away from the students' motivation to use the computer and the *HyperCard.*

USING COMPUTERS IN THE CLASSROOM

In the course of this study I observed a significant change in Margaret's ability to use computers as a tool in her teaching. The most significant factor in her improved ability was her level of confidence in using the technology. Here, her interview data show her improved skills. In her first interview (April, 1992), in answer to a question on how she was using computers in her classroom she said:

> At the moment the computers are only being used for word-processing as part of the language program. We go through the processes of `process-writing' and the children can either type-up their story or hand-write it. They seem to prefer to type it. They just like the look of the finished project. We have some game discs in the room which children use on wet days. In terms of part of the curriculum, it is mainly in the word-processing area that I use computers.
>
> The Ferny Primary School teachers take the children to the Technology Centre, so the children are doing different programs. But, in the classroom, it is mainly for word-processing that I use computers. Time is the main problem. I honestly don't find a lot of time left to do a lot more with it. They all have their turn at the computer.

I need to add that Margaret was the leading computer user in her school at that time. Her reference to teachers using other programs in the Technology Centre referred to games and a word processor. I find her reference to time as being the main problem interesting. Her involvement in this study did not give her any time release. In the second interview (August, 1992) Margaret makes the following comments on her use of the computer:

> The main focus in the classroom is story writing. It is part of the language program. What we have done with that is, we have decided to hold a writing workshop. Half of the children use the computers (in the Technology Centre) and compose straight on to the computer. The other half stay behind (in the classroom) and write on paper. We are encouraging them to write straight on to the computer. It is a little bit early to know how that is going. A few of them who did print their work, didn't really have much to show, so it is a bit hard at this stage, to know how productive it is going to be. I think too, they have been so used to writing drafts so it may take them time to get used to writing straight on to the computer. I am sure that once they get used to it they will enjoy it because they can just edit and correct mistakes while they have it on the screen.

Margaret was asked if she was using any new programs since the first interview.

> Yes, definitely. The *HyperCard* project is going really well. The children are starting to use animation and sound together. Some children are making adventure games. Some are making them for their Prep./grade one tutee. We had a fair bit of experimentation initially. When they discovered they could put sound onto their work they were very excited. In their first session, two girls animated a girl doing aerobics and put rock music with their animation.

> The computers are being used in a more cooperative way. That's a big change. The children are not using the computers in an isolated way. They are now focused on *HyperCard* which encourages a cooperative learning situation. That's quite a big change too.

> The other thing that has changed, is that children are being encouraged to reflect on where they are going with this *HyperCard* program. We have asked them twice to write about where they could go with what they are doing. It is forcing them to look at what they are doing right now and where they are going to take it.

In her third interview in February, 1993, Margaret was asked what software she would recommend to other teachers.

> Well, of course, we only worked with *HyperCard*, so it is a bit difficult for me to talk about anything much other than *HyperCard*. Because of the time that was devoted to that, we didn't really do a lot of other computer work last year, apart from word processing and the publishing of stories. But, I was really impressed with *HyperCard* and what the children were able to achieve with it, and so I would certainly recommend it to other teachers, not only for the upper Primary years. I think you can go down to the middle Primary as well. There is so much they can do with it. I was impressed with how involved the children got with *HyperCard* because of all these different options they have with it. They did become really involved with it...things like the animation...they just loved being able to create things that moved. And, being able to put sound with the animations as well, so that if they could have music while someone was doing aerobics.

Margaret was very comfortable talking about *HyperCard* in response to a question about principles of selecting software for use in the primary school curriculum, she said:

> You would look for high interest. It would depend on what area of the curriculum you were wanting to focus

on. It would probably have to incorporate problem solving strategies and using fairly high skills for this level, I would think. On the other hand, if you were just looking for something basic...some basic maths type program, it would still have to be high interest. It has to be something that appeals to the students. The graphics have to appeal. I haven't had to go out and look for software for a while. But, high interest...interest in terms of challenging to them...but also graphics and the colour would have to appeal to kids as well. Not something they could do too quickly, so that they would say, `I've been there and done that.'

Margaret stresses the need for the software to cater to the interests of the students. That was a lesson from this study.

I just think all the different options...they can write with it...they can make games...they can draw pictures...they can put the stories on it as well...they can do assignments and projects as well, if they wanted to. I think it is just... A lot of people haven't really heard of it or done much with it. They know *HyperCard* is on the hard disc, but they don't really understand all of its properties. It has a lot going for it. It has a wide range of options for the user.

In answer to how she would suggest *HyperCard* be used by other teachers, Margaret very comfortably discusses the program, possible applications and some of its features. A long section of what she said in her interview has been used to show her confidence and fluency in discussing a range of issues relating to the use of *HyperCard.*

I would certainly suggest letting the children explore with the graphics and animation and making games... the types of things my grade did. I probably haven't seen a lot of other...I've seen them write on it, I've seen the children making the games and I've seen them doing the animation. Of course, they can do that individually. They can have a plan, create some animation, like a cartoon if you like, or they can use that as part of the game that they design. I would encourage them to use it for word processing, as well, I think. They are the areas in which I have seen it work, so I can't really comment on the other things that it probably can do. I am sure there are lots of other things that we haven't found out, or explored.

That's right. They were so focused on these games. They took a long time to do them. They did a lot within the games. They all varied. One game might have been going through forests or up to the moon. Another game was going through houses, so they had to plan a house first, so they knew which room led into which room. A lot of good problem solving. There would be maths and

language in there for them, but they wouldn't be aware that they would be doing a bit of maths.

Again, that would depend on how different people use them in different ways. Some people feel quite threatened by a computer and just use it in short bursts and then mightn't use it again. It varies I guess. It depends on your grade as well as to how readily and how accepting they are of things as well. But what I have tended to do is to have the computer running most of the day with what ever software you might be focusing on at the time and then just let a pair or three people or a small group work at the computer. It depends on the activity. If it is story writing you can't have three or four at a computer at a time. I don't agree with using computers for early finishers because it tends to be the same kids who always get a go at it. So that is why it is important to have a roster so that you know whose turn it is next, so that you can go through the grade and everyone gets equal time.

Oh yes, I could see possibilities for that. It depends. I can only go on what my class have been doing with it (*HyperCard*). If they have a game that is going, and it is going to take a couple of months before they can finish it, because of the access they have to the computer, it might be hard to get them to deviate from that to do something else on *HyperCard*, in the time. There is no reason why, if you were doing a particular topic, that you couldn't link that in to something on *HyperCard* to do with what you were learning about. If you were learning about the body, for instance, there is no reason why you couldn't do some animation using body parts and things like that. There is no reason why you couldn't do that. There could be a little assignment about what you want them to create and you could let them all have a go at creating it and see what happens in different ways. There is no reason why...there is a lot of potential for that type of thing, I would think.

After working on the project for a year and a half, mid 1993 was an important period for significant steps to be taken with regard to how the computers were being used in the classroom. We began to develop an understanding that when students were working on developing their own programs, such as they were doing on *HyperCard*, the time-frame for the project often needed to be considerably longer than book-based projects.

There they are mainly using *HyperCard*. They have created a variety of adventure games, problem solving games. They did a lot of that last year and they carried over into this year completing those. Some of them are still working on those or have started new ones.

At no stage in the project did we plan to downgrade computer games. However, we did not deliberately introduce computer games. Margaret does not make any apology for the students not playing computer games, and the students did not miss them.

> A game like Carmen San Diego, for the children in my grade, is virtually a lunch time activity, or something like that because of the amount of time I am already spending in the Technology Centre. As I said, I do provide sessions in the classroom to do planning and evaluation. With regard to the word processing and typing up, it is just really when the need arises. If someone says, can I type up my story, that's when they use it. X (another teacher) has done lots of work sheets with Carmen San Diego but I haven't had the time to do it, with all the *HyperCard* work.

Here, Margaret gives an overview of her own learning with computers:

> ...right back to the time when I first came back to teaching I was thrust right into it with my work with Richard. and that was then, of course, the 11e's and I had never used a computer before, so I mean obviously it has forced me to become computer literate. I feel quite computer literate apart from probably with the*HyperCard*. I just find *HyperCard* is fairly complex, and with time, and I have certainly found that by having access to the Macintosh this year, and having to actually do it myself...see, the problem with the grade 5s and 6s was that as they didn't really rely on me a great deal, so I didn't have to learn a lot, and the just flew ahead of me any way. I would never have kept up without constant access to a Macintosh, whereas, this year, I have had access to a Macintosh. We have just bought one at home as well. I do feel reasonably computer literate with just general day to day type things that you need a computer for. So it has forced me to learn skills that I wouldn't have otherwise learnt.
>
> It has made me observe the way kids learn using computers and certainly through the use of *HyperCard*, just the different aspects and the ways in which the computers can be utilised I think.

In response to a question about what she had learned about her own learning through the use of computers in this study Margaret makes a very important reflection on her own learning.

> Well obviously you learn by doing...hands on. Obviously for children it is the same. By actually 'doing' and being forced to actually use the computer yourself you are going to develop skills and understandings about how it operates and by making mistakes you work your way through the problem. So, I think that has

> probably helped me. That is something you notice
> about your own learning. You are always talking about
> giving kids concrete materials to learn with in maths
> and things like that and obviously a computer is a
> concrete piece of equipment and you have to use it to
> learn how to use it.

In 1994, when Margaret was in the merged Creek View Primary School, I lent
her a Notebook computer for that year. She comments:

> Having access to a computer at home and not having
> had access at home before made a big difference. I
> used to find it quite difficult to find the time to get into
> the Technology Centre during lunch time or during your
> time release as invariably there was something you had
> to do... Having the Notebook has made an enormous
> difference to my own development in the use of
> computers. I still find that you get stuck on something
> and that is why, when Richard comes in on a Friday, I
> pick his brains a bit about things that have happened or
> ask him questions about things.

> I think the actual doing of the work with the computer is
> really useful as well. I have learnt a lot just by using the
> program *HyperCard*. I have seen what kids are capable
> of doing which I probably would not have been aware
> of before. And, knowing what they are capable of doing
> gives you ideas for other areas that you could use it for
> as well. It is just a matter of becoming a bit more
> confident with it as well. It is also a matter of having the
> computers to use as well. It has been great this year.
> The Macintosh that is in here is from the Technology
> Centre. It is not a school computer. I would love to see
> them buy some more Macintoshes.

Margaret's computer skills and confidence in using computers grew
significantly through her involvement in this study. I did not give Margaret any
tutorials on the use of hardware or software; she learned through
involvement. The computer skills also came with purposeful enquiry in a
process of reflection on practice. However, our collaboration through
purposeful enquiry and shared adventure would not have been possible had it
not been for Margaret's willingness to take part in this study and her
willingness to change.

DISPOSITION TO CHANGE

In Margaret's first interview (April, 1992) she speaks of her disposition to
change. She looks forward to the change from teaching grade prep to grade
six and recognises the challenge in extending her own experience as a
teacher. She sees her changing relationship from being a 'motherer' to the
preps to being more on an 'even par' with the grade sixes.

I had worked with Margaret on other projects and I was always impressed
with her questioning of what she did and her willingness to talk about her

classroom practices. She was not just interested in the question of which piece of computer software to use and the technical skills to operate the computer but the deeper question of how the facilities of the computer could be further explored.

Margaret consistently expresses the view that change is often thrust on you and you are forced to adapt. In her first interview Margaret often talks of being 'forced to' do things and the benefit that that may have. She always uses the phrase predicated on the fact that she could see the advantage of whatever was being forced on her but if she were not forced, it would not have happened.

I am not suggesting that this is necessarily representative of all teachers, but, in Margaret's case, she prefers to be in the position where she is directed to address certain aspects of her professional development. In the case of using computers in the curriculum, her preference is to be placed in a position where she would learn in the context of her own professional work.

Speaking of our first project together she says:

> I came back from five years out of teaching and Richard was looking for a class and teacher to start doing some work over at the college with computers. The Principal asked me - so I panicked a bit - because when I left teaching computers weren't in schools at all. I came back and suddenly I was put in this situation and because I said 'yes I'd do it', I was then made computer coordinator at the school. So it really did force me to learn. Later she said, It really did force me to ...

Most primary teachers would identify with being in the position of being 'forced' to use computers. Margaret, in this interview acknowledges the opportunity to a explore some of the questions she had about using computers: 'how you use them and what you use them for', with someone from a tertiary institution interested in sharing in classroom research. As shown in this paper, this led to a significant opportunity for professional development for Margaret. As she said in an early interview, 'I am going to go through the same process as the children are going through. I am learning just as they are.'

In conclusion, the professional development of Margaret was a particularly encouraging feature of this study. I have concerns about the professional development of teachers with regard to the use of computers in education and throughout this study I maintained a consistent excitement about being involved in a process that made a positive contribution in the area of that concern. Moreover, the model of 'shared adventure' that we followed could be emulated in most school situations.

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